BASEMENTS AND CRAWLSPACES

PART I
Foundation Walls

Foundation issues translate to flooring issues. Cracks in foundation walls may be a larger sign of settling, structural damage, or water infiltration that will need to be fixed by a qualified contractor.

A. Water can enter the home through these cracks, and can affect the wood subfloor above, as well as the wood flooring.

B. These cracks may also be the result of structural issues that may affect the performance of the wood floor.

C. Expansive soils are a type of clay or soil that is prone to large volume changes (swelling and shrinking) that are directly related to changes in soil water content. Areas with an abundance of this type of soil can exert pressure on a foundation potentially resulting in foundation, basement, or slab problems, which can translate to flooring problems.

PART II
Basements

The floor of a building that is partly or entirely below-grade. Basements are normally constructed to keep both liquid and capillary water from finding its way into the structure. This is often done by using vapor barriers on the foundation walls, surface drainage systems, below-grade drainage systems, perimeter drainage systems, and capillary breaks.

A. The ambient conditions of the basement will change from season to season and may affect the flooring above.

B. In a **finished basement**, the walls are normally insulated, and the space is heated and cooled similarly to the above living space. This is considered a conditioned space.

C. In **unfinished basements**, the heating and air conditioning is often not turned on, or is maintained differently than the upstairs living spaces, in an effort to reduce wasted energy and perceived unnecessary costs. This is considered an unconditioned space. Unconditioned basements are typically cooler and have higher RH levels than the living space above.

D. If an unfinished basement becomes finished, the conditions below the floor will change, which could affect an already installed wood floor.

PART III
Crawlspaces

The floor of the house is built over an open space that is deep enough to allow a person to gain access to the under-floor area by crawling.

A. Structural Requirements of a Crawlspace:

1. The distance from the earth to the underside of the floor joist must be a minimum of 18" and a minimum of 12" from the earth to the underside of the beams.

2. Piers/Stilts: The pier should be set on the footing evenly.

B. Temperature and moisture conditions in the crawlspace:
   1. In general, unconditioned crawlspaces are cooler and have higher relative humidity levels than in the living space above.
   2. Humidity levels in crawlspaces are elevated by the evaporation of moisture from the soil. Evaporation generally is greatest during summer, when the soil is warmer, and less during the winter, when it is cooler. A Class I vapor retarder installed over the ground greatly reduces evaporation from crawl space floors, thereby lowering crawl space humidity levels.
   3. The temperature gradient from the cooler underside of the subfloor system in the crawlspace to the indoor living side of the subfloor system can be drastic. This temperature gradient may result in condensation forming on the underside of the subflooring due to the dew point.

C. A crawlspace can be classified into three general categories:

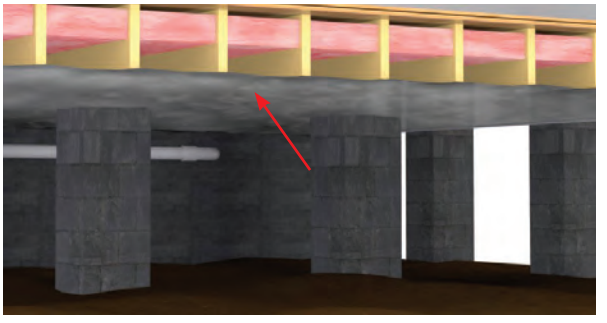
1. **Open Crawlspaces:** Open pier-and-beam foundations are considered open crawl spaces. These are considered unconditioned spaces.
   a. Open crawl spaces may have a continuous wall on just one side and be open on the other sides.
   b. Skirting these types of crawl spaces to form an enclosed crawl space and then adding venting could result in moisture issues, especially in hot and humid areas of the country.

2. **Ventilated Crawlspaces:** The International Residential Code (IRC), section R408, contains a standard requirement for ventilation in crawlspaces.
   a. The underfloor space between the bottom of the floor joists and the earth under any building (except space occupied by a basement) shall have ventilation openings through foundation walls or exterior walls.

   b. The minimum net area of ventilation openings shall not be less than 1 square foot (0.0929 square meters) for each 150 square feet (14 square meters) of under-floor space area, unless the ground surface is covered by a Class I vapor retarder material.

   c. Where a Class I vapor retarder material is used, the minimum net area of ventilation openings shall not be less than 1 square foot (0.0929 square meters) for each 1,500 square feet (140 square meters) of under-floor space area.
   d. One such ventilating opening shall be within 3 feet (914 mm) of each corner of the building.

3. **Enclosed and Conditioned Crawlspaces:** Crawl spaces are considered enclosed and conditioned where they meet all requirements as detailed in IRC section R408.3, and the entire space is conditioned and maintained at the same temperature and humidity levels as the above interior living space. These crawl spaces present the ideal circumstances to create a balanced condition below and above the flooring system. IRC section R408.3, ventilation openings in crawlspaces shall not be required where the following items are provided:
    a. Exposed earth is covered with a continuous Class I vapor retarder. Joints of the vapor retarder shall overlap by 6" (152 mm) and shall be sealed or taped. The edges of the vapor retarder shall extend not less than 6" (152 mm) up the stem wall and shall be attached and sealed to the stem wall or insulation; and
    b. One of the following is provided for the crawlspace:
        i. Continuously operated mechanical exhaust ventilation at a rate equal to 1 cubic foot per minute (0.47 L/s) for each 50 square feet (4.7 square meters) of crawlspace floor area, including an air pathway to the common area (such as a duct or transfer grill), and perimeter walls insulated in accordance with Section N1102.2.22 of IRC, or
        ii. Conditioned air supply sized to deliver at a rate of equal to 1 cubic foot per minute (0.47 L/s) for each 50 square feet (4.7 square meters) of crawlspace floor area, including a return air pathway to the common area (such as a duct or transfer grill), and perimeter walls insulated in accordance with Section N1102.2.22 of IRC, or
        iii. Plenum in existing structures complying with Section M1601.5 of IRC, if the crawlspace is used as a plenum, or
        iv. Dehumidification sized to provide 70 pints (33 liters) of moisture removal per day for every 1,000 square feet (93 square meters) of crawlspace floor area.
4. Vapor retarder installed on the underside of the joists: According to IRC section R408.8, in hot and humid climates (specifically climate zones 1A, 2A, and 3A below the warm humid line), it is a standard requirement for the builder to provide installation of a continuous Class I or Class II vapor retarder to be installed on the exposed face of air-permeable insulation installed between the floor joists, and exposed to the grade in the under-floor space. This vapor retarder shall not be required in unvented crawlspaces constructed in accordance with the IRC Section R408.3.



D. **Crawlspace Insulation:**
    1. In unconditioned spaces such as open and ventilated crawlspaces, insulation plays an important role in the temperature gradient and moisture migration from an unconditioned space into a conditioned space. Insulation installation should be completed by a qualified professional.
    2. Building codes in many climate zone regions dictate construction methods related to insulation and moisture control systems installed in crawlspaces.
    3. Common insulation and vapor retarding systems used below the subfloor include fiberglass batt insulation, closed-cell spray foam insulation, and foil-faced rigid insulation panels.