- installing roof overhangs and gutters; and
- specifying preservative-treated or naturally decay-resistant wood.

For homes, an exterior weather barrier (e.g., roofing and siding) protects most structural wood. However, improper detailing can lead to moisture intrusion and decay. Problems are commonly associated with improper or missing flashing and undue reliance on caulking to prevent moisture intrusion. For additional information and guidance on improving the durability of wood in buildings, refer to *Prevention and Control of Decay in Homes* (HUD, 1978).

Wood members that are in ground contact should be preservative treated. The most common lumber treatment is CCA (copper-chromium-arsenate), which should be used for applications such as sill plates located near the ground or for exterior decks. It is important to specify the correct level of treatment (0.4 pcf retention for nonground-contact exterior exposure and 0.6 pcf for ground contact).

Termites and other wood-destroying insects (e.g., carpenter ants, boring beetles, etc.) attack wood materials. Some practical solutions include: the chemical treatment of soil; the installation of physical barriers (e.g., termite shields); and the specification of treated lumber.

Termites are a special problem in warmer climates, although they also plague many other areas of the United States. The most common termites are "subterranean" termites that nest in the ground and enter wood that is near or in contact with damp soil. They gain access to above-grade wood through cracks in the foundation or through shelter tubes (i.e., mud tunnels) on the surface of foundation walls. Since the presence of termites lends itself to be visual to detection, wood-framed homes require periodic inspection for signs of termites.

5.2.2 Structural Wood Panels

Historically, boards were used for roof, floor, and wall sheathing; in the last 30 years, however, structural wood panel products have come to dominate the sheathing market. Structural wood panel products are more economical and efficient and can be stronger than traditional board sheathing. Structural wood panel products primarily include plywood and oriented strand board (OSB).

Plywood is manufactured from wood veneers glued together under high temperature and pressure. Each veneer or ply is placed with its grain perpendicular to the grain of the previous layer. The outer layers are placed with their grain parallel to the longer dimension of the panel. Thus, plywood is stronger in bending along the long direction and should be placed with the long dimension spanning floor and roof framing members. The number of plies typically ranges from 3 to 5. Oriented strand board is manufactured from thin wood strands glued together under high temperature and pressure. The strands are layered and oriented to produce strength properties similar to plywood; therefore, the material is used for the same applications as plywood.

The designer should specify the grade and span rating of structural wood panels to meet the required application and loading condition (i.e., roof, wall or floor). The most common panel size is 4x8 feet panels, with thicknesses typically ranging from 3/8-inch to more than 1 inch. Panels can be ordered in longer lengths for special applications.

Plywood is performance-rated according to the provisions of USDOC PS-1 for industrial and construction plywood (NIST, 1995). OSB products are performance-rated according to the provisions of USDOC PS-2 (NIST, 1992). However, these standards are voluntary and not all wood-based panel products are rated accordingly. The APA–Engineered Wood Association's (formerly American Plywood Association) rating system for structural wood panel sheathing products and those used by other structural panel trademarking organizations are based on the U.S. Department of Commerce voluntary product standards.

The veneer grade of plywood is associated with the veneers used on the exposed faces of a panel as follows:

GradeA: The highest-quality veneer grade, which is intended for cabinet or furniture use.
Grade B: A high-quality veneer grade, which is intended for cabinet or furniture use with all defects repaired.
Grade C: The minimum veneer grade, which is intended for exterior use.
Grade D: The lowest-quality veneer grade, which is intended for interior use or where protected from exposure to weather.

The wood strands or veneer layers used in wood structural panels are bonded with adhesives and they vary in moisture resistance. Therefore, wood structural panels are also classified with respect to end-use exposure as follows:

- *Exterior* panels are designed for applications with permanent exposure to the weather or moisture.
- *Exposure 1* panels are designed for applications where temporary exposure to the weather due to construction sequence may be expected.
- *Exposure 2* panels are designed for applications with a potential for high humidity or wetting but are generally protected during construction.
- *Interior* panels are designed for interior applications only.

Typical span ratings for structural wood panels specify either the maximum allowable center-to-center spacing of supports (e.g., 24 inches on center for roof, floor, or wall) or two numbers separated by a slash to designate the allowable center-to-center spacing of roof and floor supports, respectively (e.g., 48/24). Even though the second rating method does not specifically indicate wall stud spacing, the panels may also be used for wall sheathing. The *Design and Construction Guide: Residential and Commercial* provides a correlation between roof/floor ratings and allowable wall support spacing (APA, 1998a). The *Load-Span Tables for APA Structural-Use Panels* (APA, 1999) provided span ratings for various standard and nonstandard loading conditions and deflection limits.

5.2.3 Lumber Design Values

The NDS-S provides tabulated design stress values for bending, tension parallel to grain, shear parallel to grain, compression parallel and perpendicular to