

JOHNSON

Premium Hardwood Flooring

ENGINEERED HARDWOOD INSTALLATION GUIDELINES

(Revised March 22, 2011)

JOHNSON PREMIUM HARDWOOD FLOORING®
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Engineered wood flooring is defined as a multi-layer construction type product consisting of a solid wood (of any given species) wear-layer glued to the surface of a multi-layer plywood base system.

Johnson Engineered flooring can be installed in one of the following manners: Johnson recommended urethane adhesive, 20-gage cleat, 18-gage staple or floating method using recommended tongue and groove adhesive e.g. Precision Components and or Roberts. Except for Forever Tuff, it is recommended to glue, staple, or float.

STOP! IMPORTANT INFORMATION

GUIDELINE DISCLAIMER: COMPLETELY READ AND UNDERSTAND THESE GUIDELINES BEFORE INSTALLATION BEGINS. FAILURE TO DO SO CAN/WILL RESULT IN THE FOLLOWING DAMAGE TO YOUR WOOD FLOOR: CUPPING, WARPING, BOWING, TWISTING, BUCKLING, SHRINKING, DELAM, GAPPING, CHECKING, CRACKING, SPLITTING, DISCOLORING, EARLY WEAR, DENTING, SCRATCHING, HOLLOWES, AND RELEASING FROM THE SUBFLOOR. FAILURE TO ABIDE BY THESE GUIDELINES CAN/WILL VOID ANY/ALL WARRANTIES JOHNSON OFFERS WITH THIS PRODUCT.

Prior to installing Johnson engineered flooring; materials MUST be tested for recommended moisture content. Jobsite temperature and relative humidity levels MUST also be carefully measured and recorded daily during the installation process. The homeowner MUST maintain the temperature and relative humidity level in the recommended ranges (60 to 80f and 35 to 50rh) to ensure maximum performance.

OWNER/INSTALLER RESPONSIBILITY

Hardwood flooring is a beautiful product of nature, which is characterized by distinctive variations in grain and color. These variations in color and grain should not be seen as flaws, but embraced as nature displays its beauty and uniqueness. Johnson Premium Hardwood Floorings are manufactured according to accepted industry standards, which permit a defect tolerance of 5%.

Product Quality: The contractor/installer/end-user assumes all responsibility for final inspection of product quality.

The flooring **MUST** be inspected at time of delivery and prior to installation. Carefully examine the flooring for moisture content (6 to 9%), color, grade, finish quality or any damage during transit **before** installing it. The installer should use reasonable selectivity to cull out or cut off unacceptable pieces. If the flooring material is considered unacceptable, **“STOP DO NOT INSTALL THE FLOOR”**, but contact the Johnson Premium Hardwood dealer immediately. Once the flooring is installed, there is no question as to its acceptability.

Environment: Prior to installation, the installer MUST determine that the environment of the job site and the conditions are suitable to the material that is being installed. The installer is responsible for determining the moisture emission rate of the concrete slab and/ or the moisture content of the CDX plywood or better sub floor as per the National Wood Flooring Association (NWFA) installation guidelines, SECTION V – Appendix AA Moisture Testing Procedures for Concrete Slabs, (specifically the Calcium Chloride test) and Appendix AB Moisture Testing for Wood. All test results **MUST** be carefully **documented** and made available to the home owner prior to installing the flooring. Johnson Premium Hardwood declines any responsibility for job failure from or associated with inappropriately or improperly prepared subfloors or job site environment deficiencies. Also, Johnson “HIGHLY” recommends that the installer/contractor take daily readings of the ambient conditions of the environment in which the flooring will be installed i.e. temperature and relative humidity levels and record the results on a daily log sheet as well as take periodic moisture readings of the wood floor and sub floor during the installation process and record the results of those readings as well.

Waiver: Unless a waiver or letter of protest listing exceptions exists, installation constitutes acceptance of subfloor/substrate, the job itself – including the ambient temperature and relative humidity at the time of installation, and all impacting variables that may affect a wood floor.

Informing the Homeowner: Homeowner(s) **MUST** be made aware of color variations, graining ranges, the effect that moisture has on wood flooring; the importance of maintaining a controlled environment (60 to 80f and 35 to 50rh respectively) before, during and after the installation for the life of the floor. Also, the proper way in which to maintain wood floors and the effect that UV light has on wood, **especially exotic woods. All products from Johnson Premium Hardwood will change color over time. The degree of change depends on the species and the amount of UV exposure. Typically speaking, wood usually darkens over time however; some wood species will actually lighten when exposed to UV light.**

The homeowner **MUST** be made aware of the effect that moisture has on wood flooring e.g. moisture gain can result in cupping, buckling, cracking, splitting, checking, warping, wear-layer delam, separation from the sub floor and possible damage to surrounding walls, tile/stone floors and cabinetry etc. On the other hand, moisture loss can result in splitting/separation of the segments, gapping, surface and or end checking and everything else mentioned with moisture gain. Moreover, the importance of maintaining a controlled environment (60 to 80f and 35 to 50rh respectively) before, during and after the installation for the life of the floor. Also, the proper way in which to maintain wood floors. REFER TO CLEANING SECTION.

Blending Rule: Where wood flooring transitions into support moldings i.e. stair treads, stair nosing's, reducer's, T-molds, end-caps etc., pick boards that better blend to the color tone of the molding so that you don't end-up with a drastic change in color. Your goal is to gradually transition into the molding so as not to have a distinct color variance between the wood floor and the trim moldings.

Inspect Flooring: Verify that the delivered flooring has 6 to 9% moisture content and is free of defects.

During Installation: It is the installer's responsibility to protect the flooring from any/all damage i.e. dings, dents, scratches etc. Installation/construction related damages are **NOT** covered under Johnson's structural and or finish warranties.

Wet Work: All wet work such as plastering, painting and any/all masonry or tile work **MUST** be completed prior to delivering the flooring to the job-site.

Delivery/ Storage: **NEVER** deliver wood flooring during adverse weather conditions such as rain and or snow unless the flooring can be completely and thoroughly protected from getting wet and or gaining moisture during transit to the job-site. **NEVER** store wood flooring in an "uncontrolled environment" e.g. patios, drive ways, garages, sheds, storage units, or even in the structure in which the flooring will be installed. Deliver the flooring to the job-site **ONLY** when a controlled environment has been established according to Johnson/NWFA recommendations.

JOB SITE INSPECTION AND PRE-INSTALLATION REQUIREMENTS

Note: In newly constructed buildings, wood flooring should be one of the last items installed. All work involving water or moisture **MUST** be completed prior to the delivering of flooring to the job site. In addition, all doors and windows **MUST** be installed and weather stripping in place. Additional information can be found in the National Wood Flooring Association's Technical Publication No. A100 Water and Wood. "How Moisture Affects Wood".

Moisture: Job site must be dry with no visible moisture. To ensure the job site is ready for hardwood flooring, installer **MUST** conduct necessary moisture tests with approved **Calibrated Moisture Meters**. All testing results **MUST** be carefully **recorded** and made available to the homeowner **before** any work begins. Electronic moisture meters designed to measure moisture content in concrete slabs are **NOT** recognized by Johnson as a viable way to determine if a moisture vapor retarding system is needed/necessary prior to installing the floor.

Job-Site Evaluation: Contractor/installer **MUST** perform a pre-installation job site evaluation. The contractor/installer **MUST** determine the following: Does the lot/structure sit on an alluvial plain? If so is water run off directed away from the side of the building? Does the roof gutter system direct water to a main drainage system that carries water away from the side of the building? Is there adequate drainage around all landscape and hardscape to carry water away from the side of the building? Also, check the surrounding concrete walkways and driveways for signs of efflorescence and alga growth. Check surrounding planters for over watering as well as make sure sprinklers are directing water spray away from the side of the building.

HVAC System: As recommended by the NWFA as well as Johnson Premium Hardwood, the installation site **MUST** have a consistent room temperature of 60 to 80 degrees Fahrenheit and 35 to 50 percent relative humidity respectively. The structure **MUST** be fully enclosed with interior climate controls operating for at least **5 days** before delivering flooring to the jobsite. Moreover, recommended temperature and humidity levels **MUST** continue during and after installation for the life of the floor. If heating/air-conditioning/humidification systems are in operating condition, they need to be operating. If it is not possible for the permanent heating/air-conditioning/humidification systems to be operating before, during and after installation, a temporary heating/air-conditioning/humidification system that mimics "manufacturer" specified temperature and humidity conditions can enable the installation to proceed until a permanent heating/air-conditioning/humidification system is operating.

Subfloor: The sub floor **MUST** be free from any type of paint, oil, grease, dust, drywall mud, sealers, release agents and all other types of residues/contaminates.

Floor Flatness: The subfloor should be level in general however; it **MUST** be flat to within 3/16" over a 10-foot radius, in all directions. **When using a self leveling or patch type product to correct for floor flatness issues. ALWAYS consult with the chosen adhesive manufacture for recommendations as to what self leveling/patching material is compatible with their specific adhesive product(s).**

Crawl Space: The soil within the crawl space **MUST** be covered with "black" 6-mil polyethylene sheeting overlapping the seams a minimum of 12" followed by Duct taping the seams the entire length of the over-laps. Make sure to run the poly sheeting up the stem wall 4 to 6" but DO NOT tape, this will allow for "controlled" evacuation of gaseous water vapors into the crawl space atmosphere, which in turn should be carried out through the venting system. Per industry standards in order to foster proper airflow there **MUST** be at least 1 ½ vents for every 100 sq. ft. of crawl space area. The distance between the surface of the soil and the bottom of the sub floor should/must have a clearance of 18 to 24 inches. **It is the installer's responsibility to determine (prior to installing the flooring) that the perimeter of the crawl space contains the correct amount of vents for the size of the crawl space and that no vents have been blocked i.e. masonry concrete patios, etc. Local building codes may differ. Follow local building codes. See Figure 1-1.** It is not uncommon to have as much as 14 to 17 gallons of water emitting from the soil in a 24-hour period, over 1000 sq. ft. crawl space. Moisture related failures resulting from not covering the crawl space soil with 6-mil poly sheeting **will not** be warranted by Johnson Premium Hardwood Flooring.

Undercut Door Casings and Jambs: Undercut all door casings and jambs 1/16" higher than the thickness of the "finished" flooring being installed. You can achieve this by using a hand jamb saw using a piece of the flooring as your height gage or use an adjustable power jamb saw adjusted to the appropriate height.

Moisture Emission: Per NWFA/Johnson's recommendations, it is generally recognized when installing **engineered wood** flooring directly to the surface of a concrete slab (without the use of an industry/manufacture approved vapor retarding system), the maximum "allowable" moisture emission rate (passing through the surface of the slab) as expressed by the Calcium Chloride test is 3.0 pounds per 1,000 sq. ft. per 24 hours before, during and after installation for the life of the floor. In addition, when installing an industry/manufacture approved sub floor (CDX or better) to the surface of a concrete slab, which would result in perforating the moisture vapor retarding system, the maximum allowable moisture emission rate **cannot** exceed 7 pounds per 1,000 sq. ft. per 24 hours for the life of the floor.

SUB FLOOR REQUIREMENTS

Concrete Slab: **The concrete sub floor must be dry.** Newly poured Concrete slabs will require a 90 to 150 day drying period depending on the size and depth of the slab and weather conditions. **Note: Before moisture testing can begin, the concrete MUST be allowed to dry for a minimum of 30 days. If moisture testing begins before the minimum 30-day drying period, the test results will be inaccurate and unreliable. Please follow ASTM standard F-1869-4 which is the specific preparation/application instructions for calcium chloride testing.**

Mechanical Fastening: When mechanically fastening an industry/manufacture approved sub floor (3/4"CDX plywood or better) to the surface of a concrete slab (which results in perforating the moisture vapor retarding system), the maximum allowable moisture emission rate cannot exceed 7 pounds per 1,000 sq. ft. per 24 hours based on the calcium chloride test.

Glue Down: For glue down applications, the subfloor **MUST** be free from any/all type of paint, oil, greases, drywall mud/dust, release agents and all other types of residues/contaminates.

Floor Flatness: The subfloor should be level in general however; it **MUST** be flat to within 3/16" over a 10-foot radius, in all directions. **When using a self leveling or patch type product to correct for floor flatness issues. ALWAYS consult with the chosen adhesive manufacture for recommendations as to what self leveling/patching material is compatible with their specific adhesive product(s).**

Plywood Sub-Floor: If plywood is used as a subfloor, the moisture content difference **MUST NOT** exceed more than 4% between the finished wood floor and the plywood subfloor. All plywood **MUST** be exterior grade CDX or better. Plywood size for subfloor is suggested to be standard ¾" x 4' x 8' panels, with an expansion gap of ¼" between panels, and stagger full

sheets by ½. Cross kerf the back of each panel every 1' x 3/8" deep. **Plywood subfloor should run at a 45 degree angle (preferred) or perpendicular to the direction of the finished wood floor.**

ATTENTION: ENGINEERED FLOORING CANNOT BE INSTALLED DIRECTLY OVER 1" X 6" PLANK TYPE SUBFLOORING. JOHNSON REQUIRES AN ADDITIONAL LAYER OF 1/2" PLYWOOD BE PLACED AND SECURED TO THE SURFACE OF THE 1" X 6" SUB FLOOR FOR ADDITIONAL SUPPORT. RECOMMENDED FASTENERS: 1 ¼" TO 1 ½" LONG DECK SCREWS (screwing schedule 6" to 8" around perimeter and every 12" in the field).

Terrazzo or Vinyl: Before installing with a glue-down method over terrazzo or vinyl type surfaces, first consult with the adhesive manufacturer. They will be able to provide you with specific information regarding the necessary steps that are required in order to properly prepare the surface for installation.

Vapor Protection Systems/Adhesives: Johnson Premium Hardwood recognizes the following adhesives (for glue down applications) and their corresponding vapor retarding system(s) to be used in conjunction with the installation of Johnson prefinished wood flooring: Johnson Titan urethane base adhesive along with Johnson's vapor retarding system Orion 5, Franklin 811 Advantage along with 531 two part epoxy sealer, Bostik's Best or BST along MVP, DriTac 7600 along with 7000 epoxy sealer. For installations over lightweight concrete slabs consult with the adhesive manufacturer prior to beginning installation. Always follow the adhesive manufacturer's recommendations for proper use and application.

CDX Plywood: CDX plywood when properly installed over the surface of a concrete slab or lightweight concrete sub straight (following manufacturer/industry standards) it is **strongly recommended** that the plywood be covered with an additional layer of 15 lb or 30 lb tar saturated felt paper, or an asphalt laminated paper meeting UU-B-790a, Grade B, I, Style 1a., prior to installing the floor.

Raised Foundation: Ground level of the raised foundation sub floor **must** be completely covered with an industry approved moisture vapor retarding system such as 1 layer of 15 lb or 30 lb tar saturated felt paper, or an asphalt laminated paper meeting UU-B-790a, Grade B, Type I, Style 1a. Installations over raised foundations (joist type or pier and beam type construction) must conform to the following requirements: Joist span of 16" on center requires a "minimum" of 5/8" CDX plywood; 19.2" span requires a minimum of ¾" CDX and 24" spans require a minimum of 1" interlocking tongue and grove CDX plywood.

IMPORTANT INFORMATION

GUIDELINE DISCLAIMER: COMPLETELY READ AND UNDERSTAND THESE GUIDELINES BEFORE INSTALLATION BEGINS. FAILURE TO DO SO CAN/WILL RESULT IN THE FOLLOWING DAMAGE TO YOUR WOOD FLOOR: CUPPING, WARPING, TWISTING, BUCKLING, SHRINKING, DELAM, GAPPING, CHECKING, CRACKING, SPLITTING, DISCOLORING, EARLY WEAR, HOLLOW, AND RELEASING FROM THE SUBFLOOR. FAILURE TO ABIDE BY THESE GUIDELINES CAN/WILL VOID ANY/ALL WARRANTYIES JOHNSON OFFERS WITH THIS PRODUCT.

Newly Constructed Building: In newly constructed buildings, hardwood flooring should be one of the last items installed. All work involving water or moisture **MUST** be completed prior to the delivering of wood flooring to the job site. In addition, all doors and windows must be installed and weather striped.

HVAC System: **NEVER** turn off the Heating Ventilation Air-conditioning or humidification (HVAC) system when you're away from your home/building i.e. during vacation time periods. If you do, you may return to a floor that is cupped, or has a severe case of shrinking/gapping, splitting, checking and/or wear layer delamination.

Grade Level: Johnson engineered flooring is designed to be installed on all grade levels: on grade, below grade and above grade. However, you **MUST** follow adhesive manufacturer guidelines because they can/will take precedence over Johnson's installation recommendations. **Note: If any part of the soil surrounding the structure is 3" above the floor of any level, consider that level below-grade.**

Cleaning: During routine maintenance, **DO NOT** clean your floor surface with oil soaps, sprays of any kind which usually contain silicone oil or wax, water, Windex and water, vinegar and water, waxes of any kind, conditioners, surface refreshers, solvents of any kind, **non** recommended flooring cleaners such as, Swiffer Wet Jet or any other like cleaning product. **Only use cleaning products that are specifically recommended and or approved by Johnson Hardwood i.e. Bruce Armstrong hardwood/laminate cleaner, Mannington hardwood/laminate cleaner, Basic Coatings "Squeaky" Clean hardwood/laminate cleaner and Bona hardwood/laminate cleaner.** For more information on how to properly maintain your Johnson wood floor, please see our maintenance guidelines on our web-site www.jfloor.com and go to the customer support section.

Protective Glides: Place protective glides on the bottom of all chairs and furniture legs; they come in a variety of sizes and shapes and can be purchased at your local home improvement center. For your really large furniture such as China cabinets and hutches etc., you will definitely need to use protective glide pads that are designed to cover a larger area so as to better protect the flooring from scratches. For pianos use manufactured piano coasters.

Radiant Heat: For installations over radiant heated sub-floors, contact Johnson’s Customer Service department for a list of products that have been approved for radiant heat applications.

Vapor Protection System/ Calcium Chloride Testing: Johnson’s engineered wood flooring **CANNOT BE INSTALLED DIRECTLY TO THE SURFACE OF A CONCRETE SLAB WITHOUT THE USE OF A VAPOR RETARDING SYSTEM IF THE MOISTURE EMISSION RATE (based on the calcium chloride test) EXCEEDS 3 lbs IN 24 HOURS OVER 1,000 SQ. FT. OF FLOORING SURFACE.** If the moisture emission rate exceeds 3 lb before, during and after the installation for the life of the floor, then a manufacturer approved vapor retarding system **MUST** be applied to the slabs surface prior to commencing with the installation. Failure to do so can/will void all applicable warranties.

Acclimation: Johnson engineered wood floors **do not require** preinstallation acclimation for “any” specified period. However, the environment **MUST** represent “normal live-in conditions,” which is interpreted to mean an environment maintained at 35 to 50 percent relative humidity and a temperature of 60 to 80 degrees Fahrenheit respectively. These conditions **MUST** have been established at least 5-days prior to delivering the flooring to the job-site and continue for the life of the floor. **ALL** doors and windows **MUST** be installed and weather striped prior to delivering the flooring to the job-site.

Informing the Homeowner: The dealer and contractor/installer are responsible for informing the builder and or the homeowner of the importance of maintaining a controlled environment before, during and after the installation of flooring in order to maintain the physical and structural condition of the floors.

Box Rule (3-5): When installing Johnson Premium Hardwood flooring it is recommended to work out of 3 to 5 boxes at a time in order to achieve a more uniform color tone and grain appearance throughout the installation.

Blending Rule: Where wood floor transitions into support moldings i.e. nosing’s, reducers etc., pick boards that better blend to the color tone of the molding so that you don’t end-up with a drastic change in color. Your goal is to gradually transition into the molding so as not to have a distinct color variance between the wood floor and the trim moldings.

Inspect Wood: Verify that the delivered wood flooring has 6 to 9% moisture content and is free of defects.

Equilibrium Chart: Atmospheric conditions **MUST** be maintained within the recommended range in order to maintain optimal dimensional performance of your wood floor. To determine the suitable moisture content for installation, please use the equilibrium moisture chart provided below. Grayed area represents the ideal moisture content for the wood to perform normally. Moisture tests **MUST** be conducted **before, during and after** the flooring has been installed. **Additional information can be found in the National Wood Flooring Association’s Technical Publication No. A100 Water and Wood. “How Moisture Affects Wood”.**

Wet Work: All wet work such as plastering, painting and any/all masonry or tile work **MUST** be completed prior to delivering the wood to the job-site.

Equilibrium Moisture Content Chart

Temp. (F)	Relative Humidity Percent																			
	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 Product Laboratory, U.S. Department of Agriculture.

Required Tools and Accessories for Nail and Glue down Installations:

Please refer to the National Wood Flooring Association’s Technical Publication N0. A300 Tools of the Trade. “What Contractors Need for Hardwood Flooring Installation”. Below you will find a partial list of tools commonly used for wood flooring installations.

Eye Protection	Band saw	Level/straight edge	Vapor retarding system
Knee pads	Reciprocating saw	Calculator	Adhesive
Respirator	Table saw	Scrapers	Yellow glue
Ear plugs	Jamb saw	Pry bar	Adhesive removers
Moisture meter	Skill saw	Drill and bits	Rags
Nailing machines	Miter saw	Hammers	Utility knife
Nails, cleats, & staples	Chalk line	Chisels	Trammel points
Air compressor & hoses	Stapler	Nail sets	Slip tongue spline
Jig saw	Squares	Pliers	3M blue tape
Tape measure	Nail puller	Screwdriver	Trash bags
Extension cord	Nail Sets	Vacuum/broom	Router and Bits

SUBFLOOR REQUIREMENTS AND PREPARATION

Wet Slab: The concrete sub floor must be dry. The concrete slab will usually take from 90 to 150 days to thoroughly dry depending upon the size and thickness of the slab, as well as weather conditions. **Note: Before moisture testing can begin, the concrete MUST be allowed to dry for a minimum of 30 days. If moisture testing begins before the minimum 30 day drying period the test results will be inaccurate and unreliable.** Per Johnson Premium Hardwood and the National Wood Flooring Associations recommendations, the allowable amount of moisture emission, as expressed by the **calcium chloride test** is **3.0** pounds per 1,000 sq. ft of concrete surface per every 24 hours prior too, during and after for a direct installation without the use of a manufacturer approved vapor retarding system. **Please follow ASTM standard F-1869-4 which is the specific preparation/application instructions for calcium chloride testing.**

R.H Testing: A method used to determine the relative humidity level within the confines of the concrete slab is known as **RH testing or relative humidity testing following ASTM standard F-2170-2 as well as F-710. Johnson Premium Hardwood recommends the Wagner Rapid RH meter and system for determining RH levels in the slab, prior to commencing with the installation of flooring. The maximum allowable RH level CANNOT exceed 65% before, during and after installation without the use of a vapor retarding system. Let it be known that Johnson Premium Hardwood “HIGHLY” recommends the use of a vapor retarding system no mater what the rh test reveals.**

Mechanical Fastening: When mechanically fastening an industry/manufacturer approved sub floor (5/8”CDX plywood or better) to the surface of a concrete slab (which results in perforating the moisture vapor retarding system), the maximum allowable moisture emission rate cannot exceed 7 pounds per 1,000 sq. ft. per 24 hours based on the calcium chloride test.

Glue Down: For glue down applications the subfloor **MUST** be free from any/all type of paint, oil, greases, drywall mud/dust, release agents, and all other types of residues/contaminates.

Flatness Requirement: The subfloor should be level in general however it **MUST** be flat to within 3/16” over a 10 foot radius, in any/all directions. **When using a self leveling or patch type product to correct for floor flatness issues. ALWAYS consult with the chosen adhesive manufacture for recommendations as to what self leveling/patching material is compatible with their specific adhesive product.**

Plywood Sub-Floor: If plywood is used as a subfloor, the moisture content difference **MUST NOT** exceed more than 4% between the engineered floor and the plywood subfloor. All plywood **MUST** be exterior grade CDX or better. Plywood size for subfloor is suggested to be standard ¾” x 4’ x 8’ panels, with an expansion gap of ¼” between panels, and stagger full sheets by ½. Cross kerf the back of each panel every 1’ x 3/8” deep. **Plywood subfloor must run at a 45 degree angle (preferred) or perpendicular to the direction of the finished wood floor. ATTENTION: “ENGINEERED” FLOORING CANNOT BE DIRECTLY INSTALLED OVER 1’X6” SUBFLOORING. THE NWFA REQUIRES AN ADDITIONAL LAYER OF 1/2” PLYWOOD BE PLACED AND SECURED (screwing schedule 6” to 8” around perimeter and every 12” in the field using the appropriate length fastener) TO THE SURFACE OF THE 1”X 6” SUBFLOOR FOR ADDITIONAL SUPPORT.”**

Terrazzo or Vinyl: Before installing over terrazzo or vinyl type surfaces, first consult with the adhesive manufacturer. They will be able to provide you with specific information regarding the necessary steps that are required in order to properly prepare the surface for installation.

Vapor Protection Systems/ Adhesives: Johnson Premium Hardwood recognizes the following adhesives (for glue down applications) and their corresponding vapor retarding system(s) to be used in conjunction with the installation of Johnson prefinished, engineered flooring: Johnson urethane base adhesive along with 531 two part epoxy or MVP, Franklin 811 Advantage along with 531 two part epoxy sealer, Bostik's Best or BST along MVP, DriTac 7600 along with 7000 epoxy sealer. For installations over lightweight concrete slabs consult with the adhesive manufacturer prior to beginning installation. Always follow the adhesive manufacturer's recommendations for proper use and application.

INSTALLING A PLYWOOD SUBFLOOR SYSTEM OVER A CONCRETE SLAB

There are (3) commonly used methods to construct a plywood base subfloor and vapor retarding system over the surface of a concrete slab.

Mechanical Fastening

After determining the moisture emission rate (based on the calcium chloride test) does not exceed 7 lbs in 24 hours over 1,000 sq. ft. of surface area, you are now ready to begin building your sub floor system:

WARNING: IT IS THE INSTALLER/CONTRACTORS RESPONSIBILITY TO DETERMINE THE SLAB TYPE, I.E. POST TENSION. IF IT IS, USE EXTREME CAUTION WHEN USING PENETRATING FASTENERS TO SECURE THE SUB FLOOR TO THE SLAB SO A FASTENER IS NOT DRIVEN INTO A CABLE. THE CONSEQUENCES COULD BE QUITE DESTRUCTIVE, RESULTING IN DAMAGE TO THE SLAB AND OR STRUCTURE AND QUITE POSSIBLY, EVEN BODILY INJURY!

Method #1: (1) Using a 1/8" v-notch trowel apply a skim coat of Cold Stick tar i.e. Cold Stick P-84 by Pure Asphalt Co., or equivalent over the surface of the concrete slab in sections; (2) apply a layer of 6-mil polyethylene sheeting over the tar making sure to over-lap seams a minimum of 12 inches; (3) duct taping seams together as you go; (4) apply 1-layer of 15 lb tar saturated felt paper over the surface of the poly sheeting making sure to over-lap the seams of the 15 lb felt paper by a minimum of 4 to 6 inches; (5) Duct taping the seams together as you go.

Method #2: (1) Seal the surface of the slab using a manufacturer approved 2-part epoxy sealer and let dry overnight or according to the recommendations of the sealer manufacturer; (2) using a 3/16" v-notch trowel apply a coat of Cold Stick P-84 tar by Pure Asphalt Co., or equivalent over the epoxy sealer in rows 4" wider than the width of the 15 lb tar saturated felt paper, this is to ensure that the slabs surface is completely covered with tar; (3) roll out the felt paper into the freshly applied tar making sure that the felt paper is cut net to all vertical obstructions; (4) spread out another row of tar making sure to over-lap the edge of the tar paper with tar, 4 to 6 inches so that when you over-lap the next row of paper by 4 to 6 inches you will essentially be gluing them together; (5) repeat this process until you have completely covered the slabs surface with tar and felt paper; (6) then repeat the entire process applying tar and felt paper over the first layer of tar and paper, however this time the starting row of the second layer will need to be offset by half until you have covered the first layer of tar and paper completely. Make sure to go back to the initial starting row on layer #2 and cover the missing row with tar and paper remembering not to forget to coat and over-lap the seam.

Panels: Using a minimum thickness of 5/8" CDX or better plywood kerf the back of the panel to a depth of half its thickness 1-foot apart. This will help in taking the tension out of the panel. Then cut the plywood panels so that you cover all areas of installation, allowing for a 1/4" gap along all edges of the panels, and 3/4" around all vertical obstructions, as well as the perimeter of the room. You are now ready to secure/fasten the panels to the substrate using concrete screws, powder or pneumatically driven concrete pins/fasteners 1 1/4" to 1 1/2" long. The recommended fastening schedule is 1-pin per sq. ft. which equates to 32-pins per 4' x 8' panel spaced out equally throughout the panel with the perimeter pins positioned 1" to 1 1/2" inches from the edges of the panel.

Method #3 (Floating Sub-Floor): After determining that the moisture emission rate (based on the calcium chloride test) does not exceed 7 lbs in 24 hours over 1,000 sq. ft. of surface area, you are now ready to begin building your system.

(1) Construct a vapor retarding system using either method #1 or #2; (2) attach 2-sheets of 3/8" cdx plywood together (cross directional or at a 45° angle to one another) using construction adhesive (non water base), leaving a 1/4" gap between all seams, applied in a serpentine pattern 4 to 6 inches apart; (3) screw the panels together spacing every 6 to 8 inches around the perimeter and 10 to 12 inches in the field. Make sure the screws do not extend through the bottom of the second sheet of plywood, by doing so could compromise the effectiveness of the vapor retarding system, which could result in a moisture related distress failure.

Glue-down Subfloor: Using 3/4" CDX or better plywood, always follow the adhesive manufacturer's recommendation for proper application, proper adhesive and correct trowel notch configuration and spread rate before commencing with the installation. **IMPORTANT: Prior to installing Johnson SOLID Premium Hardwood Flooring, materials must be tested for recommended moisture content. Jobsite temperature and relative humidity levels must also be carefully monitored and recorded daily during the installation process.** The homeowner must maintain the temperature and relative humidity level in the recommended ranges to ensure maximum performance.

INSTALLING THE FLOOR

Control Environment: Meter the moisture content level of the flooring again and make sure it has stabilized with the surrounding **controlled environment** based on 35 to 50 percent relative humidity and 60 to 80 Fahrenheit. **An uncontrolled environment can lead to the following conditions: Shrinkage/gapping, cupping, warping, twisting, buckling, checking, splitting and even wear-layer delamination. Johnson Premium Hardwood will not warrant any damages caused by moisture/atmospheric related causes.**

Box Rule (3-5): Before beginning the actual installation, provide proper layout of flooring by working out of multiple boxes of material (3 to 5) is recommended in order to achieve a more uniform color tone, and grain appearance through out the installation.

Expansion Space: Allow at least (1/2" minimum) of expansion space at all wall and vertical obstructions. Expansion space will be concealed using baseboard and quarter round trim. Wood flooring will change in size according to changes in the ambient conditions of the structure i.e. temperature and relative humidity levels. **Insufficient expansion space can result in cupping, buckling, cracking and checking in the flooring. Johnson Premium Hardwood will not warrant any damages caused by improper installation.**

Lightweight Concrete: For installations over lightweight concrete slabs always consult with the adhesive manufacturer prior to beginning installation. They will be able to offer instruction on how to properly prep the surface of the substrate to avoid a potential debonding failure. Always follow the adhesive manufacturer's recommendations for proper use.

ENGINEERED WOOD FLOORING: Glue-Down Installation

IMPORTANT:

Johnson Hardwood does not condone the use of water/acrylic base adhesives in connection with the installation of any/all Johnson wood flooring products. The installer understands that by using such adhesives voids any/all warranties offered by Johnson.

Environment: Must be maintained within the recommended range in order to maintain optimal performance of your engineered wood floor. To determine the suitable moisture content for installation, please use the equilibrium moisture chart provided below. Grayed area represents the ideal moisture content for the wood to perform normally. Moisture tests **must** be completed **before and after** the flooring has been installed. **For additional information pertaining to the affects moisture has on wood please refer to the National Wood Flooring Association's Technical Publication No. A100 Water and Wood. "How Moisture Affects Wood."**

Expansion Space: Snap a working line parallel to the starting wall, in multiples of our engineered plank width, **plus** an expansion space of 3/4" preferably, 1/2" minimum to set up the base baseline of installation. Be careful to assure you do NOT end up with a width of less than 2 inches at the final opposing wall. If so, adjust by ripping down the width of the first row.

Adhesive: Follow the adhesive manufacturer's guidelines for determining the correct trowel configuration, spread rate and cure time for the adhesive being used. The adhesive manufacturer will have detailed information outlining the correct method of application and cleanup. It is imperative that the installer follow any/all recommendations made by both Johnson Premium Hardwood, as well as the adhesive manufacturer with regards to testing the moisture emission rate of the concrete slab according to ASTM F-1869-4 prior to commencing with the installation.

Follow the adhesive manufacturer's recommendation in regards to the proper way to seat the flooring into the adhesive during the installation process. Consult with the adhesive manufacturer on how to best remove adhesive from the surface of the floor.

Starting Line: Snap a working line parallel to the starting wall, in multiples of the planks width, **plus** an expansion space of $\frac{3}{4}$ " preferable to $\frac{1}{2}$ " minimum to set up the base baseline of installation. Be careful to assure you do NOT end up with a width of less than 2 inches at the final opposing wall. If so, adjust by ripping down the width of the first row. **Note:** For questions on how to square out a room, contact Johnson's technical department at 800-910-3047.

Backer Board: Install a backer board along your initial starting line, this will provide needed support for the first 3 to 4 feet of flooring installation. Backer boards are typically made from $\frac{1}{2}$ " to $\frac{3}{4}$ " (MDF) Medium Density Fiber Board cut into pieces 4 or 5 inch wide by 8-feet long. Secure the backer board to the sub floor using the appropriate length fasteners (deck screws for raised foundation applications and Tap Con screws for applications over concrete slabs) being careful not to exceed the thickness of the raised foundation sub floor. After securing the backer board to the starting line spread out the recommended amount of adhesive (per the adhesive manufacturer's recommendation) to the sub floor surface and then place your starting row boards into the adhesive one at a time, tongue facing the backer board making sure to seat the board into the adhesive according to the adhesive manufacturer's specifications. Continue to install each row of flooring off setting the end joints a minimum of 6 to 8 inches. Also, when installing the individual boards place the tongue into groove, this method of installation will help to prevent glue from being scooped up into the groove resulting in glue squeeze out between the board(s) seams and a lot of unnecessary work removing glue from the surface of the floor.

Foot Traffic: Limit foot traffic on the newly installed wood flooring according to the adhesive manufacturer's recommendations as to how soon the floor can be "safely" walked upon after completing the installation process so as not to cause any shifting of joints, or adhesive bond release between the subfloor and the wood floor.

NAIL-DOWN INSTALLATION

IMPORTANT: Be sure not to over drive the fastener past the nail slot, this can lead to a condition known as a telegraphing fastener. A telegraphing fastener is the visible effect of excessive pressure being placed on the wood fibers which causes the appearance of a little bump to occur just above the fasteners. This condition becomes most apparent when natural or artificial light reflects across the surface of the floor causing the bump to become visible to the eye. This condition can sometimes be difficult to see, so make sure to thoroughly examine the first few rows of flooring to make certain telegraphing does not exist. Johnson Premium Hardwood does not warrant against this condition since telegraphing fasteners are not manufacturing related. If you should encounter this condition immediately stop the installation and contact Johnson's Technical Department and or the manufacturer of the nailer for technical advice. It is essential that the flooring installer make sure that the nailer/stapler is properly adjusted for the particular floor that is being installed i.e. the fastener(s) **MUST** enter the nail slot at the correct angle and height, do not over-drive the fastener(s) so as not to cause damage to the board e.g. telegraphing fasteners, broken or split tongues, peaking, squeaking, or crackling noises to occur.

Fastener Gage: For nail down installations the tongue should be facing away from the backer board, the board is then secured to the sub floor by means of either using a $\frac{1}{4}$ " 18 gage staple, or **preferably** the 20 gage E-cleat manufactured by Power Nail Co., the corresponding nailers for the E-cleat is the model 200 (manually driven), or the 250 model which is pneumatic driven. Be vigilant for any signs of Telegraphing Fastening for the reasons previously stated.

Fastener Length: When installing "engineered" wood flooring, make sure the fastener length is a $1\frac{1}{4}$ " to $1\frac{1}{2}$ " long for installations over $\frac{3}{4}$ " sub floors attached to the surface of a concrete slab. However, for installation over raised foundations the fastener **must** be $1\frac{1}{2}$ " long.

Fastener Schedule: Typical fastening schedule when using staples is 3 to 4 inches and 4 to 6 inches when using cleats and regardless of the fastener used 1 to 2 inches from the end joints. **Failure to follow required fastening schedule can result in squeaky board/floor syndrome.**

FLOATING ENGINEERED WOOD FLOORING

IMPORTANT: Johnson Premium Hardwood requires the use of a manufacturer approved vapor retarding system be applied over the surface of the wood sub floor or concrete slab prior to installing the floor when using the floating floor system. **NOTE: most 2 in one and 3 in one underlayment's ONLY protect against 4 lbs of moisture emission over 1,000 sq. ft. in 24 hours. Therefore, it is MANDATORY that the slabs surface be covered with a layer of 6-mil polyethylene sheeting prior to installing a 2-in-one or 3-in-one padding/vapor retarder.**

NOTE: T-MOLD BRAKES ARE REQUIRED AT ALL DOORWAY TRANSITIONS AND FLOORING INSTALLATIONS THAT EXCEED 25 FEET IN WIDTH.

Concrete Slab:

- Place a layer of 6-mil polyethylene sheeting over the entire slabs surface overlapping the seams by 10 to 12 inches. Make sure that the entire lengths of the overlapped seams are completely duct taped together and the sheeting is flat and wrinkle free, followed by 1/8" foam padding or 6-mil/1/4" cork aligning, but also staggering the seams and duct tape together. Or seal the concrete slab using one of the recommended topical sealers such as Franklin Titebond 531 or Dri Tac MCS 7000 followed by a 2 in 1 foam/vapor retarding system or 6-mil/1/4" cork aligning, but also staggering the seams and duct tape together. NOTE: Maximum allowable moisture emission rate based on the calcium chloride test is 7 lbs in 1,000 sq. ft. in 24 hours.

Wood Sub-Floors:

- For installations over wood sub floors, place a layer of 30-30-30 single layer asphalt laminated paper meeting UU-B-790a, Grade B, Type I, Style Ia or a single layer of 15 lb tar saturated felt paper over the surface of the sub floor overlapping the seams 4 to 6 inches and staple in place followed by foam or 6-mil/1/4" cork aligning, but staggering the seams and duct tape together.

Disclaimer: Upon completion of the installation of a random length engineered wood floor, the floors surface may not appear as continuously flat as compared to a traditional long strip floating floor. Hollow sound and squeaking should be expected since the flooring is not secured to the subfloor by means of chemical fastening (gluing) or by mechanical fastening (staples, cleats or nails). Hollow sound is NOT a defect caused by manufacturing, but rather the result of the way in which the floor is put together. Caution: it is considered acceptable when floating Johnson Premium engineered flooring to expect an over-wood/under-wood condition in accordance to acceptable industry standards. Some vertical movement between planks could also occur over time.

INSTALLING OVER RADIANT HEAT SYSTEMS

Radiant Heat: The heat source is directly beneath the flooring, so the flooring may dry out faster than a similar floor in a home with a conventional heating system. Engineered wood floors can be installed over radiant heat as long as you understand radiant heat and how it can impact wood flooring, what precautions to take, and what type of wood flooring to use. Failure to follow the guidelines may/can produce unsatisfactory results, not to mention void any/all applicable warranties.

Slab Dry Time: The slab will usually take 90 to 150 days to thoroughly dry depending on the thickness of the slab.

Moisture Content: Before installation can begin, the contractor/installer **MUST** determine that the moisture content/moisture emission rate (based on the particular subfloor type) does not exceed the maximum allowed according to the specific requirements spelled out in these guidelines. Information can be found under the following SECTIONS: Subfloor Requirements, Preparation and Floating Engineered Flooring. Document **ALL** test results and provide test results to the homeowner before any work begins.

Flatness of Floor: Subfloor **MUST** be flat within 3/16" in 10' or 1/8" in 6' in any direction.

Methods of Installation: Wood floors can be installed by floating, glue-down or by mechanical fastener i.e. staple or cleat. NOTE: If the chosen method of installation is by gluing, check with the adhesive manufacturer for detailed instruction for the proper method(s) of application/preparation before any work begins. NOTE: Only moisture cure urethane base adhesives can be used for this application. Water base/acrylic adhesive CANNOT be used.

Temperature/RH Requirements: Make certain the temperature of the installed wood floor **does not** exceed 80 degrees Fahrenheit and that the temperature within the atmosphere is maintained between 67-72 degrees Fahrenheit and the relative humidity is maintained between 35-50 percent respectively. Moreover, make sure that the floors moisture content does NOT go below 6%. It is critical that the relative humidity does not drop below 35%, otherwise you may experience the following condition(s) with your floor: gapping/shrinking, checking, cracking, splitting, warping, bowing and wear-layer delamination. Expect some heating season separations between the edges of each plank. Once it has been determined (by the test results) that the conditions are suitable for the installation of flooring over a radiant heated subfloor, then, and only then can the installation proceed forward.

Thermostats: It is recommended to have three thermostats: one to control the tubing water supply temperature, one to control the room temperature with different zone controls and one for outside the house. This three-thermostat system is kindest to wood flooring because it moderates the floor temperature. People tend to crank up the heat inside the structure which could shock your floor resulting in cracking, splitting, wear-layer delamination, shrinking, gapping, cupping, buckling etc. Subtle changes to the setting 2 to 3 degrees up or down in a 24-hour period is recommended, otherwise you may experience the conditions mentioned above.

Subfloor: The essential requirement in proper application of wood flooring over radiant heated systems is to avoid penetration of the heating element. Radiant heated subfloor systems can be concrete, wood or a combination of the two. The type of subfloor determines subfloor preparation.

Concrete Subfloor: If the subfloor is concrete and it has cured, turn the heat on, regardless of season, and leave it on for at least 5-6 days to drive out residual moisture before installation of the wood flooring. Some installation systems, particularly glue-down applications, require the heat to be reduced or even turned off before installation of the flooring begins, so the adhesive does not cure prematurely and/or excessively. ALWAYS check with the adhesive manufacturer for recommendations.

Water Heated System: With a water-heated radiant heat system(s), a pressure test **MUST** be performed and documented by a qualified plumber or the system installer prior to beginning the installation of the wood flooring.

Raised Foundation: For installations over raised foundations make sure that the soil or rat slab is first covered with a 6-mil "black" polyethylene sheeting according to specific detailed requirements as stated under SECTION: JOB SITE INSPECTION AND PRE-INSTALLATION REQUIREMENTS, (Crawl Space). After it has been determined that the subfloor moisture content is within the recommended ranges as previously stated, you can then cover the subfloor surface with an appropriate moisture vapor retardant. Johnson recommends Seekure by Fortifiber Fed Spec UU-B-790A. CAUTION: DO NOT USE ASPHALT SATURATED FELT PAPER OR ASPHALT LAMINATED PAPER BECAUSE OF THE POTENTIAL OFF GASING INTO THE ENVIRONMENT CAUSED BY THE HEAT GENERATED BY THE RADIANT HEAT SYSTEM. **NOTE:** flooring cannot be glued directly to Seekure underlayment.

Disclaimer of Non-Responsibility:

Statement/disclaimer of non responsibility (voids any/all applicable warranties offered by Johnson) pertaining to labor/material costs and or damages caused to any/all cabinets, furniture, counter tops, built-in ranges/stoves, moldings/trims, fixed furniture/wall units, wall paper, painting, specialized plaster coatings, etc., as a result of removal of the flooring, cupping, buckling, twisting, bowing, shrinking, lifting, moving etc. Johnson reserves the right to void any/all warranties if and when any of the above mentioned or non mentioned item(s) are installed over the surface of a Johnson floor where the floor experiences a manufacturer or non manufacturer related failure, which requires the removal of the flooring in part, or in its entirety. Johnson Wood and wood flooring products **MUST NOT** be installed prior to the installation of cabinetry and or any other fixed furniture etc., as outlined above. The general contractor/flooring contractor/designer/homeowner/renter etc., assume **ALL** responsibility for any/all damages/costs incurred if flooring is laid prior to the installation of the above mentioned or non mentioned items. Said parties absolve Johnson from any/all liability/responsibility of any claims now or in the future.

WARNING: DO NOT INSTALL MOLDINGS/TRIMS IF THERE IS ANY QUESTION TO THERE ACCEPTABILITY. INSTALLATION CONSTITUTES ACCEPTANCE OF THE MATERIAL BEING INSTALLED!

Johnson Premium Hardwood **WILL NOT** be responsible/liable for any/all costs i.e. **LABOR** associated with any/all claims involving **color difference** issues within/the Wood floor and any/all supporting trim components e.g. stair treads, stair nosing's, reducers, T-moldings, end caps etc., after the molding/trims have been installed. It is the responsibility of the flooring contractor/installer/dealer to make certain that the moldings color match to the flooring is acceptable before installing it/them.

Precautionary Statement: Before mixing materials, i.e. Wood flooring from different runs/lots MAKE SURE the color tone is acceptable before installing the floor. IT IS THE RESPONSIBILITY OF THE DESIGNER, ARCHITECT, BUILDER, HOME OWNER, FLOORING CONTRACTOR ETC., TO DISCUSS WITH THE FLOORING INSTALLER(S) THE ACCEPTABLE COLOR TONE RANGE OF THE FLOORING BEING INSTALLED. THE APPROVED FLOORING SAMPLE MUST BE SHOWN TO THE INSTALLER(S) BEFORE COMMENCING WITH THE INSTALLATION. MOREOVER, THE APPROVED COLOR TONE SAMPLE MUST BE USED/VIEWED AS A GO-NO-GO TOOL. ONCE INSTALLED, THERE IS NO QUESTION AS TO THE FLOORS ACCEPTABILITY. INSTALLATION CONSTITUTES ACCEPTABILITY OF THE MATERIAL BEING INSTALLED. JOHNSON WILL NOT BE RESPONSIBLE FOR ANY/ALL COSTS I.E. MATERIALS AND OR LABOR ASSOCIATED WITH CLAIMS INVOLVING COLOR TONING RELATED ISSUES.