



Gaylord Hardwood Flooring

Product and Installation Manual

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About the Author



Introduction

We are very happy to introduce our Hardwood Flooring Information and Installation Guidelines. Following our recommendations will greatly reduce your call backs, and lessen your number of unhappy customers.

Greg and I are certified NWFA Floor Inspectors. When people have an issue with their hardwood flooring (not purchased from Gaylord) they visit www.nwfa.org and contact an inspector in their area. They will contact Greg or myself, and want us to perform an inspection. Being busy running our business, we usually listen to the concerns and explain to them that their issue is normal. We tell them how to correct the situation; and the people thank us. However, occasionally people want a full report; in which case we charge between \$500 and \$700. We create a report, compiling all of the contributing scientific facts relating to the issue. If the customer escalates the situation and it turns into legal action, we become the “Expert Witness” and our report is very important.

However, when we have an issue with one of our own floors and explain the same information to builders and homeowners, it is not accepted with the same credibility as the independent inspections we do, which is not fair to us. How can we go from the Expert Witness status to the person that isn't trusted because it is their product? My point is: the advice we give is very professional and doesn't change, whether it is or isn't our hardwood flooring.

The frustration of getting pushed into a corner by builders and homeowners, and made to feel that we are dodging our responsibilities on flooring issues has prompted me to compile this manual. The information is very clear and we are very willing to answer any questions that arise. If you are changing to laminate because you are having too many issues with hardwood, it is very likely that you are not following our recommendations. NWFA statistics show that 78% of problems are in newly constructed homes in which 95% are moisture related. The simple solution is to follow our recommendations to get through the new home stage. Laminate is a very short term solution while hardwood will last over 100 years.

Unfortunately most people selling hardwood flooring are unable to give the necessary professional advice; and they pass the problems back to the distributor, who passes it back to the manufacturer, and nobody takes the responsibility; and you are left with the problem.

Our goal is to make a perfect product, manufactured within very strict tolerances; above and beyond industry and Tarion standards.

At Gaylord, there is a great feeling of pride putting our name on a product that was manufactured and installed by your team. This manual demonstrates how committed we are in what we do. Please look at us as a partner and professional flooring consultants who will make your job easier and more profitable.

Lewis



Chapter 1

Measure Twice....Order Once!!!!

At Gaylord's your order is specially made for you, so the measure is very important. When the customer performs the site measure, there will be "No Returns"; plus a \$350 set up fee if you run short and need more material. Measure the exact footage and add on the recommended waste for the job. The waste factor will be affected by the product used; as well as the size of the rooms. Large rooms create less waste than small rooms; and hallways create more waste. Patterns and running on angles create more waste, as well. Please ask, and we will assist you with any questions regarding the waste.

The square footage on your order is the target number we shoot for during production. This footage will likely change, as we put extra material on the production line to accommodate for pieces that don't pass our strict quality control process. This extra material will not exceed your original order by more than 2%. Most competitors will suggest adding a waste factor of 10% instead of our normal 5%. In a case where you have material left over; instead of being upset, you must realize that you had less waste because of our superior quality. Had you gone with a competitor, you would have had to purchase much more material and possibly run short. It is not fair to punish us for having a great product with less waste.

Often times closets and landings will be forgotten. As we know, many changes can occur with a floor plan; as customers use tile instead of hardwood or vice versa; or areas get larger or smaller. When this happens, we need to be notified BEFORE the flooring is produced. Be sure to install the main most visual areas of the house first, leaving the closets to the end, in case you do not have enough material. Wood is a natural product and may vary from one batch to another, so running out in a very visual area creates a reason for the customer to not be happy, as the new boards may not be a perfect match. If you feel you may run out, do not use your last box until you get the new material. This way the new material can be feathered in with the existing floor, making it less noticeable.

Having an extra box of flooring available for future repairs is a good idea. Most damage to hardwood flooring occurs during the construction and move-in stage. Be sure dishwasher, fridge and washing machine hoses are securely fastened to prevent water leaks that will cause severe damage.

At the time of the site measure, please include any accessory pieces (bullnose, reducers, T-moulds, spline) as well as the number and sizes of vents; as they are all custom made for the job. Having all of the material at the jobsite at the same time will prevent unnecessary delays in completing the installation.

Please take the time to make an accurate measure, including all material needed for the job. We make enough material for the job and very seldom have extra material. Producing another box of flooring can take up to two weeks, while doing it the first time takes an additional 2 minutes; not to mention all of the stress created and wasted time.

Thanks for choosing Gaylord. The success of your job is very important to us. If any questions please contact me lewis@gaylordhardwoodflooring.com



Chapter 2

Understanding Wood Movement

Wood flooring will perform best when the interior environment is controlled to stay within a relative humidity range of 30% to 50% and a temperature range between 16 and 27 degrees Celsius. Fortunately, that's the same range most humans enjoy. The chart below indicates the moisture content that wood will likely have at any given temperature and humidity. Note that the equilibrium moisture contents in the recommended temperature/humidity range (shaded area) coincide with the 6% to 9% range in which we manufacture our hardwood flooring. Although some movement can be expected even between 6% and 9%, wood can expand and shrink dramatically outside of that range.

WOOD FLOORING HAS A COMFORT LEVEL TOO

Wood flooring will perform best when the interior environment is controlled to stay within a relative humidity range of 30 to 50 per cent and a temperature range of 60 to 80 degrees Fahrenheit. Fortunately, that's about the same comfort range most humans enjoy. The chart below indicates the moisture content wood will likely have at any given combination of temperature and humidity. Note that equilibrium moisture contents in the recommended temperature/humidity range (shaded area) coincide with the 6 to 9 per cent range within which most hardwood flooring is manufactured. Although some movement can be expected even between 6 and 9 per cent, wood can expand and shrink dramatically outside that range.

**MOISTURE CONTENT OF WOOD
AT VARIOUS TEMPERATURES AND RELATIVE HUMIDITY READINGS**

Temperature (°Fahrenheit)	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	98
30	1.4	2.6	3.7	4.6	5.5	6.3	7.1	7.9	8.7	9.5	10.4	11.3	12.4	13.5	14.9	16.5	18.5	21.0	24.3	26.9
40	1.4	2.6	3.7	4.6	5.5	6.3	7.1	7.9	8.7	9.5	10.4	11.3	12.4	13.5	14.9	16.5	18.5	21.0	24.3	26.9
50	1.4	2.6	3.7	4.6	5.5	6.3	7.1	7.9	8.7	9.5	10.4	11.3	12.4	13.5	14.9	16.5	18.5	21.0	24.3	26.9
60	1.3	2.5	3.6	4.6	5.4	6.2	7.0	7.8	8.6	9.4	10.2	11.1	12.1	13.3	14.6	16.2	18.2	20.7	24.1	26.8
70	1.3	2.5	3.5	4.5	5.4	6.2	6.9	7.7	8.5	9.2	10.1	11.0	12.0	13.1	14.4	16.0	17.9	20.5	23.9	26.6
80	1.3	2.4	3.5	4.4	5.3	6.1	6.8	7.6	8.3	9.1	9.9	10.8	11.7	12.9	14.2	15.7	17.7	20.2	23.6	26.3
90	1.2	2.3	3.4	4.3	5.1	5.9	6.7	7.4	8.1	8.9	9.7	10.5	11.5	12.6	13.9	15.4	17.3	19.8	23.3	26.0
100	1.2	2.3	3.3	4.2	5.0	5.8	6.5	7.2	7.9	8.7	9.5	10.3	11.2	12.3	13.6	15.1	17.0	19.5	22.9	25.6

Chart taken from Wood Handbook: Wood as an Engineering Material, (Agriculture Handbook 72), Forest Products Laboratory, U.S. Department of Agriculture.

Respect that wood moves 50 times more widthwise than in length. Going lengthwise into tile is not an issue; however widthwise it is very important.

The numbers on the accompanying chart reflect the dimensional change coefficient for various species, measured as tangential shrinkage or swelling within normal moisture content limits.

The dimensional change coefficient can be used to calculate expected shrinking or swelling. Simply multiply the change in moisture content by the change coefficient, and then multiply by the width of the board. Example: A red oak (Change coefficient .00369) board 5" wide experiences a moisture change from 6% to 9% - a change of 3 percentage points.

Calculation

$$3 \times .00369 = .01107 \times 5 = .055 \text{ inches of expansion per piece}$$



Brand New 5” Maple Board



Board After it is Exposed to 40% Humidity for an Extended Period of Time



THE SCIENCE

Change Coefficient	Moisture Content Change	Board Width
.00353	1.5	5

BOARD WIDTH CHANGE: .026475 **ROUGHLY 1/32”**

Difference from one end to the other would be 1/16” when sitting in normal conditions

Growing Boards

How much can temperature and humidity affect the dimensions of a hardwood floor? Take a look at the same 5” oak board.

1. Within “Normal Living Conditions” (say, an interior temperature of 70 degrees and a relative humidity of 40%), the board has a moisture content of 7.7 % and is 5” wide.
2. If the relative humidity falls to 20%, the moisture content of the board will be 4.5%, and the same 5” board will shrink by .0059” (thickness of a toonie). Across 10 feet of flooring, that could translate to as much as 1.4” of shrinkage.
3. If the humidity rises to 65%, the board’s moisture content would be 12% and the same 5” board would expand by .079”. Across 10’ of flooring, this could translate to 1.9” of expansion which would likely cause severe cupping.



Species	Change Coefficient
True Hickory	.00411
Red Oak	.00369
White Oak	.00365
Hard Maple	.00353
Brazilian Cherry	.00300
Black Walnut	.00274
White Ash	.00274
Black Cherry	.00248
Santos Mahogany	.00238
Eastern White Pine	.00212

Species	Janka Rating
Brazilian Walnut (IPE)	3670
Cumaru (Teak Brazilian)	3540
Brazilian Cherry	2350
Tigerwood	2160
Sucupira	1980
Hickory/Pecan	1820
Hard Maple	1450
White Oak	1360
Ash	1320
Red Oak (Northern)	1290
Black Walnut	1010
American Cherry	950
Black Cherry	950
Eastern White Pine	900



Chapter 3

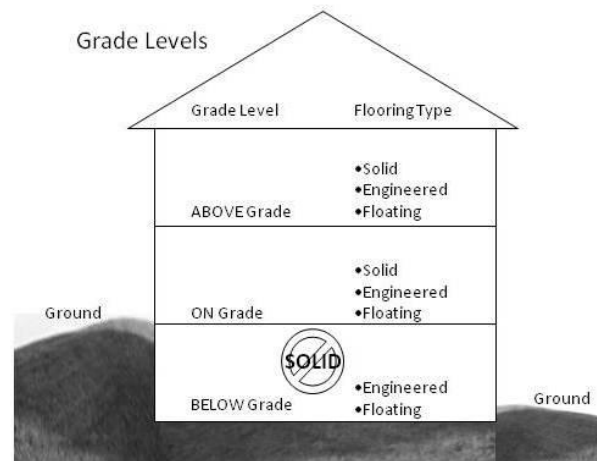
Jobsite Conditions

Part 1- Minimal Jobsite Conditions

- A. Wood flooring should be one of the last jobs completed on the construction site. Limiting the foot traffic and work done after the installation of the floor will prevent repairs when the job is done.
- B. Evaluate the jobsite for potential problems before installation begins, and before wood flooring is delivered to the jobsite; taking pictures of unacceptable jobsite conditions, recording humidity levels and moisture contents of subfloor.
- C. Unless a waiver or letter of protest listing exceptions exists, installation constitutes acceptance of the jobsite. This includes the ambient temperature and relative humidity at the time of installation and all variables that affect the long term success of the job.
 - 1. Surface drainage should direct away from the building.
 - 2. Heating, air conditioning and dehumidification systems must be operating before, during and after the installation. If it is not possible for these permanent systems to be operating, temporary systems must be set up to mimic a temperature of between 65 and 75 degrees Fahrenheit and relative humidity between 30% and 50%. Notes: 1. Electric portable heaters excessively dry out the area closest to them. Propane heaters add moisture to the area which can work against already high moisture conditions. Kerosene heaters add an oily film to the floor which makes it more difficult to clean. 2. In new home construction a dehumidifier that removes 8-10 gallons per day is required. Anything less will not remove the moisture quickly enough. The dehumidifier should always be set up in the basement which is the largest source of moisture. It is best to draw the moisture down from the subfloor. I would suggest the dehumidifier be set up as close to the middle of the basement as possible, draining into an enclosed sump hole. A couple of fans blowing towards the dehumidifier will ensure more consistent drying results.
 - 3. Do not deliver wood flooring to the jobsite or install wood flooring until these temperature and humidity conditions are achieved and the subfloor is within 3% of the wood flooring. Surface drainage should direct water away from the building. All concrete, masonry, plastering, drywall, texturing and painting must be completed. Note: 1. A newly constructed home may contain up to 0.6 gallons of water per square foot of home. A 2000 square foot home could have up to 1200 gallons of water; which will be absorbed by the wood flooring if not removed during the construction and newly occupied stages. The quick removal of the majority of this moisture is instrumental to the success of the wood flooring job. As a builder or installer you may have created the perfect conditions (40% relative humidity and a subfloor moisture content within 3% of the hardwood) to proceed with the installation, but you need to understand that the moisture in the walls, concrete etc. will be absorbed by the air; and subsequently by the subfloor and wood flooring. Without continued removal of this moisture, these perfect conditions will quickly deteriorate, resulting in a problem floor in the future.



- Basement ceilings must NOT be finished until the subfloor and joists have a humidity range of 6% to 9%. If the moisture is not removed, it remains trapped between the subfloor and basement ceiling; causing the hardwood floor to cup and crack. The flooring may take 2 to 3 years or longer to flatten; due to the moisture that is trapped between subfloors and basement.
- Basements and crawl spaces must be dry. Crawl spaces should be a minimum of 18" from the ground to the underside of the joists. Crawl space earth (or thin concrete slab) should be covered 100% by a vapour retarder of black polyethylene (minimum 6 mil) overlapping a minimum of 6". Crawl spaces should have minimal 1.5 square feet of ventilation per 1000 square foot area. There are many variations of crawl space conditions. If you require more information please contact me at lewis@gaylordhardwoodflooring.com.
- Ensure that the flooring selected is suitable for the grade level. Solid hardwood flooring can be installed on-grade and above-grade only on a wood-based subfloor. Engineered hardwood can be installed above-grade, on-grade and below-grade over wood-based subfloor and concrete.



If the soil surrounding a structure is 3 inches or more above the floor of any level, consider that level below grade. This includes walk-out basements. In addition, the surrounding soil should be sloped away from the structure.

- Radiant heating systems must be on and running for at least 7 days prior to installation. Moisture test of the concrete must be taken. For more info please contact me at lewis@gaylordhardwoodflooring.com.



Chapter 4

Acclimation

1. The point of acclimating wood flooring prior to installation is to allow the moisture content of the wood to adjust to “NORMAL LIVING CONDITIONS” at the site. That is, the temperature and humidity conditions that will typically be experienced once the new home moisture is removed and the structure is occupied. We manufacture our hardwood flooring to a moisture content between 6% and 9%, which coincides with relative humidity levels between 30% and 50%; which are the conditions the house will be after the “new home” moisture is removed. Our warehouse is climate controlled to a relative humidity as close to 40% as possible. This range is the most comfortable and healthy for humans. In most cases, our flooring is ready to install immediately after delivery. If you have a cottage that is not heated in the winter; a crawl space; a structure on piers; or any situation that may not be considered normal, please contact me at lewis@gaylordhardwoodflooring.com. It must be understood that the hardwood flooring temperature/humidity levels must be within 3% of the subfloor.
2. Having the wood flooring on the jobsite before these conditions are met will cause it to change dimensions, especially on the ends. If the humidity is higher than the recommended levels the ends of the wood will absorb moisture first and will become wider. If the humidity levels are lower than the recommended levels the ends will lose moisture and shrink. In both of these cases the width variations will make the hardwood flooring very difficult to install and the end result will not be good.
3. Acclimation is very misunderstood. Many times I have come into situations where someone was adamant that the wood flooring needed to sit in the house 2 to 3 weeks prior to installation to acclimate. This was true ages ago, before the wood was kiln dried; the flooring had to sit in the house to complete the drying process. Hardwood flooring on a jobsite with a relative humidity above 70% will start cupping in the boxes after 48 hours.



Chapter 5

Moisture Testing

- A. 1. Moisture meters and humidistats are the most critical tools of the trade. If your installer does not have either of these tools, they are obviously not aware of the very important relationship between wood and moisture. Continuing with an install constitutes acceptance of the jobsite conditions by the installer.
2. The subfloor must not exceed 11% moisture content. The wood flooring must be between 6% and 9% moisture content. The relative humidity of the home must be between 30% and 50% before, during and after the install.
3. There are many types and brands of moisture meters. Pin types penetrate into the wood to obtain the moisture reading. Pinless, non-destructive meters obtain moisture readings without penetrating the wood. The pinless meters give a reading which is not necessarily accurate, but offers an approximate reading of the moisture content. The more expensive meters have adjustable settings that are more accurate, but are affected by the glues in the subfloor. The only true method to measure the moisture content of wood is to weigh the piece; dry it until there is no moisture left; weigh it again; and subtract the dry weight from the green weight. Ex. 400 grams - 370 grams = 30 grams, divided by 370 grams x 100 = 8.1% moisture content.
4. Humidistats or hygrometers are readily available for purchase. Purchasing and using 2 units will keep accurate results.
5. Before testing a concrete slab it must be at least 45 days old. Use the Calcium Chloride test which is available at the big box stores. The moisture level using the calcium chloride must not exceed 3lb/1000 square feet. A simple method to test for moisture is to tape poly to the floor; and let it sit for 48 hours. If there is no condensate under the plastic, the concrete slab is likely dry.
6. The length of time it takes for concrete to cure can create delays on the construction site. Under average ambient conditions, a concrete slab will dry at approximately 1" per month. Concrete cures by hydration when water reacts with the cement powder, giving concrete its strength. However, the mix always contains more water than the hydration reaction requires. This has become more prevalent with the use of lightweight aggregate, which tends to retain moisture. In typical floor slabs, there could be up to 50 gallons of extra water in every cubic yard of the pour. Using a dehumidifier with constant air flow over the slab surface will speed up the process. When the slab is dry it is recommended to use a concrete sealer or a recommended adhesive with moisture barrier.
7. Radiant heating in concrete slabs must be turned on to a minimal temperature of 22C degrees, 7 days prior to drive out residual moisture before wood flooring can be installed.
8. Since there are many types of radiant heating systems, please contact me for more detailed information on your project. lewis@gaylordhardwoodflooring.com.



Chapter 6

Panel Products Subflooring

1. Subfloor Uniformity and Integrity

- A. Wood subfloors must be flat, clean, dry, structurally sound, free from squeaks and free from protruding fasteners. Especially with dark shiny floors, the slightest amount of variation on a subfloor can make the floor look terribly uneven when light shines on them.

For installations using cleats 2" and longer, the subfloor should be flat within 1/4" over 10' or within 3/16" over 6'.

It is the builder's or general contractor's responsibility to supply the wood flooring contractor with a subfloor that is within the above tolerances.

If peaks and valleys in the subfloor exceed these tolerances, the high spots can be sanded down and low spots filled with extra underlayment. Not supplying a flat level surface; and installing a shiny smooth floor with natural light, turns into disaster with no repair options, other than a tear-out.

The subfloor must be free from all dirt, especially drywall compound drips that prevent the wood flooring from laying flat on the subfloor. The hardwood flooring will only lie as uniformly as the subfloor.

If there is movement or squeaks in the subfloor, refasten the subfloor to the joists in problem areas. Protruding fasteners are easily remedied by driving those fasteners deeper into the subfloor.

Notes

When OSB subflooring dries it loses its grip on the fastener, which leads to squeaks; especially in areas with high traffic and areas above the main heating system. These squeaks are a major reason for calls from unhappy homeowners who feel it is a failure of the hardwood flooring or a poor installation job.

2. A. Ensure proper expansion space (1/8") between the panels. If the subfloor panels are not tongue and grooved; and there is not sufficient expansion space, use a circular saw to create the specified space. Do not saw through joints on the T & G subfloors.
- B. Check for delaminated or damaged areas and repair those areas as needed.
- C. Ensure the subfloor is free from debris before starting installation.
- D. Acceptable Panel Subfloors: Truss/joist spacing will determine the minimal acceptable thickness of the panel subflooring.
1. On truss/joist spacing of 16" o/c or less, the industry standard for single-panel subflooring is nominal 5/8" CD Exposure 1 Plywood subfloor panels or 25/32" OSB Exposure 1 subfloor panels, 4 x 8' sheets.
 2. On truss/joist spacing of more than 16" o/c, up to 19.2" o/c, the standard is nominal 3/4" T & G CD EXPOSURE 1 Plywood subfloor panels (CD EXPOSURE 1), 4' x 8' sheets, glued and mechanically fastened; or nominal 3/4" OSB Exposure 1 subfloor panels, 4' x 8'sheets, glued and mechanically fastened.
 3. Truss/joist systems spaced over more than 19.2" o/c up to a maximum of 24" o/c require nominal 7/8" T & G CD EXPOSURE 1 Plywood subfloor panels, (Exposure 1) 4' x 8' sheets, glued



and mechanically fastened; or nominal 1" OSB (Exposure 1), 4'x 8' subfloor panels, glued and mechanically fastened; or two layers of subflooring; or brace between truss/joists in accordance with the truss/joist manufacturer's recommendations and with local building codes. Some truss/joist systems cannot be cross-braced and still maintain stability.

4. For double-layer subfloors, the first layer should consist of nominal 3/4" CD Exposure 1 Plywood subfloor panels (CDX), 4' x 8' sheets; or nominal 3/4" OSB Exposure 1 subfloor panels, 4 x 8' sheets. The second layer should consist of nominal 1/2" CD Exposure 1 Plywood subfloor panels, (Exposure 1) 4' x 8' sheets. The 1/2" plywood should be offset by 1/2 panel in each direction to the existing subflooring. The panels may also be laid on a diagonal or perpendicular angle, with 1/8" spacing between sheets. Nail on a 12" minimal grid pattern, using ring-shanked nails or staples.



Chapter 7

Concrete Subfloor Guidelines

1. Subfloor Must Be Level
 - A. Ensure the concrete slab is flat, with the tolerance being 3/16" over 10'.
 - B. If the slab is out of specification, consider grinding, floating or both. Many high spots can be removed by grinding; depressions can be filled with approved patching compounds; and slabs can also be flattened using self-levelling concrete products.
 - C. When sanding or grinding concrete, be sure to wear a mask. Apply water to the floor before sanding to limit dust.

2. Subfloor Must Be Dry
 - A. Refer to Chapter 3 (Moisture Testing)



Chapter 8

3/4" Engineered Wood Flooring Installation Options

Edge Glued (Floating with Pad)

- Using an approved glue, put a line not less than 1/16" and up to 1/8" diameter to the side and end grooves of the flooring installed over an approved pad. The floor will slightly move when walked on, especially if the floor is not perfectly level.
- After installation, the floor can't be disturbed for 48 hours; to allow the glue to set. Putting protective covering on the flooring will prevent the glue from curing, and prolong the drying period. If the floor is walked on before that time, the glue bond will be weakened; the boards will separate and possibly cause squeaks in the future. Squeaks are not covered under our warranty.

Pros

- Installation is less expensive, as it takes less time and less glue is used.
- Board replacement, if necessary, is easier.

Cons

- Floating floors have more of a tendency to squeak.

Full Glue Down (with pad)

- Pad is glued to the concrete using Gaylord-approved glue with the proper trowel to ensure a generous amount is applied.
- Engineered flooring is glued to the pad using the proper trowel to ensure enough glue is used. Not using enough glue will prevent a good bond, and the area will be bouncy.
- After installation, the floor can't be disturbed for 48 hours; to allow the glue to set. Putting protective covering on the flooring will prevent the glue from curing, and prolong the drying period. If the floor is walked on before that time, the glue bond will be weakened; and the boards will be spongy.

Pros

- More solid feel and less possibility of squeaks.

Cons

- More expensive to install because of more time and glue needed.
- Board replacement, if necessary, takes more time.
- It is difficult to keep glue off the surface of the boards. The installer can do a fantastic job keeping the floor free from glue, but often times other trades people and homeowners will step in the glue and track it throughout the house.



FAQ

Q: Why do I need to use the pad?

A: The pad has an insulating value of almost R4, which in a basement installation can deflect the cold down and keep the heat up. If the flooring is installed directly on concrete with a surface temperature of 16 C, the flooring will absorb the cold and be 16 C. If the pad is used with the same 16 C slab, with a room temperature of 22 C, the surface temperature of the flooring will settle in between 19-21 C. In condominiums, the pad must be used as a sound barrier. The customer must check with the Condo Board to determine which pad is acceptable. The pad also works as a leveler with uneven subfloors.

Q: Why can't I use a cheaper glue?

A: There are cheaper glues that look the same, but if you make a comparison they are different. For the edge-glued floors, normal wood glue looks identical, but it contains a higher content of water which just evaporates when it dries. The glues we recommend contain less water and more solid particles. The cheaper glue for the full glue downs does not have the built in vapor retarder; which prevents the moisture from the concrete from entering the wood flooring.

3/4" Engineered Wood Flooring Installation

- A. Starting the install constitutes that you have accepted the Jobsite conditions (Chapter 1); product is properly acclimated (Chapter 2); moisture testing is complete (Chapter 3); panel products/subflooring are prepared to proceed (Chapter 4); concrete is prepared and moisture levels are ready to proceed (chapter 5).
- B. Product can be installed above-grade, on-grade and below-grade.

At or Above-Grade on Plywood or OSB

1. Refer and follow guidelines for Solid Wood Installation.

Below-Grade on Concrete (Full Glue Down)

1. Ensure concrete is not contaminated by oil, coal tar, asphalt, asphalt cutback; as these contaminants prevent glue from bonding and curing.
2. A. If a noise barrier/insulated pad is required, apply an approved Urethane-based adhesive (following manufacturer's recommendations, including coverage, trowel size, and spread pattern) to concrete; roll out the insulated underlayment, ensuring the pad is flat and level. Stay off the pad until the adhesive has bonded.
B. If installing directly to concrete, apply an approved Urethane-based adhesive (following manufacturer's recommendations, including coverage, trowel size, and spread pattern) to concrete.



3. Select a starting point according to the most aesthetically or architecturally important elements in the room; taking into consideration any stairways, hallways, fireplaces, doors, cabinets, adjoining tile and transitions; as well as the squareness of the room. The starting line will often be the longest unbroken line in the room. Fasten a backer board at your starting point. Place boards with the tongue side facing the backer board.
4. In rooms less than 16' allow 3/8" around perimeter for expansion. For rooms between 17' and 24' allow 1/2" around perimeter for expansion. For larger rooms contact me at lewis@gaylordhardwoodflooring.com.
5. Always keep at least 5 rows of flooring racked out ahead. To have the most aesthetically pleasing look rack the flooring so no joints are closer than 3 times the width of the pieces; avoid H joints and stair stepping from not completing rows.
6. Apply adhesive to install 4 to 5 rows of flooring. Place the boards so you are not squeezing the glue between them, causing glue to come to the surface. Immediately remove any excess glue from the surface with an adhesive remover.
7. Taping rows of boards together with Blue 3M low-adhesion tape will help prevent boards from separating. Tape must be removed within 24 hours to prevent damage to the finish.
8. Remove the backer board and complete the installation without walking on the newly installed floor. Walking on the floor before the glue is completely dry will cause boards to separate and will create hollow spots where the glue bond has let go.
9. Once boards are installed, they are considered to have been accepted by the installer and homeowner.

Below Grade or Above Grade (Floating Edge Glued)

1. Use insulated underlayment and an approved wood adhesive.
2. Lay the underlayment pad with the shiny side up. Tape the joints together.
3. Select a starting point according to the most aesthetically or architecturally important elements of the room, taking into consideration stairways, hallways, fireplaces, doors, cabinets, adjoining tile and transitions; as well as the squareness of the room. The starting point will often be the longest unbroken line in the room. Fasten a backer board to your starting point. Place boards with the groove sides and ends against the backer board. (This allows you to use a tapping block that can be used against the tongue only.)
4. In rooms less than 16' allow 3/8" around perimeter for expansion. For rooms between 17' and 24' allow 1/2" around perimeter for expansion. For larger rooms contact me at lewis@gaylordhardwoodflooring.com.
5. Always keep at least 5 rows of flooring racked out ahead. To have the most aesthetically pleasing look rack out the flooring so no joints are closer than 3 times the width of the pieces; avoid H joints and stair stepping from not completing rows.
6. Carefully apply a smooth and even line of glue at least 1/16" (1.6mm) but not more than 1/8" (3mm) in diameter to the bottom portion of the groove. Put the piece in place and if necessary, wipe up the excess glue on the surface.
7. Taping rows of boards together with low-adhesion tape (Blue 3M) will help prevent boards from separating. Tape must be removed within 24 hours to prevent damage to the finish.



8. Remove the backer board and complete installation without walking on the newly installed floor. Walking on the floor before the glue is completely dry will cause it to separate immediately or in the future when the flooring adjusts to the seasons.
9. Once boards are installed, they are considered to have been accepted by the installer and homeowner.

Notes

After installation, if you choose to protectively cover the floor then the entire floor should be covered, since some species are light-sensitive and uncovered areas may change colour. Do not cover an edge-glued floor or a glued-down floor for 72 hours to allow the adhesive to properly cure. Use a covering material with a vapor permeance (perm rating) of 1 perm or more (tested in accordance with ASTM E-96) to avoid trapping moisture/vapor on or within the floor. A common reinforced builder's paper is a good choice. Any covering should be taped, using a low-adhesion tape (Blue 3M), to the base or shoe mouldings. Avoid taping to the finished flooring, as it may react and weaken the finish. The resin that prevents the tape from drying out can chemically react with the finish, causing it to come off when the tape is removed. When taping sheets together, tape them to each other and not to the floor.



Chapter 9

3/4" Solid Wood Flooring Installation

- A. Starting the install constitutes that you have accepted the Jobsite conditions (Chapter 2); product is properly acclimated (Chapter 3); moisture testing is complete (Chapter 4); and panel products/subflooring are prepared to proceed (Chapter 5).
- B. Product can be installed above-grade or on-grade level on a wood-based subfloor.
1. Solid hardwood must be installed perpendicular to the joists or on a diagonal for any single layer subfloor. To run parallel to the floor joists, you must add a layer of 1/2" plywood underlayment or brace every 16" between the joists with a nominal 2" x 6" spf nailed in place. Some joists systems cannot be cross braced and maintain stability. Please direct any questions to lewis@gaylordhardwoodflooring.com.
 2. Moisture vapour retarder, overlapped 3" must be used. The purpose of an underlayment is to minimize the transfer of moisture from the subfloor to the wood flooring. This is especially important in new home construction where the subfloor is higher in moisture than the wood flooring.
 3. If using a pneumatic nailer/stapler, the air pressure must be set so the fastener does not drive in too deep and crack the tongue.
 4. Select a starting point according to the most aesthetically or architecturally important elements in the room, taking into consideration any stairways, hallways, fireplaces, doors, cabinets, adjoining tile and transitions; as well as the squareness of the room. The starting point will often be the longest unbroken line in the room. The use of spline allows you to start wherever you choose.
 5. When possible, start as close to the centre of the room as feasible. This will reduce the pressure of the floor as it won't all be pushing in the same direction. The nails/staples are put in on an angle similar to a tent peg so splitting the room reduces the pressure. Once a starting point is established, secure a backer board to the subfloor and start nailing. As you progress, continue to check your straightness with a string or laser.
 6. We recommend using 2" cleats, 1" to 2" from the board ends, and 6" to 8" apart with a minimum 2 cleats per piece. The Ontario Building Code requires cleats to be used in all floors with a width of 4" or greater.
 7. Allow 3/4" on the width and 1/4" on the length for expansion. Undercut drywall and use t-mould between the tile and hardwood when running widthwise (see Coefficients of Change).
 8. Always keep at least 5 rows of flooring racked out ahead. To have the most aesthetically pleasing look rack the flooring so no joints are closer than 3 times the width of the pieces; avoid H joints and stair stepping from not completing rows.
 9. Proceed with the installation until there is insufficient space to use the floor nailer. Remove your backer board. Glue the groove; insert the spline and fasten the piece with the floor nailer. Continue the installation in the other direction until there is insufficient space to use the floor nailer. To finish the last rows, treat them as in a floating floor installation by gluing the boards together at the tongue and groove; as well as brad nailing or hand nailing the boards in place. Never glue the last rows to the subfloor, as this prevents the hardwood floor from expanding. Face nail only the last row if it will be hidden by baseboard or quarter round (gluing the last rows together at the tongue and groove will keep them connected, enabling them to move with the rest of the floor through seasonal changes).
 10. Once the boards are installed, they are considered to have been accepted by the installer and homeowner.



Notes

After installation, if you choose to protectively cover the floor then the entire floor should be covered, since some species are light-sensitive and uncovered areas may change colour. Use a covering material with a vapor permeance (perm rating) of 1 perm or more (tested in accordance with ASTM E-96) to avoid trapping moisture/vapor on or within the floor. A common reinforced builder's paper is a good choice. Any covering should be taped, using a low-adhesion tape (Blue 3M), to the base or shoe mouldings. Avoid taping to the finished flooring, as it may react and weaken the finish. The resin that prevents the tape from drying out can chemically react with the finish, causing it to come off when the tape is removed. When taping sheets together, tape them to each other and not to the floor.



Chapter 10

Exotic Species

Exotic species are very beautiful; however they are very different than our domestic species in look; and require more care and patience when installing. Be sure to wear a dust mask and safety glasses when cutting the pieces to avoid contact with the dust. Also wear gloves to prevent slivers as they are difficult to get out and will cause your hand to swell.

Exotics are very dense which makes them very difficult to mill. Because of this, the milling tolerances are not as strict as our domestic species; and slight width and thickness variations are normal. Not to mention that the wood is coming from a tropical climate in Brazil to our four season climate. Leaving a climate with a temperature of 38 C and 75% humidity and travelling 6000 km and arriving in Canada where the temperature could be -20 C with a humidity of 20% is quite a change to deal with.

The exotic species are up to 3 times harder than our domestic species. Quite often installers that have never worked with exotics call and tell us that the fastener is not going in properly or bending over. The same nailer and air pressure that works well on domestic woods will not suffice. When you get the fasteners going in the right depth be sure that there is not a dimple showing on the surface where the fastener went in. Because of the large amount of prefinished exotic floors being installed in North America the nailer companies have developed new equipment. The latest product is an 18 gauge nailer using a 1.5" cleat. When you have dark shiny floors with lots of light, it is very difficult to avoid the dimples showing.

Just as with light-sensitive domestic species such as cherry; exotic species will darken and nothing will prevent this from happening. Exposed to natural light; the change happens immediately. Avoid partially covering your floor with area rugs, as the floor around them will change. These colour changes make the floor more beautiful. If your customer has picked from a sample that has been aged, they must be forewarned that out of the box, the floor will not be aged like the sample. Moving furniture around will allow the floor to darken evenly. If you have a spot that has been covered, it will catch up with the rest of the floor.

In exotics, huge colour variations are expected within the specie. If customers do not like variation, exotics should not be considered.

Exotic species can develop white spots months after the flooring has been installed. Lab testing has shown this is calcium carbonate, which is in the wood. Although, when finishing the wood we use sealers to prevent these spots from coming to the surface; and at time of production we cull the pieces with white spots; we can't predict what pieces in the future will develop these spots.

Moisture conditions are very important. Exotics are very dense, making them stronger and stiffer, which puts more stress on the fastener when the wood swells.



We do not recommend our engineered exotic flooring over radiant heat. Exposed to dry conditions, the surface layer will develop cracks. In general, exotics do not handle low humidity as well as our domestic species.

Although very beautiful, exotics are not suitable for all customers. Professional installation is recommended. When getting quotes for installation, be sure to tell the installer you are choosing exotic specie. Be sure that they have experience with that particular specie. If the installer has no experience with exotics, it would be a bad choice to use them.

Avoid Common Callbacks with Imported Species

Here are some of the most common reasons contractors get called back to the job site after installing exotics, and how to avoid them.

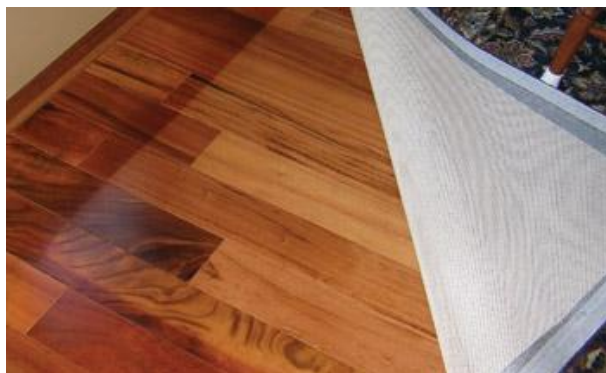


Problem: Dimpling

Cause: The exotic species are up to 3 times harder than our domestic species. Quite often installers that have never worked with exotics call and tell us that the fastener is not going in properly or bending over. The same nailer and air pressure that works well on domestic woods will not suffice. When you get the fasteners going in the right depth be sure that there is not a dimple showing on the surface where the fastener went in.

Common species: Brazilian cherry/jatoba, tigerwood (shown), many others

Cure: Because of the large amount of prefinished exotic floors being installed in North America the nailer companies have developed new equipment. The latest product is an 18 gauge nailer using a 1.5" cleat. When you have dark shiny floors with lots of light, it is very difficult to avoid the dimples showing.



Problem: Color Change

Cause: Just as with light-sensitive domestic species such as cherry, color change with exotics can be a problem in two ways. The most common stems from the floor changing color only in some areas due to part of the floor being covered, often with an area rug or piece of furniture. With some species that change color quickly, the color difference can even be a problem when the floor is covered temporarily on a job site. Complaints can also arise



when the new floor out of the box is not the same colour as the aged sample they saw. Yet another problem with color change happens when most of the floor darkens except for an area of sapwood that stays a lighter color. Most woods darken with light exposure, but there are a few that lighten with exposure.

Common species: Brazilian cherry/jatoba, tigerwood (shown), many others

Cure: There's no way to prevent color change. Educate the customer when they are considering a species known to drastically change color. Provide them with samples showing what the species looks like new and after aging. After the fact, the best answer is to simply let the previously covered area "catch up" to the rest of the floor. If the customer can't wait that long, resanding is the only option (although in some severe cases, even resanding won't fix it). If a floor needs to be covered on a job site to protect it from other trades, be sure every square inch of the floor is covered. If customers won't accept the appearance of a single board, **board replacement** may be the only option.



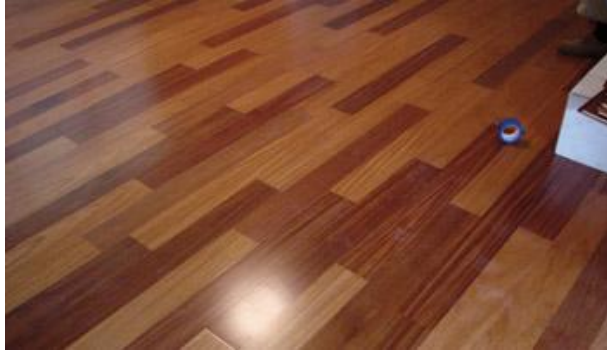
Problem: White Spots

Cause: White spots that appear over time—often months after the floor has been installed.

Cure: Lab testing has shown that these spots are calcium carbonate. Although they are sometimes visible on the unfinished wood, other times there is no way to tell ahead of time where the white spots are going to occur. Like other wood grain characteristics, they are simply considered part of the species. At the factory, we pull out the white spots during production, but are unable to recognize the pieces that may develop these spots later.



Some contractors educate customers ahead of time about the spots, others simply hope they don't occur and still others just avoid installing species prone to the white spots.



so this must be communicated before installation.

Problem: Color Variation

Cause: Once the floor is installed or racked out, the customer objects to the wide color variation of the boards.

Cure: Be sure you show customers an accurate representation of the species, not just a small sample. Exotics can have a wide range of colours within the species. The customer needs to see the variations, and may like most variation but not all;



Problem: Gapping and Cupping

Cause: Just as with many standard domestic species, moisture problems are an issue with exotics. But several factors can make exotics particularly tricky. They are extremely dense woods, making them stronger and stiffer, which puts more stress on fasteners when the woods swell. (These factors can also make the woods difficult to nail. Installers may tend to use fewer fasteners than they normally would, and tongues may tend to split.) Adding to potential moisture problems is the fact that most exotics originate in much more humid climates. When they are installed at much lower relative humidity than they will have over time, permanent gaps in the floor may appear.



move excessively and are difficult to install.

Cure: Moisture testing the wood—with the right adjustments on the moisture meter for the species used—is critical. Also, we have found that many exotics appear to be dimensionally stable when tested in a lab but seem to behave differently on actual job sites, so don't rely on published rankings of dimensional stability as a guarantee of stability. Experiment with which fastener to use, the angle and the pressure so that tongues don't crack. Some species are so hard that pre-drilling is the only effective way to fasten them. Through our experience, we have eliminated many species that



Problem: Face-Checking

Cause: Cracks appear on the surface of the pieces in both solid and engineered flooring during the heating season and close during the humid season. Our engineered flooring is sawn-face, which handles humidity changes quite well; but will crack. For this reason, we do not recommend exotics over radiant heating systems.

Cure: Keep humidity levels between 40-50%.





Chapter 11

Managing Customer Expectations

Following our installation guidelines, quickly removing the excess moisture in the new home, and keeping the long term relative humidity as close to 40% as possible will greatly reduce your chance of call-backs. However some customers have unreal expectations.

1. Wood is a natural product and is infinitely variable, with no two pieces alike. Hardwood flooring is manufactured in accordance with accepted industry standards which permit a defect tolerance not exceeding 5%.
2. Wood is a hygroscopic material. This means when exposed to air it will pick up or lose moisture. Moisture loss causes wood to shrink. Moisture absorption will cause wood to swell. Wood will not shrink or swell equally in all directions. It is normal to have large spaces between boards above heating systems and heat duct runs. Wider widths will shrink and expand more per piece than narrow ones. It is normal in the dry heating season to have spaces between boards the thickness of a dime (1/32") in 2 1/4" wide flooring. Tarrion guidelines state that seasonal spaces between boards cannot exceed 2mm, which is the thickness of a toonie.
3. Many customers have undersized humidifiers and dehumidifiers that will not keep the relative humidity in the recommended range but feel they are following the guidelines. Many homeowners believe that an HRV is a magical machine that automatically controls the humidity in their home. Unfortunately it will not control the humidity at this time. An HRV is only an air exchanger; it removes stale air from inside the home and exchanges it with fresh air from outside the home. In winter months it will bring in dry air from outside so interior humidification is necessary. In the summer months it will bring in humid air so it must be turned off. If not used properly your HRV can actually be harmful causing damage to your floor. (Excessive Drying or absorbing Excessive Moisture)
4. New floors will have a snap, crackle and pop sound when walked across. When walking back over the same boards the sound is gone. This is more prevalent near larger windows where the sun comes in. This is totally normal.
5. All imperfections must be visible from a standing position in any light. It is unreasonable when homeowners tell you to come at 3pm on a sunny day as that is the only time the blemish is visible or get on their hands and knees with a 5,000,000 candle power flashlight.
6. Dark shiny floors are more prone to call backs, especially dark stains on light colored wood. When the flooring shrinks during the heating season the light-coloured wood on the tongue shows through giving a striped look. Although very stylish the slightest scratch or dent will be noticeable. This should be mentioned during the selection phase. This is not a good choice for people with pets; young children; and people who will not control humidity.
7. Occasional squeaks and creaks are normal especially in high traffic areas. They can come and go as the seasons change.
8. The sun will change the colour of the floors; do not cover the floors with area rugs, etc. for the first year.



9. Finishing the basement ceiling before the subfloor humidity is within 2% of the hardwood will cause the hardwood and joists to cup and remain cupped for 2 years or longer. There is no airflow, which is needed to pick up and remove this moisture. The trapped moisture in the joists and subfloor migrate to the hardwood.
10. Our finish is 2 to 3 times as thick as most of our competitors. Our finish also has a high content of solid titanium oxide particles, which gives us a finish we can warranty for 40 years; but has less elasticity in it.



Chapter 12

Problems, Causes, and Cures



Problem: Cupping

Cause: Flooring absorbing excessive moisture on underside, causing expansion with raised edges. / Not leaving enough expansion space around perimeter. / Flooring has nowhere to go but up. / Cupping is very common in newly built homes. / Develops gradually and cause boards to crack and split. / Finishing the ceiling in basement traps moisture, which is absorbed by hardwood floor; prolonging the time flooring will remain cupped.

Cure: Run a commercial dehumidifier in the basement with fans blowing air towards it. It is very important to place the dehumidifier in the basement, as it will pull the moisture down from the sub-floor, minimizing the long-term damage (cracks, splits). If the dehumidifier is placed upstairs, the sub-floor moisture will be drawn through the hardwood, causing cracks and splits.



Problem: Scratches and Dents

Cause: Tradespeople careless with tools. / Moving furniture and appliances.

Cure: Use a touch-up marker to make the scratches less visible. / Adhere felt pads on furniture legs. / Replace heavily damaged boards / deal with the trades people who are causing the damage.



Problem: Spaces between boards

Cause: During the heating season, the air is dry and the wood gives up some of its moisture and shrinks. These spaces are larger in the area above the heating system and along the heat duct runs.

Cure: Run a humidifier to add moisture into the environment / wrap your heat ducts with insulation.



Problem: Cracks in boards

Cause: Wood is a natural product and when it is exposed to conditions outside of the recommended 30% to 50% relative humidity, it can crack and split.

Cure: Replace the damaged boards. / Use putty, stain, and topcoat. / Live with the cracks and splits.



Problem: Water damage

Cause: Excessive water left on or below the surface of the flooring for extended periods of time. The finish becomes wrinkled on the edges, end, and surface. The finish can peel. The damage can be caused by water coolers, icemakers, pet dishes, dishwashers, toilet overflows, leaky hoses on washing machines in adjacent rooms; plumbing leaks, etc. Severe water damage will buckle the floor.

Cure: Replace or patch the damaged boards. / Remove the damaged boards; allow area to completely dry before installing new boards.



Problem: Buckling

Cause: The hardwood pulls away from the sub-floor, rising up several inches in one or more areas. This is the most extreme reaction to moisture; usually caused by a moisture leak.

Cure: Locate and repair the leak. Remove the damaged boards; allow area to completely dry before installing new boards.



Problem: Settling

Cause: Wood floor joists shrink, but interior steel beams and jackposts do not. When settling occurs, the floor settles (lowers) on wood joists, but remains higher over the steel joists/jackposts. This causes large gaps between the rows of flooring that are over the steel beams/jackposts.

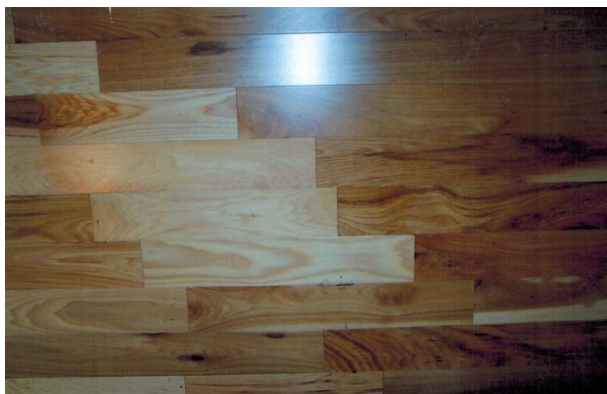
Cure: Customize a wider board to fill the gapped space.



Problem: Squeaks

Cause: Fasteners have let go from the subfloor. / Subfloor has too much flex. / Not enough fasteners used. / Overdrawn fasteners have cracked the tongue; allowing movement. / Cluster joints. / Loose connection between the subfloor and the joists. / Boards have shrunk, allowing the wood to move.

Cure: Glue injection / Live with the squeaks / Secure subfloor to the wood joists with glue and screws.



Problem: Stair Step Joints

Cause: Installer did not complete one row at a time.

Cure: Replace the boards. / Live with the look of the joints.



Problem: Cluster Joints

Cause: Installer did not follow the guidelines for joints. Squeaks will likely occur in the area of cluster joints.

Cure: Replace the boards. / Live with the look of the joints.



Problem: H-Joints

Cause: Installer not being attentive during installation.

Cure: Replace the boards. / Live with the look of the joints.



Problem: Colour Change

Cause: Sun changes the colour of the floors.

Cure: Do not cover floors for the first year.



Problem: Finish comes off when tape is removed from floor after a long period.

Cause: The resin that prevents the tape from drying out has a chemical reaction with the finish if left longer than 24 hours.

Cure: Do not adhere tape to the floor for more than 24 hours.



Chapter 13

Summary

Statistics taken from the NWFA (National Wood Flooring Association) show that 75% of hardwood flooring problems are in newly built homes; of which 95% are moisture related. Due to the rising cost of heating and cooling, building practices have changed. Vapour retarders, ostensibly made to prevent warm or cool air loss, may seal in the new home's moisture. Thanks to these vapour retarders, the moisture will take far too long to leave the newly constructed home. Hundreds of gallons of water used in concrete, masonry, mortar, plaster, drywall compound, studs, joists, paint, and many other building components evaporate into the home's interior. This moisture will cause the floor to expand soon after installation. At time of installation the conditions may have been ideal but this hidden excess moisture will quickly be absorbed by the subfloor and hardwood flooring causing it to cup and crack.

We all have our duties and responsibilities to ensure the best long term results.

1. We manufacture the product under the strictest of quality control, stored in our climate controlled warehouse, and delivered to acceptable jobsite conditions.
2. The builder brings the home within acceptable conditions by running dehumidifiers, heating systems, etc.
3. The installer (ours or yours) accepts the jobsite conditions and completes the installation following Gaylord Hardwood Flooring Guidelines.
4. After installation, the builder continues to keep relative humidity within recommended range until closing.
5. The builder gives the new homeowner our information package on how to care for their new floor; stressing how important controlling relative humidity is. A humidistat needs to be placed in the basement; which is the largest source of moisture.

After all the physical labour is done and the floor looks great, the job is not complete until that new home moisture is removed; which can take more than a year. This is where things can become unsuitable and the barely acceptable conditions at installation quickly fall into the unacceptable range very quickly. The hundreds of gallons of water in the home from the concrete, drywall, etc. turn to water vapour and are absorbed into the subfloor, then to the wood flooring. It must be realized that air with 80% Relative Humidity is 80% full of its capacity to hold the water vapour. When the air reaches 100% Relative Humidity it turns to water. People would surely be quick to wipe up a pail of water that was dumped on their floor; however the 5 pails of water vapour in the air is not seen, so it is not looked at as a potential problem. Unfortunately, the wood does not recognize the difference and absorbs both the water and the water vapour.



About the Author

Graduated in 1980 from the National Hardwood Lumber Association Hardwood Lumber Inspection School in Memphis, Tennessee.

In 1981 graduated from the Certified Ontario Ministry of Natural Resources Log Scaler Course in Huntsville, Ontario

Worked at two large sawmills scaling logs, grading lumber, operating dry kilns and selling lumber.

Started own business in 1985 buying and selling lumber mainly to furniture, hardwood flooring, and cabinet manufacturers.

Started into the unfinished flooring market in 1992

In 2000 started producing prefinished hardwood flooring.

Joined the National Hardwood Flooring Association

Successfully completed the following NWFA Certified Courses:

- Basic Installation
- Professional Installation
- Expert Jigs & Staircases
- Professional Sand & Finish
- Professional Borders & Medallions

Hardwood Flooring Inspector Licence# CP 222007

NWFA Assistant Instructor

Vanguard Award Winner

Over 30 years working in the industry at sawmills, dry kilns, milling & finishing plants. Retailing, installing, training installers, and dealing with customer issues on a daily basis. From the log to the final nail of an install, I have been involved everyday for over 30 years.

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*I can only stress to you how important it is to follow our recommended guidelines to have the best results and the happiest customers. Doing in excess of 2,000 floors per year, you get lots of experience.*

*Lewis Gaylord*