Thank you for choosing Triângulo Hardwood Flooring. To protect your investment, it is extremely important that you understand this information prior to beginning, since improper installation can void all manufacturing warranties.

INSTALLATION GUIDELINES

These installation guidelines must be strictly followed. If even ONE of the following recommendations are not followed, the floor and installation may fail.

These instructions are for the qualified, experienced hardwood flooring installer. For more details on the basics of installing hardwood flooring, please contact the National Wood Flooring Association at 800-422-4556, or visit www.nwfa.org.

ORDER ENOUGH PRODUCT

As a natural product, hardwood flooring can have boards that are defects that occur during the manufacturing process or naturally as a characteristic of the wood species. Accepted industry standards allow for up to 5% defective product (either natural or manufacturing related) based on the original hardwood flooring purchased. At least 5% - 8% additional flooring product should be ordered above actual square footage to allow for cutting, grading and culling of the material. For #2, #3, or Rustic grades, order an extra 10% - 12%.

THE MANUFACTURER HAS NO CONTROL OVER WHERE WOOD FLOORING IS STORED

Once the end user receives the product, the manufacturer and seller have no control over where the product was stored, or if it was placed in a damp area, or on a concrete substrate that was giving off moisture vapors. Do not store in the garage or outside. This is the precise reason that all manufacturers and industry installation guidelines insist that the installer and end user must properly acclimate the wood flooring to bring it to within 2% of the wood sub floor or concrete substrate. In addition, the installer must check the moisture content of the boards to make sure they are not too dry or too wet and that the sub floor is not producing excessive moisture. This is not the responsibility of the manufacturer or the seller. It is clearly one of the installer.

PRE-INSTALLATION AND JOBSITE CONDITIONS

It is the installer/owners responsibility to check and ensure that the job site is environmentally and structurally acceptable prior to the installation of Triângulo Hardwood Floors.

NORMAL LIVING CONDITIONS

The job site must be climate controlled “normal living conditions” for at least one week before any wood flooring is delivered.

The National Wood Flooring Association states that wood floors perform best when the home's environment is within “normal living conditions”:

- Relative humidity is between 40% to 50% (preferably 45% to 50%).
- Temperature is from 60º F to 80º F (preferably 68º F to 72º F).
- Thermostat fan switch is left “ON” to provide a constant flow of air across the floor.

ACCLIMATION OF SOLID WOOD FLOORING

Acclimation is not a “length of time measurement”, it is a function of making sure the moisture content of the floor boards to be installed are within a 2% range of the sub floor’s moisture content.

Stack boxes in an alternating (criss-cross) manner, at least 4” off the sub floor, to allow air circulation. Open box ends and any plastic wrap. If possible, spread out individual boards in the rooms to be installed. Leave them sitting for at least one week. This will allow boards to acclimate to the “normal living conditions” that will be experienced when the job is finished and occupied.

ACCLIMATION OF ENGINEERED FLOORING

Because engineered floor boards are much more stable, Triângulo Hardwood Floors recommends the following:

- Store on the job site
  - For 72 hours
  - At “normal living conditions” as described above
  - Leave boards in sealed cartons until installation

FAILURE TO CONDUCT MANDATORY MOISTURE TESTING IS THE NUMBER ONE INSTALLER ERROR

The installer must conduct mandatory moisture testing of wood floor boards and sub floors. Use a pin type moisture meter on boards and wood sub floors. Concrete substrates require “special” concrete meters or calcium chloride testing. Planks (3” or wider) boards must have a moisture content that is within 2% of the moisture content in the sub floor. Strip (2 1/4”) boards must be within 4%.

CONCRETE SUBSTRATES – ONLY FOR ENGINEERED FLOORING – CALCIUM CHLORIDE TEST

Moisture transfer must not exceed 3 lbs/1000 square feet with this test. One test must be performed every 250 square feet. These test kits can be found at installation supply firms, online at www.taylortools.com, or by calling (888) 216-TEST (8378).

TRAMEX CONCRETE MOISTURE ENCOUNTER METER

Moisture readings using this meter should not exceed 4.5 on the upper scale. www.tramexltd.com

MOISTURE BARRIER SYSTEMS

The following moisture barrier systems are recommended. They carry a warranty from their manufacturer:

- Bostik – MVP4
  - www.bostik-us.com
  - Technical Services 800-523-6530

Please remember that your warranty against moisture vapor transmission comes from the manufacturer of the sealer. Triângulo Hardwood Floors does not warranty products we do not manufacture.

INSTALLER MUST CHECK CRAWL SPACE

The National Wood Flooring Association installation guidelines states, in Section 1, Chapter 1, Page 1, "Acceptable Job Site Conditions", that the installer/retailer is responsible for checking to see if the job site conditions are acceptable for a wood floor installation. These checks should be done long before the installer arrives on the job site to start the installation. In this case, a quick inspection when the job estimated would have revealed that the crawl space was unacceptable, and therefore the job site was not ready for a wood flooring installation. Current guidelines for crawl spaces are: "There must be a minimum of 18" from the ground to the underneath side of joists, they must be dry (no apparent or standing water) and must be covered 100 percent by a vapor retarder of 6-mil black polyethylene that is overlapped 6" and lapped up the walls 6". Crawl spaces also should have 1.5 percent of open venting per 1,000 square feet (92.90 square meters) of floor area, and the venting should be properly located to foster cross ventilation. In addition to these guidelines, installers must check and follow local building codes.

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CONCRETE SUBSTRATE MUST BE LEVEL

It is the installer's responsibility to make sure the concrete substrate is flat within 1/8" in 6' and 3/16” in 10 feet. If it is not, then the high points must be ground down and the low valleys filled with leveling compound. Furthermore, the concrete substrate must be free of all contaminants, i.e. paint, varnish, kerosene from heaters, dry wall paste, crayon marks, grit, soil, and other foreign chemicals and substances. Once they proceed to install the floor, they are assuring all of the parties involved that the concrete substrate has been inspected, is level, free of all contaminants, and is acceptable, resulting in a properly installed floor.

WOOD SUBFLOOR MUST BE LEVEL

In the Chapter 4 of The National Wood Flooring Association's Installation Guidelines (Wood Subfloor Guidelines), it states that wood subfloors must be flat, clean, dry, structurally sound, free of squeaks, and free of protruding fasteners. For installations using mechanical fasteners of 1 1/2” and longer, the subfloor should be flat to within 1/4” in 10', or 3/16” in 6'. For glue down installations, and installations using mechanical fasteners of less than 1 1/2”, the subfloor should be flat to within 3/16” in 10', or 1/8” in 6'. If peaks or valleys in the subfloor exceed the tolerances specified above, sand down the high spots and fill the low spots with a leveling compound or other material approved for use under wood flooring. However, it is the builder's or general contractor's responsibility to provide the wood flooring contractor with a subfloor that is within the tolerances listed above. 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.

DRY LAY FLOOR FIRST

You should expect variations in color tones, shade, grain, and character marks in your wood flooring. Meet with your installer. Have them open the boxes and pull boards at random from many different cartons. Then ask them to dry lay and arrange planks to suit your personal taste. Now is the time to let the installer know what you like and dislike *before* they install the first board.

HOME OWNER – END USER RESPONSIBILITY

Your presence during the installation is crucial. Approximately 40% of installation failures and/or customer dissatisfaction are due to installer error. If you choose not to be present, you forgo the ability and right to participate in the board selection process. In doing so, you have left it up to the installer's judgment for arranging floor boards according to natural variations such as color, grain, and length. Neither the wood flooring manufacturer nor the seller can be held responsible for any unpleasant surprise resulting from the installer's lack of qualifications or poor judgment. *Once installed, you and the installer own the floor.* The responsibility to resolve any dispute is between you and your installer. This has long been an industry accepted rule.

NEW CONSTRUCTION OR REMODELING

BUILDER AND INSTALLER CHECKLIST

The National Wood Flooring Association states, in their technical publication, A-100 Water and Wood, page 14, and Triângulo Hardwood Floors states that laying the floor should be the LAST STEP in your project. Even BEFORE the wood flooring is delivered, make sure that: A) The house is closed or sealed in with all doors and windows installed. B) Plaster, paint, and plywood sub floors and/or concrete substrates are thoroughly dry. C) All plumbing or wet trades must be completely finished. D) The foundation is dry and the basement is well ventilated. E) The floor in the crawl space (if it has one) is completely covered, overlapped, and lapped up the wall six inches by a 6-8 mil black polyurethane plastic film. F) The heating or ventilation system is working properly and that the conditions inside your room(s) where the wood flooring installation is to take place have been kept at an approximate temperature of 68º F (20º C), and a relative humidity of between 40% and 50% for at least one week prior to the acclimation of the wood flooring to it's normal climatic environment that it is to perform in. G) Solid wood flooring is acclimated for minimum of at least one week prior to it's installation (the wood manufacturer's installation guidelines do supersede). Furthermore, the room's temperature and relative humidity must be kept at the recommended levels shown above, with a constant flow of air across the floor, during and after the installation until the end user moves into the rooms and/or house and controls the climatic conditions to their preference. A failure to make sure that EVERY ONE of these industry proven steps are meticulously followed can result in splits, cracks, cupping, buckling, board delamination, finish flaking, blisters, bubbles, face checks, and peeling, or other major problems with the wood flooring.

DO NOT INSTALL TOO EARLY

Triângulo Hardwood Floors and the National Wood Flooring Association agree that “pre-finished” wood floors are defined as a factory-finished product requiring installation only. When wood floors are installed, all other trades should have finished their work on the job site. By being installed the week before the closing date,the newly installed wood floors will be subject to less potential for damage. The floor will remain in top condition for the consumer's final walk-through.

Pre-finished wood floors should be climatized, as it is installed during the same time frame as carpet. By coordinating the timing of the two installations, there should be less construction traffic, and the heating and air conditioning units can be activated a week before the installation. If this industry proven practice is not followed, the installation will look great at move in, but shortly thereafter the floor will begin to separate. What caused the problem? Acclimation to the job site conditions. Where was the flooring stored on the job site for acclimation? *The likely answer to the problem is that the pre-finished floor was installed too early.* The product should not have been installed on the job site before the new home was under climate control for at least one week. The floor was stabilized to an elevated moisture content, not to conditions after move-in. Also, after move-in, the heat or air conditioning (air movement) systems removed a portion of the job site moisture from the wood, allowing a reduction in the face width which resulted in visual

conditions such as: separation between boards (cracks or gaps), face checks, splits, cupping, delamination, raised grain, finish problems, etc.

DO NOT USE PROTECTIVE COVER

The use of protective coverings that are not “breathable” such as plastic, paper,cardboard, Masonite, carpet or carpet padding,etc., over new wood floors may cause future moisture related problems. Like a lid on a Tupperware jar, these kind of protective coverings will trap moisture normally being released by the boards and drive it back down into the wood flooring and subsurface. The overall effect is that of a “hot house” as the boards overheat and go into stress shock. This can result in elevated moisture levels, cupping, crowning, buckling, board delamination, peeling, or flaking of the finish, side and end joint gaps, stress fracture face checks, or split ends. This is NOT the result of any manufacturing deficiencies in the wood flooring product. The burden to resolve this issue is that of the person who chose to cover the floor.

PREVENTING GAPS BETWEEN BOARDS

If the wood flooring was delivered to a new home and was installed prior to the conditioning of the home through it's air conditioning and heating system, gaps between planks may occur at a later date. In addition, there would have been no consistent movement of air across the new wood floor. When it was turned on, it would have caused the home to start drying out due to the dehumidifying action of the air conditioning and/or heat. During this time it extracts most of the moisture out of the wood floor, making the wood contract or shrink and allow objectionable gaps to occur. Wood flooring is a part of the interior finish. Just like a grand piano, wood flooring should not be delivered or installed until after all of the construction dampness is gone, the building closed in, and under complete, stable temperature and humidity control. We recommend: A) Letting a humidifier run in the home until the relative humidity comes within the recommended 40% to 50% level (preferably 45% - 50%) with the temperature between 60º and 80º F, preferably between 68º to 72º F. This level should be maintained for another two weeks until stable. Then closely examine these gapped planks. B) As needed, rework the planks or replace the gapped planks. Once the floor has gone through a complete year of seasons and gaps have not filled up, *they will remain gapped*. Sanding and refinishing the floor will do nothing to improve the appearance. Filling in the cracks with putty would be a “band-aid” approach, as the putty will become loose and fall out as the boards expand and contract.

PRE-INSTALLATION WARNING: Triângulo Hardwood Flooring is designed and manufactured to strict manufacturing tolerances for use in typical residential environments. Once our quality product “leaves our hands”, we no longer have any control. Only you, the installation contractor, can conduct the mandatory moisture testing of the sub floor and boards to make sure they are within 2% or less of each other. If the interior relative humidity is too high or too low, you are responsible to alert all parties of the issues you're having. If the relative humidity is less than 40%, installed boards may cup, split, check, crack, shrink (or delaminate, if engineered). In such dry conditions, we recommend the use of humidifier to introduce moisture to the home. Floor boards installed onto a wet sub floor may experience checks, splits, crowning, cupping, buckling, shrinking, swelling, coreboard telegraphing (if engineered), delamination or edge or corning edge

raise. It's possible the installed boards can be soaked from above by clean-up crews or other contractors in the home.

Again, conduct the **MANDATORY** moisture testing on the sub floor and new floor boards. DO NOT INSTALL THIS FLOORING ON A WET SUB FLOOR OR WHEN THE HOME'S ENVIRONMENT IS EXPERIENCING DRY CONDITIONS.

RELATIVE HUMIDITY ***REALLY*** MATTERS

When the indoor relative humidity is maintained at a consistent level throughout the year, natural expansion and contraction of the boards will be minimized.

- During the heating season, forced air heating, wood stoves and electric heat tend to create very dry conditions. A whole house humidifier is recommended if the home has a forced air heating system. Otherwise, the use of a portable humidifier is a good choice. An average size portable humidifier is suggested for every 400 square feet of installed flooring. Be sure to read the humidifier's operating instructions for best results.

- Non-Heating Season: The reverse is usually the issue. The home's air conditioner or a dehumidifier should be used to lower the interior relative humidity if it exceeds 50%. Turning on the heating system periodically can also control the interior environment.

WOOD FLOORING HAS A COMFORT LEVEL, TOO

The National Wood Flooring Association states the following in page 5 of their technical publication A-100, entitled “Water and Wood”:

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 of 60°F to 80°F. Fortunately, that's the same comfort range most humans enjoy. The chart below indicates the moisture content the wood will likely have at any given combination of temperature and humidity. Note that equilibrium moisture contents in the recommended temperature/humidity range coincide with the 6% to 9% range within which most hardwood flooring is manufactured. Although some movement can be expected even between 6% and 9%, wood can expand and shrink dramatically outside that range.

Wood floors perform best when the interior environment’s relative humidity range is kept between 35-50% (preferably 45-50%). The temperature range from 60-80 degrees Fahrenheit is acceptable, but the ideal temperature is 68 degrees Fahrenheit.

To recap, the ideal:

- Relative humidity is 45%.
- Temperature is 68 degrees Fahrenheit.

When these guidelines are not maintained, damage to your wood floor will be most likely to occur. Some of these objectionable appearances can be, but are not limited to, dry cupping, cracking, splits, cracks, gaps at joints, delamination of plys, finish is issues such as peeling, flaking, chipping, rupturing, wet cupping, tenting, buckling or noises emitting from the floor when walked on.

It is extremely important to keep the environment surrounding your wood floor at the “normal” living conditions as described above. If necessary, heating systems, air exchanges, air conditioners, dehumidifiers, whole house or portable humidifiers should be used to control these environmental conditions.

Because wood is a natural material that is hygroscopic, it constantly reacts to the moisture (relative humidity), high or lack of in the home’s environment.

While the temperature of the interior environment is an important factor, it is absolutely critical to maintain a relative humidity of no lower than 35 percent and no higher than 50 percent.

Stagnant air is not good for wood flooring; therefore, we recommend that you leave the HVAC system’s fan switch in the “On” position to provide a flow of air across the floor.

If away from home, the climate controls should be left within the parameters suggested above.

The key to preventing future problems with your hardwood flooring is to keep the job site environment within it's comfort zone at “normal living conditions”. See the peach colored box in the chart below.

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MOISTURE CONTENT OF WOOD AT VARIOUS TEMPERATURES AND RELATIVE HUMIDITY READINGS

30°F	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°F	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°F	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°F	1.6%	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°F	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°F	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°F	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° F	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%
	5%	**10 %**	**15 %**	**20 %**	**25 %**	**30 %**	**35 %**	**40 %**	**45 %**	**50 %**	**55%**	**60%**	**65%**	**70%**	**75%**	**80%**	**85%**	**90%**	**95%**	**98%**

Table Key: The far left column represents interior temperature of the job site. The lower column represents the relative humidity level of the job site. The corresponding value represents the likely moisture content of the hardwood flooring, given the job site temperature and relative humidity values.
The values highlighted this color represent the ideal moisture content levels of the hardwood flooring (and the corresponding ideal job site temperature and relative humidity levels).

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

Moisture meter manufacturers state that moisture meters accurately measure the moisture content of wood products when the moisture content is in the range of 6% to 30%. Any moisture meter readings outside of the range of 6% to 30% will not be scientifically accurate. Through deductive reasoning and the data obtained from the Forest Products Laboratory, U.S. Department of Agriculture, an accurate estimation of the wood's moisture reading can be determined.