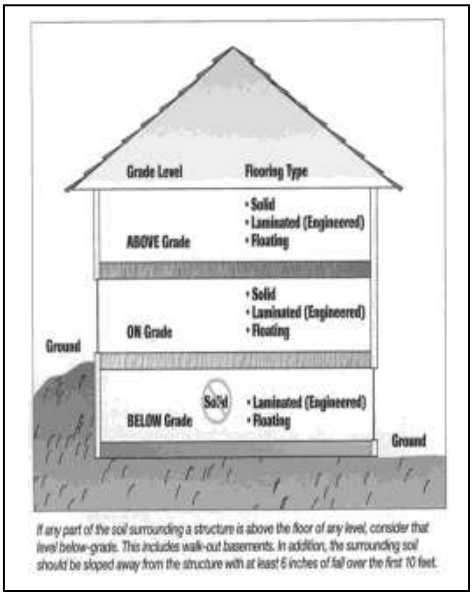
Chapter 9
Solid Strip and Plank Flooring Installation

Part I
Acceptable Jobsite Conditions and Jobsite Checklist
A. See Chapter 1, Jobsite Conditions.

Part II
Acclimation Guidelines
A. See Chapter 2, Acclimation and Conditioning of Wood Flooring.

Part III
Appropriate Grade Levels
A. Solid strip and plank wood floors can be installed successfully above grade level or on grade, but are not recommended for installation below grade.
B. The entire flooring level is considered to be below grade where soil is present along any perimeter wall and is more than 3" above the installed wood flooring level. Ground should be sloped away from the house for proper drainage. (Follow local building codes.)



If any part of the soil surrounding a structure is 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 with at least 6 inches of fall over the first 10 feet.

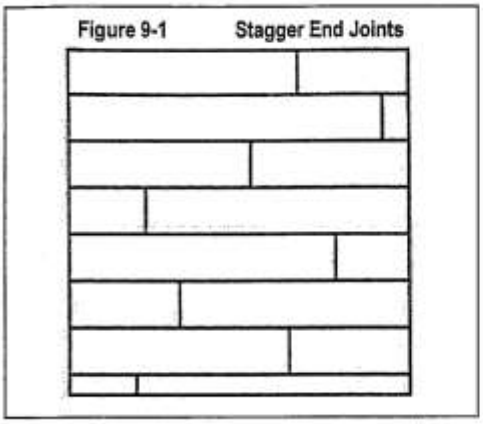
Part IV
Subfloors – Wood Joist Systems
A. See Chapter 4, Wood Subfloor Guidelines.

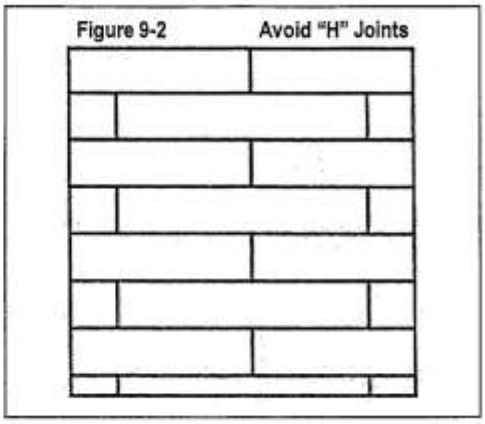
Part V
Subfloors – Concrete Slab
A. See Chapter 5, Concrete Subfloor Guidelines.
B. When installing solid strip and solid plank flooring over concrete, a vapor retarder is always required over the concrete slab and below the subflooring material. A minimum 6 mil construction grade polyethylene film, with perm of .13, or other impermeable material with a perm of .15 or less is recommended.
C. Some manufacturers allow direct glue installation of ¾" solid strip and solid plank flooring. In such cases, follow wood or adhesive manufacturer's recommendation.

Part VI
Solid Strip & Plank Installation Methods
Floor preparation: Refasten any loose areas of subfloor and clean the subfloor by sweeping, scraping, etc., as necessary. With frame construction, mark location of joists on perimeter walls so that starting runs and finishing runs, which require face nailing, can be nailed into joists. Marking also locates the joists for plank flooring installation. Flooring direction: In general over single layer subfloor, wood should be installed perpendicular to the floor truss.
A. Always follow the manufacturer's recommended installation procedure.
B. Unfinished and factory-finished solid strip and solid plank flooring should be installed perpendicular to the joists or on a diagonal for any single layer subfloor. (Exception: Over diagonal, solid subfloor boards, install perpendicular to joists or subfloor direction.)
C. When ¾" solid strip and solid plank flooring is laid parallel with the floor joists, follow one of these two steps below:
    1. Add a layer of minimum ½" (15/32") CD Exposure 1 (CDX) plywood underlayment to the existing subfloor (as previously recommended).
    2. 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.

D. Before installing wood flooring, use an approved vapor retarder. Some examples of acceptable vapor retarders over wood subfloors include:
   1. An asphalt laminated paper meeting UU-B-790a, Grade B, Type I, Style 1a.
   2. Asphalt-saturated kraft paper or #15 or #30 felt that meets ASTM Standard D4869 or UU-B-790, Grade D.
   3. Cover the subfloor with a good grade of #2 vapor retarders (see Perm Rating Chart in Chapter 3) ASTM 4869, lapped 2”- 4” along the edge seams. This retards moisture movement from below. Extend the felt/building paper completely to the walls. It is necessary to fasten the felt to the subfloor.

E. Wall Line Layout
   1. Choose a starting wall according to the most aesthetically or architecturally important elements in the room, taking into consideration fireplaces, doors, cabinets and transitions, as well as the squareness of the room. The starting wall will often be the longest unbroken wall in the room.
   2. Snap a working line parallel to the starting wall, allowing ¾” expansion space between the starting wall and the edge of the first strip or plank run.
   3. As a general rule, a ¾” expansion space must be left around the perimeter and at all vertical obstructions.
   4. Random-width plank is laid out with alternating courses varying by widths. Start with the widest board, then the next width, etc., and repeat the pattern.
   5. Lay one row of strip or plank along the entire length of the working line.
   6. Top-nail and blind-nail the first row (hand-nail if necessary), using appropriate fasteners. Denser species may require pre-drilling. Each succeeding row should be blind-nailed with the nailing machine wherever possible. At the finishing wall and other obstructions, it may be necessary to blind-nail by hand until top nailing is required.
   7. Racking rule of thumb: Avoid H patterns. Stagger end joints of boards row to row a minimum of 6” for strip flooring, 8”-10” for 3” to 5” plank, and for plank wider than 5 inch, stagger as much as possible with minimal or no H joints. See Figures 9-1 and 9-2.





   8. To minimize expansion on floors wider than 20 feet, more or less spacing between rows may be needed, depending on geographical area, interior climate control and time of the year.
   9. Where spacing is required: Use a washer or removable spacer to leave additional space every few rows and/or start in center of room and work out to both sides. Do not use spacers that may cause damage on factory-finished products.
   10. Nailing: Blind-nail through the tongue using 1½” to 2" fasteners. Use 1½” fasteners with ¾” plywood subfloor direct to concrete slab. Face-nail boards where needed using 6d-8d casing or finish nails. Fasteners should be spaced every 6”-8” on blindnailing, or every 10”-12” on face-nailing.
   11. If adhesive is used with nailing, follow wood and/or adhesive manufacturer's instructions for installing plank flooring.
   12. Blind-nail, face-nail or use wood floor adhesive, as necessary, to complete the final rows.

F. Center Line Layout

Note: For instructions on using the trammel point method to square a room and find the center point, see Appendix G, Trammel Point Method.

1. Find the center of the room, measuring off the two longest walls, and snap a line down the center of that room.
2. Install a starter board on the line. Fasten the starter board to the floor using wood screws.
3. Nail the first row of wood flooring against the starter board, being careful not to move the starter board when nailing. The groove of the flooring should be against the starter board.
4. Use a blind nailer to install the remaining rows of wood flooring. Use the nailing practices described earlier in the chapter.
5. After installing in one direction, remove the starter board and start rows going in the opposite direction.
6. Install a spline or a slip tongue in the groove of the board that was against the straightedge. Put wood flooring adhesive down the entire length of the groove before installing the splines.
7. Install the spline using a blind nailer. To keep the spline in alignment for the next flooring board, use a scrap piece of wood flooring to run along the length of the spline as you nail.
8. Install the remaining rows in the opposite direction. Use the nailing practices described earlier in the chapter.

Coefficients of Change: How Moisture Affects Wood Flooring

At 70 Fahrenheit, a relative humidity of 25 percent gives an EMC of 5 percent, and a relative humidity of 75 percent gives an EMC of 14 percent. A 50 percent variance in relative humidity produces an EMO change of 10 percent. How that affects wood flooring depends on which species is being used. However, let's say the width variation is just 1/16" for a 2¼" board. That's a full inch over 16 boards in a floor. Over the width of a 10-foot wide floor, that amounts to more than three inches of total expansion or contraction. Protective coatings cannot prevent wood from gaining or losing moisture; they merely slow the process. Installers need to take those expected dimensional variations into account when installing the wood flooring.

This is a tool for the wood flooring professional to calculate perpendicular movement, but not absolute due to variable conditions. These variables need to be taken into consideration when calculating dimensional change coefficients (e.g., plain sawn dimensional change vs. rift sawn dimensional change, etc.). These figures are noninstalled boards.

The following is a simple way to determine the number that will be used to calculate dimensional change coefficient for any given species:

Examples:
Species type: (example only) Lapacho/Brazilian Walnut
Average reported shrinkage value (green to oven dry): Tangential 8.0%
Coefficient is determined by taking the tangential shrinkage and dividing it by the fiber saturation point. (To find the fiber saturation point, google the species.)
Answer: .8/20 = .004 coefficient

A red oak (change coefficient = .00369) (see page 6 of NWFA Technical Publication A100, Water & Wood) board 5 inches wide experiences a moisture content change from 6 to 9 percent – a change of 3 percentage points.

Calculations: 3" x .00369 = .01107 x 5 = .055 inches

In actual practice, however, change would be diminished in a complete floor, as the boards' proximity to each other tends to restrain movement.