

- Accelerated air-drying, 13-6
- Acid copper chromate (ACC):
 components, 15-3
 effectiveness and leaching, 15-3
 retention levels for various wood products, 15-4t
 Southern pine sapwood stakes retention and life span test results, 15-7t to 15-8t
 temperature for pressure treating, 15-20
- Adherends:
 bond strength properties, 10-21
 density and porosity, 10-6
 ease of bonding by species, 10-7t
 extractives on surface, effect on, 10-4
 knife- and abrasive-planed surfaces, 10-2 to 10-3, 10-3fig
 mechanical testing of bonded assemblies, 10-20 to 10-21
 moisture content:
 and dimensional change, 10-6 to 10-7
 control, 10-14 to 10-15
 U.S. averages, 10-15, 10-15fig
 surface preparation, 10-15
 surface properties, 10-2 to 10-3
 veneer surfaces, 10-3 to 10-4
 wettability, 10-4
 wood and nonwood composites, 10-5
- Adhesives:
 affected by:
 physical properties, 10-5 to 10-8
 surface properties, 10-5
 wood density, 10-6
 wood moisture content, 10-6
 wood porosity, 10-8
 analytic chemical and mechanical testing of polymers, 10-20 to 10-21
 assembly and pressing, 10-16 to 10-17, 10-17fig
 composition, 10-8 to 10-9
 consistency, effect of, 10-16 to 10-17, 10-17fig
 definition, 10-1
 ease of bonding by species, 10-7t
 form and color of types, 10-11t to 10-13t
 health and safety, 10-14
 mechanical testing of bonded assemblies, 10-20 to 10-21
 post-cure conditioning, 10-17
 preparation and application, 10-11t to 10-13t
 quality assurance programs, 10-22
 short- and long-term performance, 10-21 to 10-22, 10-22fig
 selection, 10-10 to 10-14
 spreading, 10-15, 10-16fig
 strength and durability, 10-9 to 10-10, 10-10t, 10-11t to 10-13t
 strength properties, 10-21
 uses, 10-1, 10-11t to 10-13t
 use on veneers, 10-3 to 10-4
 use on wood and nonwood composites, 10-5
 use with chemically modified wood, 10-4
 use with fire-retardant-treated woods, 10-4
 use with preservative-treated wood, 10-4
 working life, 10-10, 10-14
- Adjustment of properties for design use, 7-10 to 7-13
- Advantages of using wood for structures, 2-2
- Afara. *See* Limba
- Aformosia:
 characteristics, 2-19
 decay resistance, 2-19
 ease of bonding, 10-7t
 locality of growth, 2-19
 mechanical properties, 5-18t, 5-22t
 shrinkage values, 4-8t
 uses, 2-19
- Air-drying advantages and limitations, 13-6
- Albarco:
 characteristics, 2-19
 locality of growth, 2-19
 mechanical properties, 5-18t, 5-22t
 shrinkage values, 4-8t
 uses, 2-19
 workability, 2-19
- Alder, red:
 characteristics, 2-3
 characteristics for painting, 16-5t
 decay resistance, 14-5t
 dimensional change coefficient, 13-16t
 ease of bonding, 10-7t
 erosion of planed surfaces, 16-12t
 locality of growth, 2-3
 moisture content, 4-2t
 nomenclature, 6-5t
 shock resistance, 2-3
 shrinkage values, 4-6t
 strength properties, 5-4t, 5-9t
 uses, 2-3
- Alkaline copper quat (ACQ):
 common types, 15-5
 composition of common types, 15-6t
 retention levels for various wood products, 15-4t
 uses, 15-5
- Alkyl ammonium compound:
 effectiveness, 15-12
 in ammoniacal copper quat, 15-5
 solubility, 15-9
- Almon. *See* Meranti
- Alpha paper, 19-12
- Amaranth. *See* Purpleheart
- American Lumber Standard Committee (ALSC):
 accepting design values for foreign species, 7-3, 7-4t
 design properties, 7-4
 stress grading, 7-2 to 7-3
- American Society of Testing and Materials (ASTM):
 calculating design properties, 7-8 to 7-9
 calculating strength ratios, 7-3
 calculating wood properties for visual stress grades, 7-3
 critical radiant flux of floorcovering systems using a radiant heat energy source (ASTM E 648), 18-5
 related test methods, 18-8 to 18-9
 cone calorimeter (ASTM E 1354), 18-6, 18-7
 fire tests of roof covering (ASTM E 108), 18-3
 fire-resistance test (ASTM E 119), 18-6 to 18-7
 flame spread (ASTM E 84), 18-3 to 18-5, 18-4t, 18-6, 18-12
 flame spread index for solid sawn lumber, 18-4t
 NBS smoke chamber (ASTM E 662), 18-6
- American Softwood Lumber Standard, 6-2, 6-7, 6-8, 7-2
- American standard lumber sizes, 6-10, 6-11t
- American Wood Preservers' Association:
 fire-retardant-treated wood, 18-16 to 18-17
- Ammonia for plasticizing wood, 19-2
- Ammoniacal copper citrate (CC):
 retention levels for various wood products, 15-4t
 solution percentages, 15-9
 temperature for pressure treating, 15-18
- Ammoniacal copper zinc arsenate (ACZA):
 composition, 15-3
 replacement for ACA, 15-3
 retention levels for various wood products, 15-4t
 temperature for pressure treating, 15-18
 uses, 15-3
 use with Douglas-fir, 15-3
- Anani. *See* Manni
- Anaura. *See* Marishballi
- Andiroba:
 characteristics, 2-19
 decay resistance, 14-5t
 dimensional change coefficient, 13-17t
 durability, 2-19
 ease of bonding, 10-7t
 locality of growth, 2-19
 mechanical properties, 5-18t, 5-22t

- nomenclature, 2-19, 2-43t
 resistance to decay and insects, 2-19
 shrinkage values, 4-8t
 uses, 2-19
 workability, 2-19
- Angelin (*See also* Sucupira):
 ease of bonding, 10-7t
 mechanical properties, 5-18t, 5-22t
 shrinkage values, 4-8t
- Angelique:
 characteristics, 2-19 to 2-20
 decay resistance, 14-5t
 dimensional change coefficient, 13-17t
 ease of bonding, 10-7t
 machining properties, 2-20
 mechanical properties, 5-18t, 5-22t
 resistance to decay and insects, 2-20
 shrinkage values, 4-8t
 uses, 2-20
- Animal adhesives:
 structural performance, 10-10t
 working and strength properties, and
 uses, 10-11t to 10-13t
- Ants, carpenter, 14-13
- Annual growth rings. *See* Growth rings
- Apa. *See* Wallaba
- Apamate. *See* Roble
- Apitong. (*See also* Keruing):
 dimensional change coefficient, 13-17t
 shrinkage values, 4-8t
- Apple:
 dimensional change coefficient, 13-16t
 moisture content, 4-2t
- Ash:
 decay resistance, 14-5t
 for flooring, 6-4, 6-6
- Ash, black:
 characteristics, 2-3
 dimensional change coefficient, 13-16t
 locality of growth, 2-3
 moisture content, 4-2t
 nomenclature, 6-5t
 shrinkage values, 4-6t
 species, 2-3
 specific gravity, 2-3
 strength properties, 5-4t, 5-9t
 thermal conductivity, 4-13t
 uses, 2-3
- Ash, blue:
 shrinkage values, 4-6t
 strength properties, 5-4t, 5-9t
- Ash, green:
 dimensional change coefficient, 13-16t
 moisture content, 4-2t
 penetration, 15-16t
 shrinkage values, 4-6t
 strength properties, 5-4t, 5-9t
- Ash, Oregon:
 dimensional change coefficient, 13-16t
 nomenclature, 6-5t
 shrinkage values, 4-6t
- strength properties, 5-4t, 5-9t
- Ash, pumpkin:
 dimensional change coefficient, 13-16t
 shrinkage values, 4-6t
- Ash, white:
 characteristics, 2-3 to 2-4
 characteristics for painting, 16-5t
 connector joint strength, 8-21t
 dimensional change coefficient, 13-16t
 ease of bonding, 10-7t
 elastic ratio, 5-2t
 locality of growth, 2-3
 moisture content, 4-2t, 5-34t
 nomenclature, 6-5t
 penetration, 15-16t
 Poisson ratio, 5-3t
 shrinkage values, 4-6t
 shock resistance, 2-3
 species, 2-3
 thermal conductivity, 4-13t
 uses, 2-4
- Aspen:
 characteristics, 2-4
 connector joint strength, 8-21t
 decay resistance, 14-5t
 ease of bonding, 10-7t
 locality of growth, 2-4
 moisture content, 4-2t
 nomenclature, 6-5t
 shock resistance, 2-4
 species, 2-4
 uses, 2-4
 workability, 2-4
- Aspen, bigtooth:
 characteristics for painting, 16-5t
 mechanical properties, 5-14t, 5-16t
 penetration, 15-16t
 shrinkage values, 4-6t
 strength properties, 5-4t, 5-9t
 thermal conductivity, 4-13t
- Aspen, quaking:
 dimensional change coefficient, 13-16t
 mechanical properties, 5-14t, 5-16t
 Poisson ratio, 5-3t
 shrinkage values, 4-6t
 strength properties, 5-4t, 5-9t
 thermal conductivity, 4-13t
- Avodire:
 characteristics, 2-20
 decay resistance, 14-5t
 dimensional change coefficient, 13-17t
 ease of bonding, 10-7t
 locality of growth, 2-20
 mechanical properties, 5-18t, 5-22t
 shrinkage values, 4-8t
 shock resistance, 2-20
 uses, 2-20
 workability, 2-20
- Axial load, deformation, 9-1, 9-1eq
- Azobe:
 characteristics, 2-20
- decay resistance, 14-5t
 ease of bonding, 10-7t
 locality of growth, 2-20
 mechanical properties, 5-18t, 5-22t
 resistance to decay and insects, 2-20
 marine borers, 14-13 to 14-15
 shrinkage values, 4-8t
 workability, 2-20
 uses, 2-20
- Bacteria causing decay, 14-9
- Back priming, 16-25
- Bagtikan. *See* Seraya, white
- Balata:
 characteristics, 2-20
 decay resistance, 14-5t
 ease of bonding, 10-7t
 locality of growth, 2-20
 resistance to decay and insects, 2-20
 shrinkage values, 4-8t
 uses, 2-20
 workability, 2-20
- Balau:
 characteristics, 2-21
 decay resistance, 14-5t
 ease of bonding, 10-7t
 locality of growth, 2-21
 species, 2-21
 uses, 2-21
- Baldcypress:
 characteristics, 2-11
 characteristics for painting, 16-5t
 connector joint strength, 8-21t
 decay resistance, 14-5t
 dimensional change coefficient, 13-16t
 elastic ratio, 5-2t
 flame spread index, 18-4t
 locality of growth, 2-11
 moisture content, 4-2t
 nomenclature, 6-13t
 pecky cypress, 2-11
 penetration, 15-16t
 Poisson ratio, 5-3t
 tensile strength, 5-26t
 thermal conductivity, 4-14t
 uses, 2-11
- Balsa:
 characteristics, 2-21, 2-44t
 decay resistance, 14-5t
 dimensional change coefficient, 13-17t
 ease of bonding, 10-7t
 elastic ratio, 5-2t
 locality of growth, 2-21
 mechanical properties, 5-18t, 5-22t
 Poisson ratio, 5-3t
 shrinkage values, 4-8t
 uses, 2-21
- Banak:
 characteristics, 2-21
 decay resistance, 14-5t

Index

- dimensional change coefficient, 13-17t
 - ease of bonding, 10-7t
 - locality of growth, 2-21
 - machining properties, 2-21
 - mechanical properties, 5-18t, 5-22t
 - nomenclature, 2-21, 2-44t
 - resistance to decay and insects, 2-21
 - shrinkage values, 4-8t
 - uses, 2-21
- Bark:**
- growth, 3-2
 - inner and outer, 3-2fig
- Basswood:**
- characteristics, 2-4
 - characteristics for painting, 16-5t
 - charring rate data, 18-14t
 - connector joint strength, 8-21t
 - decay resistance, 14-5t
 - ease of bonding, 10-7t
 - elastic ratio, 5-2t
 - flammability data, 18-4t
 - locality of growth, 2-4
 - machinability, 2-4
 - moisture content, 4-2t
 - nomenclature, 6-5t
 - strength properties, 5-4t, 5-9t
 - in wood-polymer composites, 19-11t
 - thermal conductivity, American, 4-13t
 - uses, 2-4
 - workability, 2-4
- Basswood, American:**
- dimensional change coefficient, 13-16t
 - penetration, 15-16t
 - shrinkage values, 4-6t
 - strength properties, 5-4t, 5-9t
- Bastard sawn lumber, definition, 3-14**
- Beams:**
- bending deflection, 9-3 to 9-4, 9-2eq, 9-2t, 9-4eq
 - bending stress, 9-4, 9-5eq, 9-9
 - combined bending and axial load, effect of, 9-3, 9-6
 - compressive stress, 9-4
 - deformation, 9-1 to 9-4
 - end loading, effect of, 9-6
 - lateral buckling, 9-9 to 9-10, 9-9eq, 9-9t
 - modulus of rupture, 9-4, 9-4eq
 - notches and holes, effect of, 9-2, 9-6 to 9-7
 - shear deflection, 9-2, 9-2eq, 9-2t
 - shear stress, 9-4, 9-4eq
 - size, effect on strength, 9-5, 9-5eq, 9-6eq
 - size, effects on modulus of rupture, 9-5, 9-6eq
 - stability, 9-7 to 9-10
 - tapered beams:
 - bending stress, 9-5 to 9-6, 9-5eq
 - deflections, 9-3, 9-3eq, 9-3fig
 - glulam combinations, 11-17 to 11-18
 - shear stresses, 9-4 to 9-6, 9-5fig
- tensile, stress, 9-4, 9-4eq
 - time, effect of, 9-2, 9-7
 - twist, 9-4, 9-4eq
 - waterponding, effect of, 9-2, 9-3eq, 9-6, 9-8, 9-8eq
- Beech:**
- characteristics for painting, 16-5t
 - decay resistance, 14-5t
 - for flooring, 6-4, 6-6
 - nomenclature, 6-5t
 - penetration, 15-16t
- Beech, American:**
- characteristics, 2-4
 - connector joint strength, 8-21t
 - dimensional change coefficient, 13-16t
 - ease of bonding, 10-7t
 - locality of growth, 2-4
 - machinability, 2-4
 - moisture content, 4-2t
 - shock resistance, 2-4
 - shrinkage values, 4-6t
 - strength properties, 5-4t, 5-9t
 - tensile strength, 5-26t
 - thermal conductivity, 4-13t
 - uses, 2-4
- Bees, carpenter, 14-13**
- Beetles:**
- ambrosia beetles, 14-9 to 14-10
 - damage caused by, 14-8t
 - bark beetles, 14-9
 - old house borers, 14-10
 - damage caused by, 14-8t
 - powder-post beetles, 14-10
 - damage caused by, 14-9fig, 14-8t
- Bending:**
- creep, 5-39
 - strength and temperature, 5-37t
- Bending of glulam, 11-17**
- Bending properties, affected by temperature, 5-37, 5-37t**
- Bending stiffness:**
- bending strength, stress grading, 7-6
- Bending stress:**
- derivations for machine-graded lumber, 7-8 to 7-10, 7-12fig
- Bending of wood:**
- apparatus, 19-4
 - chemicals used, 19-2
 - fixing the bend, 19-4
 - moisture content of stock, 19-3 to 19-4
 - principles of plasticizing and bending, 19-1
 - selection of stock, 19-3
 - solid members, 19-3, 19-3fig
 - steaming, 19-1
- Benge:**
- characteristics, 2-21
 - decay resistance, 14-5t
 - ease of bonding, 10-7t
 - mechanical properties, 5-18t, 5-22t
 - nomenclature, 2-21
 - shrinkage values, 4-8t
 - uses, 2-22
 - workability, 2-21
- Bent wood members:**
- characteristics, 19-4
 - solid wood members, species used, 19-3
 - uses, 19-2
- Birch:**
- connector joint strength, 8-21t
 - decay resistance, 14-5t
 - for casing and base, 6-17
 - for flooring, 6-4, 6-6
 - heat release data, 18-12fig
 - nomenclature, 6-5t
- Birch, gray, shrinkage values, 4-6t**
- Birch, paper:**
- characteristics, 2-4 to 2-5
 - dimensional change coefficient, 13-16t
 - locality of growth, 2-5
 - moisture content, 4-2t
 - shrinkage values, 4-6t
 - strength properties, 5-4t, 5-9t
 - uses, 2-5
- Birch, river:**
- dimensional change coefficient, 13-16t
 - penetration, 15-16t
 - shrinkage values, 4-6t
- Birch, sweet:**
- characteristics, 2-5
 - dimensional change coefficient, 13-16t
 - ease of bonding, 10-7t
 - locality of growth, 2-5
 - moisture content, 4-2t
 - penetration, 15-16t
 - shock resistance, 2-5
 - shrinkage values, 4-6t
 - strength properties, 5-4t, 5-9t
 - thermal conductivity, 4-13t
 - uses, 2-5
- Birch, yellow:**
- characteristics, 2-5
 - characteristics for painting, 16-5t
 - dimensional change coefficient, 13-16t
 - ease of bonding, 10-7t
 - elastic ratio, 5-2t
 - flame spread index, 18-4t
 - laminated:
 - strength properties, 19-7t to 19-8t
 - thermal expansion coefficients, 19-8t
 - locality of growth, 2-5
 - moisture content, 4-2t, 5-34t
 - Poisson ratio, 5-3t
 - penetration, 15-16t
 - shrinkage values, 4-6t
 - shock resistance, 2-5
 - strength properties, 5-4t, 5-9t
 - thermal conductivity, 4-13t
 - toughness values, 5-27t
 - uses, 2-5

- Bird peck:
 description, 5-33
 effect on strength, 5-33
 species involved, 5-33
- Black locust. *See* Locust, black
- Blood adhesive, working and strength properties, and uses, 10-11t to 10-13t
- Blue stain, description, 14-2
- Boats, wood:
 control of decay in, 14-9
 control of marine borers, 14-14 to 14-15
 use of varnish on, 16-25
- Bolts:
 bearing stress of wood under:
 bolt diameter, effect perpendicular to grain, 8-15fig
 intermediate angle to grain loading, 8-14, 8-13fig
 L/D ratios, 8-14
 parallel to grain loading, 8-14, 8-14fig
 perpendicular to grain loading, 8-14, 8-14fig
 bearing stress with steel side plates, 8-15
 bolt holes, effect on, 8-16 to 8-17, 8-16fig
 bolt quality, effect on joint strength, 8-15, 8-14fig, 8-15fig
 drift, 8-10
 member thickness, effect of, 8-15, 8-15fig
 multiple bolt joints, 8-15 to 8-16
 pre-1991 allowable loads:
 parallel to grain, 8-17 to 8-18, 8-17t
 perpendicular to grain, 8-17, 8-18t, 8-19eq
 post-1991 yield model, 8-17, 8-19eq, 8-19t
 spacing, edge and end distance, 8-16
- Bondability:
 of metals and plastics to wood, 10-5
 of wood species, 10-6, 10-7t
- Bonded joints:
 basic stress modes, 10-20 to 10-21
 construction joints, 10-19 to 10-20, 10-19fig
 edge-grain joints, 10-18, 10-18fig
 end-grain joints, 10-18, 10-18fig
 end-to-edge grain joints, 10-18, 10-18fig
 mechanical testing of, 10-19 to 10-21
- Bonding:
 adhesive selection, 10-10 to 10-15
 assembly and pressing, 10-16 to 10-17, 10-17fig
 effect of:
 moisture content and dimensional change, 10-14 to 10-15
 wood density, 10-5 to 10-6
 wood porosity, 10-6
 elements of, 10-1 to 10-2
 moisture content control, 10-14 to 10-16
- quality assurance programs, 10-22
 short- and long-term performance of adhesives, 10-21 to 10-22, 10-22fig
 strength and durability of adhesives, 10-9 to 10-10, 10-10t, 10-18
 strength properties of adhesives, 10-21
 surface preparation, 10-15
 with veneers, 10-3 to 10-4
 wettability of wood, 10-2, 10-4fig
 wood and nonwood composites, 10-5
- Boxelder, nomenclature, 6-5t
- Box nails, 8-2, 8-2t
- Bridges, 17-8 to 17-9, 17-9fig
- Brown rot, 14-4
- Bubinga (*See also* Bengé):
 decay resistance, 14-5t
 ease of bonding, 10-7t
 mechanical properties, 5-18t, 5-22t
 shrinkage values, 4-8t
- Buckeye:
 characteristics, 2-5
 decay resistance, 14-5t
 dimensional change coefficient, 13-16t
 locality of growth, 2-5
 machinability, 2-5
 nomenclature, 6-5t
 shock resistance, 2-5
 species, 2-5
 uses, 2-5
 yellow, shrinkage values, 4-6t
- Buckling:
 interaction of buckling modes, 9-9 to 9-10, 9-9eq, 9-10eq
 of beams, 9-9 to 9-10, 9-9eq, 9-9t, 9-10fig
 of columns, 9-7 to 9-9, 9-7eq, 9-8fig
 of deck beams, 9-9, 9-10fig
 of roof beams, 9-9
- Building codes:
 classifications of construction, 18-2
 fire safety:
 containment to compartment of origin, 18-6 to 18-8
 fire growth within compartments, 18-3 to 18-6
 types of construction, 18-2
 organizations producing, 18-2
- Buildings, control of decay in, 14-4, 14-7
- Built-up columns, 9-8
- Bulletwood (*See also* Balata):
 mechanical properties, 5-18t, 5-22t
 shrinkage values, 4-8t
- Butternut:
 characteristics, 2-5
 characteristics for painting, 16-5t
 decay resistance, 14-5t
 dimensional change coefficient, 13-16t
 ease of bonding, 10-7t
 locality of growth, 2-5
 machinability, 2-5
 nomenclature, 6-5t
 shock resistance, 2-5
 shrinkage values, 4-6t
 strength properties, 5-4t, 5-9t
 uses, 2-5
- Buttonwood. *See* Sycamore
- Cambium, 3-2fig, 3-4, 3-6fig
- Carapa. *See* Andiroba
- Carbon impact:
 construction performance indices, 1-2t
 contained, 1-3
 deforestation, 1-2
 emissions, net carbon, 1-3, 1-4t
 photosynthesis, 1-2
 process, 1-2
 sequestration, 1-2
 sustainability, defined, 1-3
- Carbon monoxide, 18-6
- Carpenter ants:
 damage caused by, 14-11fig, 14-8t
 discussed, 14-13
- Carpenter bees:
 damage caused by, 14-8t
 discussed, 14-13
- Casing and base, availability, 6-17
- Casein adhesive:
 structural performance, 10-10t
 working and strength properties, and uses, 10-11t to 10-13t
- Catalpa:
 decay resistance, 14-5t
 dimensional change coefficient, 13-16t
- Catalysts and adhesion, 10-10
- Cativo:
 characteristics, 2-22
 decay resistance, 14-5t
 dimensional change coefficient, 13-17t
 ease of bonding, 10-7t
 locality of growth, 2-22
 mechanical properties, 5-18t, 5-22t
 resistance to decay and insects, 2-22
 shrinkage values, 4-8t
 uses, 2-22
- Cedar:
 availability at retail lumber yards, 6-16
 for finish boards, 6-16
- Cedar, Atlantic-white:
 characteristics, 2-18
 decay resistance, 14-5t
 dimensional change coefficient, 13-16t
 locality of growth, 2-18
 nomenclature, 6-13t
 shock resistance, 2-18
 shrinkage values, 4-6t
 strength properties, 5-6t, 5-11t
 thermal conductivity, 4-14t
 uses, 2-18
- Cedar, eastern red:
 characteristics, 2-16

Index

- decay resistance, 14-5t
 - dimensional change coefficient, 13-16t
 - ease of bonding, 10-7t
 - heat release data, 18-12fig
 - locality of growth, 2-16
 - moisture content, 4-2t
 - nomenclature, 6-13t
 - shock resistance, 2-16
 - shrinkage values, 4-6t
 - strength properties, 5-6t, 5-11t
 - thermal conductivity, 4-14t
 - uses, 2-16
- Cedar, incense:
- characteristics, 2-12 to 2-13
 - characteristics for painting, 16-5t
 - decay resistance, 14-5t
 - dimensional change coefficient, 13-16t
 - locality of growth, 2-12
 - moisture content, 4-2t
 - pecky, 2-13
 - nomenclature, 6-13t
 - shock resistance, 2-13
 - shrinkage values, 4-6t
 - strength properties, 5-6t, 5-11t
 - uses, 2-13
- Cedar, northern white:
- characteristics, 2-18
 - characteristics for painting, 16-5t
 - decay resistance, 14-5t
 - dimensional change coefficient, 13-16t
 - elastic ratio, 5-2t
 - for shingles, 6-17
 - locality of growth, 2-18
 - mechanical properties, 5-14t, 5-15t
 - nomenclature, 6-13t
 - penetration, 15-16t
 - Poisson ratio, 5-3t
 - shock resistance, 2-18
 - shrinkage values, 4-6t
 - strength properties, 5-6t, 5-11t
 - thermal conductivity, 4-14t
 - uses, 2-18
- Cedar, Port-Orford:
- characteristics, 2-16
 - characteristics for painting, 16-5t
 - connector joint strength, 8-21t
 - decay resistance, 14-5t
 - dimensional change coefficient, 13-16t
 - ease of bonding, 10-7t
 - locality of growth, 2-16
 - moisture content, 4-2t
 - nomenclature, 6-13t
 - shock resistance, 2-16
 - shrinkage values, 4-6t
 - strength properties, 5-7t, 5-12t
 - tensile strength, 5-26t
 - thermal conductivity, 4-14t
 - uses, 2-16
- Cedar, western red:
- characteristics, 2-16
 - characteristics for painting, 16-5t
 - charring rate data, 18-14t
 - connector joint strength, 8-21t
 - decay resistance, 14-5t
 - dimensional change coefficient, 13-16t
 - ease of bonding, 10-7t
 - elastic ratio, 5-2t
 - erosion of planed surfaces, 16-12t
 - flame spread index, 18-4t
 - for shingles and shakes, 6-17
 - for siding, 6-16
 - locality of growth, 2-16
 - mechanical properties, 5-14t, 5-15t
 - moisture content, 4-2t
 - nomenclature, 6-13t
 - penetration, 15-16t
 - Poisson ratio, 5-3t
 - shock resistance, 2-16
 - shrinkage values, 4-6t
 - strength properties, 5-12t, 5-7t
 - tensile strength, 5-26t
 - thermal conductivity, 4-14t
 - toughness values, 5-28t
 - used for poles, 6-19
 - uses, 2-16
- Cedar, yellow:
- characteristics, 2-18
 - characteristics for painting, 16-5t
 - connector joint strength, 8-21t
 - decay resistance, 14-5t
 - dimensional change coefficient, 13-16t
 - ease of bonding, 10-7t
 - flame spread index, 18-4t
 - locality of growth, 2-18
 - mechanical properties, 5-14t, 5-15t
 - moisture content, 4-2t
 - nomenclature, 6-13t
 - shrinkage values, 4-6t
 - shock resistance, 2-18
 - strength properties, 5-7t, 5-12t
 - thermal conductivity, 4-14t
 - toughness values, 5-28t
 - uses, 2-18
- Cedro. *See* Spanish-cedar
- Cedro macho. *See* Andiroba
- Cedro-Rana. *See* Tornillo
- Ceiba:
- characteristics, 2-22
 - decay resistance, 14-5t
 - locality of growth, 2-22
 - mechanical properties, 5-18t, 5-22t
 - resistance to decay and insects, 2-22
 - shrinkage values, 4-8t
 - uses, 2-22
 - workability, 2-22
- Cells of wood:
- description, 3-7, 3-9 to 3-12
 - fibers, 3-11
 - functions of various types, 3-9 to 3-12
 - parenchyma, 3-9, 3-11
 - rays, 3-9, 3-11
 - tracheids, 3-9
 - vessels, 3-10
- Cellulose, discussion, 3-7
- Cellulose insulation, product safety standard, 18-2 to 18-3
- Cement-bonded composites, 11-23 to 11-25, 11-24fig
- magnesia-cement-bonded, 11-23
 - mechanical properties, 12-9, 12-10t
 - Portland-cement-bonded, 11-24
 - problems, 11-24
 - treatment, 11-24
- Cement-coated nails, 8-2fig, 8-3
- Ceramic-bonded composites, 11-25
- Chalking, 16-28
- Checks:
- development due to weathering, 16-6, 16-11, 16-11fig
 - during drying, 13-7, 13-9 to 13-10, 13-12fig
 - in decking boards, 16-6
 - in lumber stress grading, 7-4
 - in glued-laminated timbers, 11-19
 - in veneer adhesion, 10-4
- Chemical discolorations during drying, 13-10, 13-13fig
- Chemicals, effect on wood:
- discussion, 5-41
 - strength and mechanical properties, 5-41 to 5-42
- Cherry:
- characteristics for painting, 16-5t
 - ease of bonding, 10-7t
 - nomenclature, 6-5t
- Cherry, black:
- characteristics, 2-5
 - decay resistance, 14-5t
 - dimensional change coefficient, 13-16t
 - elastic ratio, 5-2t
 - locality of growth, 2-5
 - machinability, 2-5
 - moisture content, 4-2t
 - Poisson ratio, 5-3t
 - shock resistance, 2-5
 - strength properties, 5-4t, 5-9t
 - thermal conductivity, 4-13t
 - uses, 2-1, 2-5
- Cherry, pin, penetration, 15-16t
- Chestnut:
- characteristics for painting, 16-5t
 - nomenclature, 6-5t
- Chestnut, American:
- availability, 2-5 to 2-6
 - characteristics, 2-6
 - connector joint strength, 8-21t
 - decay resistance, 14-5t
 - dimensional change coefficient, 13-16t
 - ease of bonding, 10-7t
 - locality of growth, 2-5

- moisture content, 4-2t, 5-34t
penetration, 15-16t
shock resistance, 2-6
shrinkage values, 4-6t
strength properties, 5-4t, 5-9t
thermal conductivity, 4-13t
uses, 2-6
workability, 2-6
- Chewstick. *See* Manni
- Chlorothalonil/chlorpyrifos:
component ratios, 15-12
effectiveness, 15-12
- Chlorpyrifos:
effectiveness, 15-12
in combination, 15-12
- Chromated copper arsenate (CCA):
common types, 15-4
component substitutions, 15-4
composition of common types, 15-5t
effectiveness of common types, 15-4
effect on adhesion, 10-4
finishing wood treated with, 16-24
resistance to marine borers, 15-5
retention levels for various wood products, 15-5t
Southern pine sapwood stakes retention and life span test results, 15-7t to 15-8t
temperature for pressure treating, 15-18
use with Douglas-fir, 15-3
- Coal-tar creosote. *See* Creosote
- Cocobolo, shrinkage values, 4-8t
- Coefficient of friction, 4-17
- Coefficient of thermal expansion, 4-14
- Coefficient of variation, 5-26t
- Collapse during drying, 13-10, 13-12fig
- Columns:
built-up and spaced columns, 9-8
flanged columns, 9-8
long columns, compressive stress, 9-7, 9-7eq
short columns, compressive stress, 9-7 to 9-8, 9-8eq
- Composite products:
classification, 11-2t
conventional wood-based composite panels, 11-2 to 11-17
additives, 11-5
adhesives, 11-3 to 11-5
classification, 11-2t
elements, 11-2, 11-6fig
fiberboard, 11-12 to 11-15
oriented strandboard, 11-7 to 11-10
particleboard, 11-10 to 11-12
performance and standards, 11-1, 11-3t
plywood, 11-5 to 11-7
specialty composites, 11-15
glued-laminated timber (glulam), 11-17 to 11-20
mechanical properties, 12-2t
specific gravity, 12-2t
standards, 11-3t
- structural composite lumber, 11-20 to 11-22
description, 11-20
laminated strand lumber, 11-21
laminated veneer lumber, 11-21
oriented strand lumber, 11-21
parallel strand lumber, 11-21
- test standards, 12-5 to 12-7
- wood elements, 11-4fig
- wood–nonwood composites, 11-22 to 11-27
description, 11-22
inorganic-bonded composites, 11-22 to 11-25
wood–thermoplastic composites, 11-25 to 11-27
- Compreg:
advantages, 19-5
dimensional stability, 19-9t
molding, 19-5, 19-9
plasticizers, 19-5
properties, 19-5, 19-6t
thermal expansion coefficients, 19-8t
uses, 19-5 to 19-9
- Compressed wood, untreated (staypak)
appearance, 19-10
dimensional stability, 19-9t
purpose, 19-7t to 19-6t
strength properties, 19-7t to 19-8t
uses, 19-10
- Compression failures:
causes, 5-33
description, 5-33, 5-33fig
effect on strength, 5-33
- Compression wood:
definition, 5-31
density increase, 5-31
in juvenile wood, 5-32
shrinkage, 4-5, 5-32
- Compression strength parallel to grain:
affected by temperature, 5-36t
coefficient of variation, 5-26t
defined, 5-3
- Compressive stress of columns, 9-7 to 9-9, 9-7eq
- Compression stress perpendicular to grain:
coefficient of variation, 5-26t
defined, 5-3
- Condensation in crawl spaces, 14-7
- Conductance meters and moisture content, 13-2 to 13-3
- Conductivity, thermal:
definition, 4-10
discussion, 4-10 to 4-15
- Cone calorimeter, 18-12
- Connector joints:
cross bolts, 8-24
design loads, 8-20, 8-20fig, 8-21fig
end distance and spacing, 8-23
multiple connectors, 8-23 to 8-24, 8-24fig
net section stress, 8-23
parallel to grain loading, 8-19, 8-20fig
perpendicular to grain loading, 8-19 to 8-20, 8-20fig
shear plate connector, 8-19fig
split-ring connector, 8-19fig
strength components, 8-18 to 8-19
strength ratios, 8-25t
working loads:
exposure and moisture condition, effect of, 8-21
grade and quality of lumber, 8-22
loads at angle with grain, 8-22, 8-7fig, 8-13eq,
species grouping, 8-21t, 8-22t
steel side plates, effect of, 8-21
thickness of member, effect of, 8-22, 8-22t, 8-23fig
width of member, effect of, 8-23
- Consortium for Research on Renewable Industrial Materials (CORRIM):
calculations, 1-2
standards, 1-2
- Construction, design factors affecting
dimensional change, 13-18
- Construction logs:
availability, 6-20
form, 6-21, 6-21fig
standards and specifications, 6-18t
strength properties, 7-14
uses, 6-20
- Copper azole - Type A (CBA-Type A):
retention levels for various wood products, 15-4t
solution percentages, 15-6
temperature for pressure treating, 15-18
- Copper bis(dimethyldithiocarbamate) (CDDC):
retention levels for various wood products, 15-4t, 15-5t
solution percentages, 15-6
temperature for pressure treating, 15-18
uses, 15-6
- Copper HDO (CXA), 15-6
- Copper naphthenate:
color transfer and changes, 15-6
effectiveness, 15-6
retention levels for various wood products, 15-4t
solution values, 15-6
Southern pine sapwood stakes retention and life span test results, 15-7t to 15-8t
treatment for cutting pretreated wood, 15-25
- Copper naphthenate (waterborne), 15-6
- Cotton linter paper, 19-12

Index

- Cottonwood:
characteristics, 2-6
connector joint strength, 8-21t
decay resistance, 14-5t
ease of bonding, 10-7t
elastic ratio, 5-2t
flame spread index, 18-4t
locality of growth, 2-6
moisture content, 4-2t
nomenclature, 6-5t
penetration, 15-16t
shock resistance, 2-6
species, 2-6
uses, 2-6
workability, 2-6
- Cottonwood, balsam poplar:
mechanical properties, 5-14t, 5-15t
shrinkage values, 4-6t
strength properties, 5-4t, 5-9t
- Cottonwood, black:
dimensional change coefficient, 13-16t
mechanical properties, 5-14t, 5-15t
shrinkage values, 4-6t
strength properties, 5-4t, 5-9t
thermal conductivity, 4-13t
- Cottonwood, eastern:
dimensional change coefficient, 13-16t
elastic ratio, 5-2t
characteristics for painting, 16-5t
mechanical properties, 5-14t, 5-15t
Poisson ratio, 5-3t
shrinkage values, 4-6t
strength properties, 5-4t, 5-9t
thermal conductivity, 4-13t
- Courbaril:
characteristics, 2-22 to 2-23
decay resistance, 14-5t
ease of bonding, 10-7t
locality of growth, 2-22
machinability, 2-23
mechanical properties, 5-18t, 5-22t
resistance to decay and insects, 2-23
shrinkage values, 4-8t
uses, 2-23
- Covalent chemical bonds, 10-1 to 10-2
- Crabwood. *See* Andiroba
- Crack propagation systems, 5-17
- Creep:
defined, 5-39
discussed, 5-39
influence of stress on, 5-39fig
- Creosote, coal-tar:
advantages, 15-10
appearance, 15-10
composition variability, 15-10
EPA-approved customer information sheet, 15-2
effect on mechanical properties, 15-25 to 15-26
for non-pressure treatments, 15-12
handling precautions, 15-2
in pressure treatment process, 15-18
odor and vapors, 15-2
retention levels for various wood products, 15-4t, 15-5t
standards, 15-2 to 15-3
temperature for pressure treating, 15-25
treatment for cutting pretreated wood, 15-25
use site precautions, 15-2
volatility, 15-10
- Creosote-coal-tar solutions:
properties, 15-10
retention levels for various wood products, 15-4t to 15-5t
standards by volume, 15-10
temperature for pressure treating, 5-42
- Creosote-petroleum oil solutions:
retention levels for various wood products, 15-4t to 15-5t
- Cristobal. *See* Macaewood
- Critical radiant flux test, 18-5
- Cross grain:
effect on mechanical properties, 5-27 to 5-30
types, 5-27 to 5-30
- Cuangare (*See also* Banak):
dimensional change coefficient, 13-17t
mechanical properties, 5-18t, 5-22t
shrinkage values, 4-8t
- Cucumber, nomenclature, 6-5t
- Cypress:
for siding, 6-16
- Cypress, Arizona, decay resistance, 14-5t
- Cypress, Mexican
characteristics, 2-38 to 2-39
locality of growth, 2-38
machinability, 2-38
mechanical properties, 5-18t, 5-22t
uses, 2-39
- Dead trees, strength, 5-34
- Decay:
and exposure to weather, 16-10, 16-13
appearance of fungi, 14-4
brown rot, 14-4
conditions favoring, 14-4
control in:
boats, wood, 14-7
buildings, 14-7
logs, poles, piling, or ties, 14-6
lumber, 14-6
plywood, 14-7, 14-9
cycle, 14-3fig
dead trees, 5-34
dry rot, 14-4
dry rot fungi, 14-4
effect on mechanical properties, 5-44
effect on strength, 5-43 to 5-44, 14-4 to 14-5, 14-6
fungal stain and molds, 14-4
heartwood, susceptibility to, 14-3 to 14-4
incipient, 14-4
sapwood, susceptibility to, 14-3
soft rot, 14-4
white rot, 14-4
- Decay hazard climate index, 14-2fig
- Decay resistance:
extractives, 3-3
heartwood, 3-3, 4-2t, 14-3 to 14-4
in visual stress grading, 7-5
- Decks:
discussed, 17-4
finishes, suitability and expected service life, 16-17t
finishing, 16-24
supports, 9-9, 9-10fig
use of cleaners, 16-34 to 16-35
- Deflections of beams:
effect of time, creep, 9-2
straight beams, 9-1 to 9-2, 9-2t, 9-1eq
tapered beams, 9-2, 9-2eq, 9-3fig
- Deformation equations:
axial load, 9-1, 9-1eq
bending:
effect of notches and holes, 9-2
effect of time, creep deflection, 9-3
straight beam deflection, 9-1 to 9-2, 9-1eq, 9-2t
tapered beam deflection, 9-2, 9-2eq, 9-3fig
water ponding, 9-2, 9-3eq
combined bending and axial load:
concentric load, 9-3 to 9-4, 9-4eq
eccentric load, 9-7, 9-7eq
torsion, 9-7, 9-7eq, 9-7fig
- Deformed shank nails, strength of, 8-8
- Degame:
characteristics, 2-23
locality of growth, 2-23
machinability, 2-23
mechanical properties, 5-18t, 5-22t
resistance to decay and insects, 2-23
shrinkage values, 4-8t
strength, 2-23
uses, 2-23
- Delamination and adhesive failure, 10-21
- Density:
as function of specific gravity and moisture content, 4-7 to 4-10, 4-11t, 4-12t
definition, 3-12
effect on adhesive bonding, 10-5 to 10-6
effect on withdrawal resistance of nails, 8-2 to 8-3
in sorting machine-graded lumber, 7-8
in visual stress grading, 7-5
variation, 4-7
- Design factors affecting dimensional change in structures:
flooring, 13-18

- framing lumber in house construction, 13-17
- heavy timber construction, 13-18
- interior finish, 13-18
- Design properties:
and stress grading, 7-3
procedures for deriving, 7-5 to 7-7
- Design values:
for foreign species, approval process, 7-4t
- Determa:
characteristics, 2-23
decay resistance, 14-5t
ease of bonding, 10-7t
locality of growth, 2-23
machinability, 2-23
mechanical properties, 5-18t, 5-22t
resistance to decay and insects, 2-23 uses, 2-23
- Diagonal grain, 5-28 to 5-31
- Dielectric constant, definition, 4-15, 4-16
- Dielectric meters and moisture content, 13-2 to 13-3
- Dielectric power factor, 4-16, 4-17
- Dimensional change and wood paintability, 16-2, 16-3
- Dimensional changes in wood:
affected by design factors, 13-17
calculation based on green dimensions, 13-17, 13-17eq
care during construction, 13-18 to 13-19
estimation using coefficients, 13-15 to 13-17, 13-15eq, 13-16t, 13-17t
- Discoloration:
by mildew, 16-12, 16-28, 16-28fig
by mold and fungal stains, 14-2
by nonmicrobial or chemical stains, 14-2
from water-soluble extractives, 16-28 to 16-30
of paint due to extractives, 16-25, 16-29 to 16-31
use of wood cleaners, 16-34 to 16-36
- Dogwood, nomenclature, 6-5t
- Doors, fire resistance in frame construction, 18-3 to 18-6
- Douglas-fir:
availability at retail yards, 6-16
characteristics, 2-11
characteristics for painting, 16-5t
charring rate equation, 18-13
connector joint strength, 8-21t
decay resistance, 14-5t
ease of bonding, 10-7t
elastic ratio, 5-2t
erosion of planed surfaces, 16-12t
flame spread index, 18-4t
for flooring, 6-16
for siding, 6-16
fracture toughness, 5-28t
kiln drying schedule, 13-11t
- locality of growth, 2-11
mechanical properties, 5-14t, 5-15t
moisture content, 5-34t
nomenclature, 6-13t
penetration, 15-16t
Poisson ratio, 5-3t
preservative pressure and temperature, 15-18, 15-20
preservative treatment to prevent marine borer attack on piles, 15-5t
preservatives used, 15-10 to 15-12
shrinkage, 4-5, 4-7fig
used for poles, 6-19
uses, 2-11
- Douglas-fir, coast:
dimensional change coefficient, 13-16t
moisture content, 4-2t
penetration, 15-16t
shrinkage values, 4-6t
strength properties, 5-7t, 5-12t
thermal conductivity, 4-14t
toughness values, 5-28t
- Douglas-fir, interior north:
dimensional change coefficient, 13-16t
shrinkage values, 4-6t
strength properties, 5-7t, 5-12t
tensile strength, 5-26t
thermal conductivity, 4-14t
toughness values, 5-28t
- Douglas-fir, interior west:
dimensional change coefficient, 13-16t
shrinkage values, 4-6t
strength properties, 5-7t, 5-12t
thermal conductivity, 4-14t
toughness values, 5-28t
- Douglas-fir, interior south:
strength properties, 5-7t, 5-12t
toughness values, 5-28t
- Draftstops, 18-6
- Dried wood, moisture control during transit and storage, 13-14 to 13-15, 13-15t
- Drift bolts, 7-10
- Dry kilns, 13-6 to 13-8, 13-8fig
- Drying of wood:
accelerated air drying and predrying, 13-6
advantages, 13-5
affect of properties, 13-5
air drying, 13-6
drying mechanism, 13-6 to 13-7, 13-6fig
drying defects:
discoloration, 13-10, 13-13fig, 13-14fig
fracture or distortion, 13-10, 13-12fig
warp, 13-10, 13-13fig
drying schedules, 13-8 to 13-9, 13-11t
drying stresses, 13-7, 13-7fig
kiln drying, 13-6
hardwood lumber targets, 13-5
softwood lumber targets, 13-5
- Duration of load:
adjustment of design properties, 7-10 to 7-13, 7-12t, 7-13fig
defined, 5-15, 5-39
effect on mechanical properties, 5-39 to 5-40
relationship to failure, 5-40fig
Dutch elm disease, 2-6
- Earlywood:
effect on paintability, 16-2, 16-3fig, 16-4fig, 16-3 to 16-4
description, 3-4
erosion of planed surfaces, 16-12t
- Ebony, shrinkage values, 4-8t
- Edge-grained lumber:
preferred for painting, 16-8, 16-6fig
weathering and check development, 16-11
- Ehie (*See also* Bengé):
decay resistance, 14-5t
- Ekki. *See* Azobe
- Ekop:
characteristics, 2-23
decay resistance, 14-5t
locality of growth, 2-23
machinability, 2-23
mechanical properties, 5-18t, 5-22t
shrinkage values, 4-8t
uses, 2-23
- EL2, 15-8
- Elastic properties of clear wood:
discussion, 5-2
values of:
modulus of elasticity ratios, 5-2t
modulus of rigidity ratios, 5-3t
Poisson's ratio, 5-2
- Elastomeric adhesives:
in light-frame construction, 10-19, 10-19fig
performance over time, 10-21 to 10-22, 10-22fig
structural performance, 10-10t
working and strength properties, and uses, 10-11t to 10-13t
- Electrical properties of wood:
conductivity, 4-15 to 4-17
dielectric constant, 4-15, 4-16
power factor, 4-16, 4-17
resistance and moisture content, 4-16fig
- Elm:
characteristics, 2-6
connector joint strength, 8-21t
decay resistance, 14-5t
disease, 2-6
locality of growth, 2-6
moisture content, 4-2t
species, 2-6
uses, 2-6

Index

- Elm, American:
 - characteristics for painting, 16-5t
 - dimensional change coefficient, 13-16t
 - ease of bonding, 10-7t
 - moisture content, 4-2t
 - shrinkage values, 4-6t
 - strength properties, 5-4t, 5-9t
 - thermal conductivity, 4-13t
- Elm, cedar:
 - dimensional change coefficient, 13-16t
 - moisture content, 4-2t
 - shrinkage values, 4-6t
 - tensile strength, 5-26t
- Elm, rock:
 - dimensional change coefficient, 13-16t
 - ease of bonding, 10-7t
 - moisture content, 4-2t
 - nomenclature, 6-5t
 - penetration 15-16t
 - shrinkage values, 4-6t
 - strength properties, 5-4t, 5-9t
 - thermal conductivity, 4-13t
- Elm, slippery:
 - dimensional change coefficient, 13-16t
 - penetration, 15-16t
 - shrinkage values, 4-6t
 - strength properties, 5-4t, 5-9t
 - thermal conductivity, 4-13t
- Elm, soft:
 - nomenclature, 6-5t
- Elm, winged:
 - dimensional change coefficient, 13-16t
 - shrinkage values, 4-6t
- Encased knots, definition, 5-27
- Encino. *See* Oak
- End joints in glued laminated timber, 11-19
- Engineered trusses and light-frame construction, 17-4
- Environmental benefits of wood:
 - discussion, 1-1
 - wood industry fuel sources, 1-2t
- Epoxy:
 - performance over time, 10-21 to 10-22
 - structural performance, 10-10t
 - use with wood and nonwood composites, 10-5
 - working and strength properties, and uses, 10-11t to 10-13t
- Erosion:
 - of earlywood and latewood planed surfaces, 16-12t
 - of finishes, 16-13
 - of wood, discussed, 16-11
 - rates for hardwood and softwoods, 16-12t
- Equilibrium moisture content:
 - definition, 4-3, 16-6
 - relative humidity as related to, 4-4t
 - values for U.S. cities, 13-3, 13-4t
- Extractives:
 - and mill glaze, 16-26 to 16-27
 - discoloration, water-soluble, 16-25, 16-29
 - discussion, 3-3, 5-34
 - effect on painting, 16-7, 16-12 to 16-13, 16-29
 - effect on strength, 5-34
 - heartwood, 3-3
 - species involved, 5-34
- Factory-finished wood products, 16-25
- Factory lumber (*See also* Hardwood lumber):
 - grades, 6-2
 - standard dimensions, 6-3
- Fastener head embedment, 8-26, 8-27fig
- Fasteners:
 - and iron stain, 16-30
 - corrosion and fire-retardant treated wood, 18-15
 - fire resistance in frame construction, 18-7 to 18-8
 - multiple-fastener joints, 8-24 to 8-25
- Fatigue:
 - defined, 5-15, 5-40
 - discussed, 5-40 to 5-41
 - summary of fatigue studies, 5-40t
- Fences, finishing, 16-13, 16-24
- Fiberboard:
 - attrition milling or refining, 11-12
 - cellulosic fiberboard, 11-14
 - grade stamp, 11-15fig
 - manufacture, 11-14
 - products, 11-14
 - sizing agents, 11-14
 - standards, 11-3t
 - classification, 11-1, 11-2t, 11-5fig
 - fibers used, 11-12
 - finishing techniques, 11-14 to 11-15
 - hardboard:
 - dry-process, 11-13
 - grade stamp, 11-15fig
 - heat treatment, 11-13
 - humidification, 11-13
 - manufacture, 11-13
 - mechanical properties, 12-6t
 - specific gravity, 12-6t
 - standards, 11-3t
 - tempering, 11-13
 - wet-process, 11-13
 - medium-density fiberboard (MDF):
 - density, 12-6t
 - grade stamp, 11-14fig
 - mechanical properties, 12-6t
 - resins used, 11-13
 - standards, 11-3t
 - uses, 11-13
 - with veneer overlay, 11-15, 11-16fig
- Fiber orientation, related to slope of grain, 5-28 to 5-31, 5-30fig
- Fibers:
 - description, 3-11
 - length, 3-11
 - shape, 3-11
- Fiber saturation point:
 - average, 4-2
 - definition, 4-2
- Finger joints, in laminated members, 11-19
- Finger-jointed lumber:
 - defined, 16-9
 - finishing, 16-10, 16-32
- Finish board, availability, 6-16
- Finish failure:
 - chalking, 16-28
 - cross-grain cracking, 16-26
 - discoloration from water-soluble extractives, 16-29, 16-29fig
 - intercoat peeling, 16-27, 16-27fig
 - mill glaze, 16-26 to 16-27
 - moisture blisters, 16-26, 16-26fig
 - stain:
 - blue, 16-30, 16-30fig
 - brown stain over knots, 16-25, 16-31
 - iron, 16-25, 16-30
 - rust, 16-30
- Finishes:
 - application and maintenance, 16-14t, 16-17t, 16-19t
 - application of:
 - paint, 16-22
 - semitransparent penetrating stain, 16-20
 - caution in use, 16-20, 16-19t
 - solid-color stain, 16-22
 - water-repellant preservative, 16-13
 - drying oils, 16-21
 - function, 16-21
 - factors affecting performance:
 - extractives, 16-7, 16-29 to 16-30
 - knots, 16-31
 - texture of wood, 16-8
 - weathering:
 - as a natural finish, 16-16
 - effect on paint adhesion, 16-12
 - effect on wood, 16-11
 - effect on wood finish, 16-13
 - wood moisture content, 16-6 to 16-7
 - back-priming, 16-25
 - wood product characteristics:
 - finger-jointed lumber, 16-9, 16-32
 - lumber, 16-8 to 16-9
 - plywood, 16-9
 - reconstituted wood products:
 - fiberboard, 16-8 to 16-10
 - particleboard, 16-10
 - treated wood:
 - fire-retardant treated, 16-11
 - preservative treated, 16-10

- wood properties, 16-2 to 16-3, 16-32
 - moisture-excluding effectiveness of, 16-6 to 16-8, 16-13
 - on ponderosa pine, 16-14t
 - non-drying oils, 16-34
 - on:
 - butcher blocks and cutting boards, 16-34
 - floors, 16-33 to 16-34
 - interior wood, 16-32
 - items used for food, 16-34
 - porches, decks, fences, 16-24
 - treated wood, 16-24
 - wood exposed to marine environments, 16-24 to 16-25
 - paintability values, 16-7, 16-12
 - paraffin wax, 16-33 to 16-34
 - refinishing, 16-22 to 16-23
 - suitability and expected service life for exterior wood surfaces, 16-17t
 - types:
 - film-forming:
 - effect on water and vapor absorption, 16-13
 - fire-retardant coatings, 16-11, 16-25
 - paint, 16-7, 16-12, 16-22
 - solid-color stain, 16-22
 - varnish:
 - clear, 16-21
 - pigmented, 16-21
 - opaque, 16-32
 - penetrating, 16-17 to 16-18
 - lightly colored, 16-16 to 16-17
 - semitransparent stains, 16-19 to 16-20
 - transparent clear, 16-17
 - oils, 16-21
 - stains, 16-16 to 16-24
 - surface coats, 16-33
 - transparent, 16-33
 - use of fillers, 16-33
 - use of sealers, 16-33
 - VOC regulation compliance, 16-15 to 16-16
 - See also* Paint and Water-repellant preservatives
- Fire performance characteristics of wood:
 - charring:
 - differences in wood species, 18-13 to 18-15
 - discussed, 18-13 to 18-15
 - equations for charring rates, 18-13 to 18-15
 - moisture content, 18-10
 - flame spread:
 - and heat release rate, 18-11
 - configurations, 18-9
 - factors influencing, 18-11
 - flammability data for wood species, 18-14t
 - heat release rate:
 - discussed, 18-11 to 18-13
 - measuring, 18-11
 - ignition:
 - piloted, 18-9
 - unpiloted, 18-10
 - smoke:
 - approaches for dealing with, 18-11
 - carbon monoxide, 18-6
 - defined, 18-6
 - release rate, 18-8
 - tests for determining yield, 18-6 to 18-8
 - toxicity, 18-6
 - smouldering, 18-6 to 18-7
 - stages of degradation, 18-8
- Fire resistance:
 - calculating, 18-13
 - defined, 18-13
 - failure criteria, 18-14
 - in heavy timber construction, 18-7
 - in light-frame construction, 18-7
 - in glued laminated members, 18-2 ratings, 18-2
- Fire-retardant coatings, 16-11, 16-25, 18-17
- Fire-retardant-treated wood:
 - and hygroscopicity, 18-15
 - and mechanical properties, 18-17
 - discussed, 18-15
 - effect on adhesion, 10-4
 - fastener corrosion, 18-17
 - heat release rates, 18-12 to 18-13
 - in high temperature applications, 18-11
 - paintability, 16-22
 - performance requirements, 18-11
 - uses, 18-11
- Fire-retardant treatments:
 - application methods, 18-15
 - chemical penetration, 18-16
 - inorganic salts, 18-15
- Fire safety design:
 - cellulosic insulation, 18-3
 - code organizations, 18-2
 - code requirements, 18-1
 - components, 18-1
 - containment to compartment of origin:
 - firestops and draftstops, 18-6
 - fire resistance, 18-6
 - of heavy timber construction, 18-2
 - in light-frame construction, 18-7
 - of glued-laminated members, 18-2, 18-7
 - fire safety engineering, 18-7
 - flame spread index, 18-3 to 18-5
 - flashover, 18-5
 - flooring, 18-5
 - roof covering materials, 18-5
- types of construction:
 - heavy timber, 18-2
 - light frame, 18-7
 - ordinary, 18-2
- Fire tests:
 - critical radiant flux, 18-5
 - flame spread index:
 - discussed, 18-3
 - values for solid lumber, 18-4t
 - roof coverings, 18-5
 - room/corner test, 18-5
 - tunnel test, 18-3
 - wood ignition, 18-9
- Firestops, 18-6
- Fir, balsam:
 - connector joint strength, 8-21t
 - dimensional change coefficient, 13-16t
 - mechanical properties, 5-14t, 5-15t
 - nomenclature, 6-13t
 - shrinkage values, 4-6t
 - strength properties, 5-7t, 5-12t
 - thermal conductivity, 4-14t
- Fir, California red:
 - dimensional change coefficient, 13-16t
 - nomenclature, 6-13t
 - penetration, 15-16t
 - tensile strength, 5-26t
 - toughness values, 5-28t
 - shrinkage values, 4-6t
 - strength properties, 5-7t, 5-12t
- Fir, grand:
 - dimensional change coefficient, 13-16t
 - ease of bonding, 10-7t
 - moisture content, 4-2t
 - nomenclature, 6-13t
 - penetration, 15-16t
 - shrinkage values, 4-6t
 - strength properties, 5-7t, 5-12t
- Fir, noble:
 - dimensional change coefficient, 13-16t
 - ease of bonding, 10-7t
 - moisture content, 4-2t
 - nomenclature, 6-13t
 - penetration, 15-16t
 - shrinkage values, 4-6t
 - toughness values, 5-28t
 - strength properties, 5-7t, 5-12t
- Fir, Pacific silver:
 - dimensional change coefficient, 13-16t
 - ease of bonding, 10-7t
 - flame spread index, 18-4t
 - mechanical properties, 5-14t, 5-15t
 - moisture content, 4-2t
 - nomenclature, 6-13t
 - shrinkage values, 4-6t
 - strength properties, 5-7t, 5-12t
 - tensile strength, 5-26t
 - toughness values, 5-28t
- Fir, subalpine:
 - dimensional change coefficient, 13-16t

Index

- elastic ratio, 5-2t
- mechanical properties, 5-14t, 5-15t
- nomenclature, 6-13t
- Poisson's ratio, 5-3t
- shrinkage values, 4-6t
- Firs, true (Eastern species):
 - characteristics, 2-11
 - decay resistance, 14-5t
 - locality of growth, 2-11
 - shock resistance, 2-11
 - strength properties, 2-11
 - uses, 2-11
- Firs, true (Western species):
 - decay resistance, 14-5t
 - locality of growth, 2-12
 - species, 2-12
 - uses, 2-12
- Fir, white:
 - connector joint strength, 8-21t
 - dimensional change coefficient, 13-16t
 - ease of bonding, 10-7t
 - moisture content, 4-2t
 - nomenclature, 6-13t
 - penetration, 15-16t
 - shrinkage values, 4-6t
 - strength properties, 5-7t, 5-12t
 - thermal conductivity, 4-14t
 - toughness values, 5-28t
- Flame-retardant composites, 11-15
- Flame spread index (FSI):
 - classes for, 18-2
 - discussed, 18-3
 - values for solid lumber, 18-4t
 - wood usage, 18-4
- Flat-sawn lumber:
 - and mill glaze, 16-26 to 16-27
 - disadvantages for finishing, 16-1, 16-25
- Flashover, discussed, 18-5
- Flooring:
 - care during construction, 13-19
 - design factors affecting dimensional change, 13-17
 - recommended moisture content, 13-5t
 - retail yard availability, 6-16, 6-17
- Forest certification programs:
 - discussion, 1-3 to 1-4
 - systems used, 1-4
 - American Tree Farm System (ATFS):
 - standards, 1-4
 - program location, 1-4
 - Canadian Standards Association (CSA):
 - standards, 1-5
 - program location, 1-5
 - Forest Stewardship Council (FSC):
 - standards, 1-4
 - program location, 1-4
 - Programme for the Endorsement of Forest Certification (PEFC) Schemes:
 - standards, 1-5
 - program location, 1-5
- Sustainable Forestry Initiative (SFI):
 - standards, 1-4
 - program location, 1-4
- Formaldehyde adhesives:
 - performance over time, 10-21 to 10-22, 10-22fig
 - safety concerns, 10-14
 - structural performance, 10-11t to 10-13t
 - use with composite products, 11-3 to 11-4
- Formosan termite, 14-11
- Foundations for light-frame buildings, 17-2
- Fracture toughness, defined, 5-15
- Friction, coefficient of, 4-17
- Fungi:
 - appearance of, 14-4
 - conditions favorable to growth, 14-1
 - definition, 14-1
 - discoloration caused by, 14-1 to 14-2
 - effect on wood, 14-2
 - prevention of damage from, 14-6
- Fungus damage:
 - causes, 14-1 to 14-2
 - stains, 14-2
- Glued-laminated timber (Glulam):
 - advantages, 11-17
 - architectural effects, 11-7
 - combinations:
 - axial members, 11-18
 - bending members, 11-18 to 11-19
 - curved members, 11-18
 - tapered straight members, 11-18
 - cross section variation, 11-17
 - finishes, suitability and expected service life, 15-15t
 - fire resistance, 17-5
 - grade variation, 11-17
 - manufacture:
 - end jointing, 11-19
 - face bonding, 11-19 to 11-20
 - finishing and fabrication, 11-20
 - lumber drying and grading, 11-19
 - preservative treatment, 11-20
 - mechanical properties, 12-7t
 - preservative retention levels, 14-5t to 14-6t
 - seasoning advantages, 11-17
 - size capabilities, 11-17
 - standards 11-18 to 11-19, 11-3t
- Glulam. *See* Glued-laminated timber (Glulam)
- Glulam beam construction, 16-8
- Glulam timber bridge, 16-10, 16-10fig
- Gluing properties of different wood, classification of species, 9-8t
- Gmelina, shrinkage values, 4-8t
- Gola. *See* Ekop
- Goncalo alves:
 - characteristics, 2-24
 - decay resistance, 14-5t
 - locality of growth, 2-24
 - mechanical properties, 5-18t, 5-22t
 - resistance to fungus attack, 2-24
 - shrinkage values, 4-8t
 - species, 2-24, 2-43t
 - strength, 2-24
 - uses, 2-24
- Grades and lumber, purchasing consideration, 6-17 to 6-18
- Grading hardwood lumber, 6-2 to 6-4
- Grading, machine, 7-7 to 7-11
- Grading softwood lumber, 6-7 to 6-10
- Grading, visual, 7-3 to 7-7
- Grain and texture of wood:
 - and finish performance, 16-6fig
 - and paintability, 16-7 to 16-8
 - discussion, 3-13 to 3-15
- Green building:
 - bioenergy, 1-2
 - biomass, 1-2
 - carbon neutral, 1-2
 - defined, 1-1
 - embodied energy, 1-1
 - fossil fuels, 1-2
 - production uses, 1-1 to 1-2
 - wood products, 1-2
- Greenheart:
 - characteristics, 2-24
 - decay resistance, 14-5t
 - dimensional change coefficient, 13-17t
 - ease of bonding, 10-7t
 - locality of growth, 2-24
 - machinability, 2-24
 - mechanical properties, 5-18t, 5-22t
 - shrinkage values, 4-8t
 - resistance to fungi and insects, 2-24
 - marine borers, 14-13 to 14-15
 - uses, 2-24
- Green wood:
 - and clinched nails, 8-5
 - bending properties, 19-3
 - creep and relaxation under load, 5-39
 - definition, 4-1
 - relationship of mechanical properties to specific gravity, 5-29t
 - treatment with polyethylene glycol (PEG), 19-10
- Growth rings:
 - cross section showing, 3-5fig, 3-6fig
 - discussion, 3-4, 3-6
 - effect on strength properties, 5-30 to 5-31
 - grain, 3-14
 - in sawn boards, 3-14
 - principal axes with respect to, 5-2
 - shrinkage, 4-5 to 4-7, 4-7fig
- Guatambu. *See* Pau marfim
- Guayacan. *See* Ipe
- Gum:

- nomenclature, 6-5t
 Gurjun. *See* Apitong
 Gypsum board, use in wood-frame construction to provide fire resistance, 18-7 to 18-8
 Gypsum-bonded composites, 11-23
- Hackberry:
 characteristics, 2-6
 decay resistance, 14-5t
 dimensional change coefficient, 13-16t
 ease of bonding, 10-7t
 locality of growth, 2-6
 moisture content, 4-2t
 nomenclature, 6-5t
 penetration, 15-16t
 shock resistance, 2-6
 shrinkage values, 4-6t
 strength properties, 5-4t, 5-9t
 thermal conductivity, 4-13t
 uses, 2-6
- Hardness:
 coefficient of variation, 5-26t
 definition, 5-3
- Hardwood flooring, grading rules:
 Maple Flooring Manufacturers Association, 6-4, 6-4t
 National Oak Flooring Manufacturers Association, 6-4, 6-4t
- Hardwood lumber:
 drying targets, 13-5
 finished market products:
 flooring:
 grading rules, 6-2 to 6-6
 standard dimensions, 6-3 to 6-4
 types, 6-4, 6-6
 kiln drying schedules, 13-8 to 13-9, 13-11t
 grades, 6-2, 6-2fig, 6-3t
 grading associations and rules, 6-4, 6-3t, 6-4t
 minimum widths, 6-3
 standard dimensions, 6-3
 standard thicknesses, 6-6t
 uses, 6-2
- Hardwoods:
 availability, 2-1 to 2-3
 bending properties, 19-3
 charring rates, 18-14t
 definition, 2-2
 flame spread index, 18-4t
 flammability data, 18-10t
 heat release data, 18-12fig
 imported, 2-19 to 2-38
 locality of growth, 2-2
 moisture content, heartwood and sapwood, 4-2t
 preservative penetration, 15-16t
 relationship of mechanical properties to specific gravity, 5-29t
- species by region, 2-3t
 uses, 2-2
 vessels, 3-10 to 3-11
- Heartwood:
 color, 4-2t
 decay resistance in different species, 3-3, 14-5t
 extractives content, 3-3
 for shakes, 6-17
 in visual stress grading, 7-5
 moisture content and drying, 13-7
- Heat capacity:
 defined, 4-11 to 4-12
 discussed, 4-11
 of solid wood, 4-15t
- Heat release rate:
 and smoke release rate, 18-11
 discussed, 18-11 to 18-12
- Heat sterilization:
 American Lumber Standard Committee (ALSC) regulations, 20-9 to 20-11
 quality mark, 20-11, 20-13fig
 standards:
 discussion, 20-1
 International Standard for Phytosanitary Measures (ISPM), 20-1 to 20-2
 pest groups, 20-1, 20-2t
 heating times:
 experimental, 20-4t
 factors affecting:
 air circulation, 20-2
 energy source, 20-2
 heating medium, 20-2, 20-3fig
 size and configuration of wood, 20-2, 20-3fig
 species, 20-2, 20-3fig
 stacking methods, 20-2, 20-4fig
 methods for estimating:
 MacLean equations, 20-5, 20-5eq, 20-6eq, 20-7fig
 degree of accuracy, 20-7
 heat conduction, 20-5eq
 summary of estimates, 20-8t
 multiple regression models, 20-7
 coefficients for, 20-9t
 summary of estimates, 20-10t, 20-11t, 20-12t
- Heat treatment. *See* Heat sterilization
- Heavy-timber construction:
 fire resistance of, 18-2, 18-7 to 18-8
 wood used in, 18-2
- Hemicellulose, 3-7
- Hemlock:
 availability at retail yards, 6-17
 for siding, 6-16
- Hemlock, eastern:
 characteristics, 2-12
 dimensional change coefficient, 13-17t
 connector joint strength, 8-21t
 locality of growth, 2-12
 mechanical properties, 5-14t, 5-15t
 moisture content, 4-2t
 nomenclature, 6-13t
 penetration, 15-16t
 shock resistance, 2-12
 shrinkage values, 4-6t
 strength properties, 5-7t, 5-12t
 thermal conductivity, 4-14t
 uses, 2-12
- Hemlock, mountain:
 characteristics, 2-12
 locality of growth, 2-12
 nomenclature, 6-13t
 shrinkage values, 4-6t
 strength properties, 5-7t, 5-12t
 toughness values, 5-28t
 uses, 2-12
- Hemlock, western:
 characteristics, 2-12
 characteristics for painting, 16-5t
 connector joint strength, 8-21t
 dimensional change coefficient, 13-17t
 elastic ratio, 5-2t
 erosion of planed surfaces, 16-12t
 flame spread index, 18-4t
 fracture toughness, 5-28t
 locality of growth, 2-12
 mechanical properties, 5-14t, 5-15t
 moisture content, 4-2t, 5-34t
 nomenclature, 6-13t
 Poisson ratio, 5-3t
 shock resistance, 2-12
 shrinkage values, 4-6t
 strength properties, 5-7t, 5-12t
 tensile strength, 5-26t
 thermal conductivity, 4-14t
 toughness values, 5-28t
 uses, 2-12
- Hickory:
 decay resistance, 14-5t
 nomenclature, 6-5t
- Hickory, bittersweet:
 moisture content, 4-2t
 strength properties, 5-5t, 5-10t
- Hickory, mockernut:
 moisture content, 4-2t
 penetration, 15-16t
 shrinkage values, 4-6t
 strength properties, 5-5t, 5-10t
 thermal conductivity, 4-13t
 toughness values, 5-27t
- Hickory, nutmeg, strength properties, 5-5t, 5-10t
- Hickory, pecan:
 characteristics, 2-6 to 2-7
 dimensional change coefficient, 13-16t
 ease of bonding, 10-7t
 for flooring, 6-4, 6-6
 locality of growth, 2-6 to 2-7

Index

- shrinkage values, 4-6t
- species, 2-6
- strength properties, 5-5t, 5-10t
- thermal conductivity, 4-13t
- uses, 2-7
- Hickory, pignut:
 - moisture content, 4-2t
 - shrinkage values, 4-6t
 - strength properties, 5-5t, 5-10t
 - toughness values, 5-27t
- Hickory, red, moisture content, 4-2t
- Hickory, sand:
 - moisture content, 4-2t
 - toughness values, 5-27t
- Hickory, shagbark:
 - characteristics for painting, 16-5t
 - shrinkage values, 4-6t
 - strength properties, 5-5t, 5-10t
 - thermal conductivity, 4-13t
- Hickory, shellbark:
 - shrinkage values, 4-6t
 - strength properties, 5-5t, 5-10t
- Hickory, water:
 - moisture content, 4-2t
 - strength properties, 5-5t, 5-10t
- Hickory, true:
 - characteristics, 2-7
 - connector joint strength, 8-21t
 - dimensional change coefficient, 13-16t
 - ease of bonding, 10-7t
 - locality of growth, 2-7
 - shrinkage values, 4-6t
 - species, 2-7
 - strength properties, 5-5t, 5-10t
 - uses, 2-7
- Holly, nomenclature, 6-5t
- Holly, American:
 - dimensional change coefficient, 13-16t
 - shrinkage values, 4-6t
- Honeylocust:
 - availability, 2-7
 - characteristics, 2-7
 - decay resistance, 14-5t
 - dimensional change coefficient, 13-16t
 - locality of growth, 2-7
 - shock resistance, 2-7
 - shrinkage values, 4-6t
 - strength properties, 5-5t, 5-10t
 - uses, 2-7
- Hot melt adhesives:
 - bonding, 10-9
 - structural performance, 10-10t
 - working and strength properties, and uses, 10-11t to 10-13t
- Hot-press bonding, affect on moisture content, 10-15
- Hot pressing:
 - fiberboard, 11-13 to 11-14
 - oriented strandboard, 11-8, 11-10
 - particleboard, 11-11
- Hura:
 - characteristics, 2-24
 - decay resistance, 14-5t
 - ease of bonding, 10-7t
 - locality of growth, 2-24
 - machinability, 2-24
 - mechanical properties, 5-18t, 5-22t
 - resistance to fungi and insects, 2-24
 - shrinkage values, 4-8t
 - uses, 2-24
- Identification of wood, 3-16
- Ignition of wood:
 - piloted, 18-9
 - unpiloted, 18-10
- Ilomba:
 - characteristics, 2-24 to 2-25
 - locality of growth, 2-24
 - machinability, 2-25
 - mechanical properties, 5-19t, 5-23t
 - resistance to fungi and insects, 2-25
 - shrinkage values, 4-8t
 - uses, 2-25
- Imbuia, shrinkage values, 4-8t
- Imported woods, commercially important, 2-18 to 2-40
- Impact bending:
 - coefficient of variation, 5-26t
 - defined, 5-3
- Impreg:
 - bulking agents, 19-4 to 19-5
 - dimensional stability, 19-9t
 - process, 19-4 to 19-5
 - properties, 19-6t
 - species, 19-5
 - strength properties, 19-7t to 19-8t
- Incising:
 - and fire-retardant treatments, 18-15 to 18-16
 - effect on strength properties, 5-43
- Incense-cedar. *See* Cedar, Incense
- Inorganic boron (borax/boric acid):
 - acceptable compounds, 15-13 to 15-15
 - effectiveness, 15-13 to 15-15
 - solubility, 15-6, 15-8
 - temperature for pressure treating, 15-20
 - uses, 15-6, 15-8
- Insect damage and control:
 - beetles, 14-9 to 14-10
 - carpenter ants, 14-13
 - bees, 14-13
 - effect on strength, 5-44
 - naturally termite-resistant wood, 14-12 to 14-13
 - termites, 14-11 to 14-12
 - types of damage, 14-8t, 14-9fig
- Insulation for sound control for wood buildings, 17-11, 17-12t
- Insulation in wood building, 17-11 to 17-12
- Intergrown knots, 3-15, 5-27
- Interlocked grain:
 - definition, 3-15
 - effect on strength, 5-30
 - in Sweetgum, 2-9
- Interior finishes, care during construction, 13-19
- Internal friction, 5-17, 5-21
- Invasive species. *See* Heat sterilization
- Ipe:
 - decay resistance, 14-5t
 - locality of growth, 2-25
 - machinability, 2-25
 - mechanical properties, 5-19t, 5-23t
 - resistance to decay and insects, 2-25
 - shrinkage values, 4-8t
 - uses, 2-25
- Ipil. *See* Merbau
- Iroko:
 - characteristics, 2-25
 - decay resistance, 14-5t
 - dimensional change coefficient, 13-17t
 - ease of bonding, 10-7t
 - locality of growth, 2-25
 - mechanical properties, 5-19t, 5-23t
 - resistance to fungi and insects, 2-25
 - shrinkage values, 4-8t
 - species, 2-25
 - workability, 2-25
 - uses, 2-25
- Iron stain, 14-2, 16-25, 16-30
- Ironwood, nomenclature, 6-5t
- Isocyanate adhesives:
 - performance over time, 10-21
 - structural performance, 10-11t to 10-13t
 - use with composite products, 11-4
 - working and strength properties, and uses, 10-11t to 10-13t
- Jacaranda. *See* Rosewood, Brazilian
- Jarrah:
 - characteristics, 2-25 to 2-26
 - decay resistance, 14-5t
 - ease of bonding, 10-7t
 - locality of growth, 2-25
 - machinability, 2-26
 - mechanical properties, 5-19t, 5-23t
 - resistance to decay and insects, 2-25 to 2-26
 - marine borers, 14-13 to 14-15
 - shrinkage values, 4-8t
 - uses, 2-26
- Jatoba. *See* Courbaril
- Jelutong:
 - characteristics, 2-26
 - decay resistance, 14-5t
 - locality of growth, 2-26
 - mechanical properties, 5-19t, 5-23t
 - shrinkage values, 4-8t
 - uses, 2-26
 - workability, 2-26

- Jequitiba. *See* Albarco
- Joints, glued, strength, 10-4 to 10-5
- Joists and light-frame construction, 17-1 to 17-2
- Joists and rafter systems in light-frame construction, 17-3
- Juniper, decay resistance, 14-5t
- Juvenile wood:
- discussion, 3-13
 - effect on mechanical properties, 5-32 to 5-33
 - effect on strength properties, 5-32 to 5-33
 - properties, 5-33, 5-33fig
 - shrinkage of, 5-32
- Kakaralli. *See* Manbarklak
- Kaneelhart:
- characteristics, 2-26
 - ease of bonding, 10-7t
 - locality of growth, 2-26
 - mechanical properties, 5-19t, 5-23t
 - resistance to fungi and insects, 2-26
 - shrinkage values, 4-8t
 - uses, 2-26
- Kapur:
- characteristics, 2-26
 - decay resistance, 14-5t
 - ease of bonding, 10-7t
 - locality of growth, 2-26
 - machinability, 2-26
 - mechanical properties, 5-19t, 5-23t
 - resistance to fungi and insects, 2-26
 - shrinkage values, 4-8t
 - strength properties, 2-26
 - uses, 2-26
- Karri:
- characteristics, 2-26 to 2-27
 - decay resistance, 14-5t
 - ease of bonding, 10-7t
 - locality of growth, 2-26 to 2-27
 - machinability, 2-27
 - mechanical properties, 5-19t, 5-23t
 - shrinkage values, 4-8t
 - uses, 2-27
- Kauta. *See* Marishballi
- KDS, 15-8
- Kempas:
- characteristics, 2-27
 - decay resistance, 14-5t
 - locality of growth, 2-27
 - machinability, 2-27
 - mechanical properties, 5-19t, 5-23t
 - resistance to fungi and insects, 2-27
 - shrinkage values, 4-8t
 - uses, 2-27
- Keruing:
- characteristics, 2-27
 - decay resistance, 14-5t
 - dimensional change coefficient, 13-17t
 - ease of bonding, 10-7t
 - durability, 2-27
 - locality of growth, 2-27
 - machinability, 2-27
 - mechanical properties, 5-19t, 5-23t
 - shrinkage values, 4-8t
 - uses, 2-27
- Khaya (*See* Mahogany, African):
- dimensional change coefficient, 13-17t
- Kiln drying:
- advantages, 13-6
 - importance of air circulation, 13-6
 - kiln schedules, 13-8 to 13-9, 13-11t
 - types of kilns, 13-6 to 13-8, 13-10fig
- Knots:
- changes during drying, 13-10, 13-12fig
 - definition, 5-26
 - discoloration through paint, 16-25
 - effect on:
 - in determining strength ratios, 7-5 to 7-6, 7-6fig
 - mechanical properties of wood, 5-26 to 5-28, 5-34
 - stiffness, 7-4
 - strength properties, 7-3 to 7-4
 - encased, 5-27, 7-4
 - in lumber stress grades, 7-4
 - intergrown, 5-27, 7-4
 - knotholes, 7-4
- Kokrodua (*See also* Afrormosia):
- dimensional change coefficient, 13-17t
- Korina. *See* Limba
- Krabak. *See* Mersawa
- Kraft paper, 19-12
- Kwila. *See* Merbau
- Lag screws. *See* Screws, lag
- Laminated members, curved:
- advantages, 19-2 to 19-3
 - species, choice of, 19-2 to 19-3
 - uses, 19-2
- Laminated members, glued. *See* Glued structural members.
- Laminated strand lumber, 11-21
- Laminated veneer lumber, 11-21
- mechanical properties, 12-8t
- Laminated wood, strength properties, 19-7t to 19-8t
- Laminates. *See* Paper-based plastic laminates
- Laminating grades, 6-8
- Lapacho (*See also* Ipe):
- ease of bonding, 10-7t
- Lap marks, 16-19, 16-20fig
- Lapuna. *See* Ceiba
- Larch, western:
- characteristics, 2-13
 - characteristics for painting, 16-5t
 - connector joint strength, 8-21t
 - decay resistance, 14-5t
 - dimensional change coefficient, 13-17t
 - ease of bonding, 10-7t
 - elastic ratio, 5-2t
 - for flooring, 6-16
 - locality of growth, 2-13
 - mechanical properties, 5-14t, 5-15t
 - moisture content, 4-2t, 5-34t
 - nomenclature, 6-13t
 - penetration, 15-16t
 - Poisson ratio, 5-3t
 - shock resistance, 2-13
 - strength properties, 5-7t, 5-12t
 - tensile strength, 5-26t
 - thermal conductivity, 4-14t
 - toughness values, 5-28t
 - used for poles, 6-19
 - uses, 2-13
- Lateral buckling, of beams, 9-9 to 9-10
- Lateral resistance:
- and the National Design Specification for Wood Construction, 8-1
 - of lag screws, 8-12 to 8-14
 - of nails, 8-5
 - of wood screws, 8-10 to 8-11
- Latewood:
- description, 3-4
 - erosion of planed surfaces, 16-12t
 - paintability, 16-7 to 16-8, 16-12
- Lauans:
- dimensional change coefficient, 13-17t
 - shrinkage values, 4-8t
- Lemonwood. *See* Degame
- Light-frame construction:
- balloon framing, 17-1
 - ceiling and roof, 17-4
 - decks, 17-4
 - exterior walls, 17-3 to 17-4
 - fire resistance of, 18-2 to 18-3
 - floors, 17-2, 17-3fig
 - foundations, 17-2
 - platform framing, 17-1 to 17-2
 - use of elastomeric adhesives, 10-19 to 10-20, 10-19fig
 - wood use in, 18-2
- Lignin:
- discussion, 3-7
 - weathering, 16-11 to 16-12
- Lignumvitae:
- characteristics, 2-27 to 2-28
 - decay resistance, 14-5t
 - ease of bonding, 10-7t
 - locality of growth, 2-28
 - mechanical properties, 5-19t, 5-23t
 - species, 2-27 to 2-28
 - uses, 2-28
 - working and strength properties, and uses, 10-11t to 10-13t
- Limba:
- characteristics, 2-28
 - decay resistance, 14-5t

Index

- dimensional change coefficient, 13-17t
- ease of bonding, 10-7t
- locality of growth, 2-28
- machinability, 2-28
- mechanical properties, 5-19t, 5-23t
- resistance to decay and insects, 2-28
- shrinkage values, 4-8t
- uses, 2-28
- Limnoria, 14-14
- Locust, black:
 - characteristics, 2-7
 - decay resistance, 14-5t
 - dimensional change coefficient, 13-16t
 - locality of growth, 2-7
 - nomenclature, 6-5t
 - penetration, 15-16t
 - shock resistance, 2-7
 - shrinkage values, 4-6t
 - strength properties, 5-5t, 5-10t
 - uses, 2-1, 2-7
- Lodgepole pine, used for poles, 6-19
- Log homes, 6-21, 17-6, 17-7fig
- Logs, control of mold, stain, decay, 14-6
- Longitudinal shrinkage of wood, 4-5
- Lumber:
 - commonly used abbreviations, 6-23 to 6-25
 - development of grading rules, 6-7
 - grading organization, 6-9t, 6-12
 - hardwood:
 - drying targets, 13-5
 - finished market products:
 - flooring:
 - grading rules, 6-6 to 6-7
 - standard dimensions, 6-3 to 6-4
 - types, 6-6
 - kiln drying schedules, 13-8 to 13-9, 13-11t
 - grades, 6-2, 6-3t, 6-2fig
 - grading associations and rules, 6-2, 6-3t
 - minimum widths, 6-3
 - standard dimensions, 6-3
 - standard thicknesses, 6-6t
 - uses, 6-2
 - purchase:
 - distribution yards, 6-12
 - primary manufacturers:
 - customers, 6-12
 - retail yard inventory:
 - availability of hardwood and softwoods, 6-12, 6-16
 - boards and yard lumber, 6-16
 - casing and base, 6-17
 - dimension and structural lumber stocked, 6-16
 - finish boards, 6-16
 - flooring, 6-16, 6-17
 - shingles and shakes, 6-17
 - siding, 6-16
 - purchase consideration, 6-17 to 6-18
 - softwood:
 - American Lumber Standards, 6-7
 - classification by grades:
 - factory and shop lumber:
 - factory (shop) grades, 6-10
 - industrial clears, 6-10
 - ladder and pole stock, 6-10
 - moulding stock, 6-10
 - pencil stock, 6-10
 - tank stock, 6-10
 - structural lumber:
 - dimension lumber, 6-8
 - structural laminations, 6-8
 - yard lumber:
 - select lumber, 6-7
 - common lumber, 6-7, 6-8fig
 - development of grading rules, 6-7
 - drying targets, 13-5
 - grading organizations, 6-9t
 - kiln drying schedules, 13-8 to 13-9, 13-11t
 - manufacture:
 - size, 6-10 to 6-11, 6-11t
 - surfacing, 6-11
 - patterns, 6-11, 6-12fig
 - species, 6-13t to 6-15t, 6-16
 - transportation, 6-12
 - Macacauba. *See* Macawood
 - Macawood:
 - characteristics, 2-28
 - common names, 2-44t
 - locality of growth, 2-28
 - mechanical properties, 5-19t, 5-23t
 - resistance to fungi and insects, 2-28
 - shrinkage values, 4-8t
 - uses, 2-28
 - workability, 2-28
 - Machine-graded structural lumber:
 - allowable stress for bending, 7-8 to 7-10
 - common grades, 7-7, 7-7t
 - components of system, 7-8
 - design stresses for other properties, 7-10
 - machine sorting criteria, 7-8
 - procedures for deriving design properties, 7-8
 - quality control, 7-10
 - Machinmango. *See* Manbarklak
 - Madrone, Pacific:
 - dimensional change coefficient, 13-16t
 - ease of bonding, 10-7t
 - nomenclature, 6-5t
 - shrinkage values, 4-6t
 - Magnesia-cement-bonded composites, 11-23
 - Magnolia:
 - characteristics, 2-7 to 2-8
 - decay resistance, 14-5t
 - dimensional change coefficient, 13-16t
 - ease of bonding, 10-7t
 - locality of growth, 2-7
 - moisture content, 4-2t
 - nomenclature, 6-5t
 - shock resistance, 2-8
 - shrinkage values, 4-6t
 - species, 2-7
 - strength properties, 5-5t, 5-10t
 - thermal conductivity, 4-13t
 - uses, 2-7
 - Mahogany:
 - species, 2-28
 - Mahogany, African:
 - characteristics, 2-28
 - dimensional change coefficients, 13-17t
 - decay resistance, 2-29, 14-5t
 - ease of bonding, 10-7t
 - elastic ratio, 5-2t
 - locality of growth, 2-28
 - machinability, 2-29
 - mechanical properties, 5-19t, 5-23t
 - Poisson ratio, 5-3t
 - shrinkage values, 4-8t
 - species, 2-28
 - uses, 2-29
 - Mahogany, American
 - characteristics, 2-29
 - decay resistance, 14-5t
 - ease of bonding, 10-7t
 - locality of growth, 2-29
 - machinability, 2-29
 - mechanical properties, 5-19t, 5-23t
 - uses, 2-29
 - Mahogany, Honduras:
 - elastic ratio, 5-2t
 - Poisson ratio, 5-3t
 - Mahogany, Phillippine, availability at retail yards, 6-16
 - Manbarklak:
 - characteristics, 2-29
 - locality of growth, 2-29
 - mechanical properties, 5-19t, 5-23t
 - nomenclature, 2-29, 2-44t
 - shrinkage values, 4-8t
 - resistance to fungi and insects, 2-29
 - marine borers, 14-13 to 14-15
 - uses, 2-29
 - workability, 2-29
 - Manni:
 - characteristics, 2-29
 - decay resistance, 14-5t
 - locality of growth, 2-29
 - machinability, 2-29
 - mechanical properties, 5-19t, 5-23t
 - resistance to insects, 2-29
 - shrinkage values, 4-8t
 - uses, 2-29
 - Maple, black:
 - dimensional change coefficients, 13-16t

- shrinkage values, 4-6t
- strength properties, 5-5t, 5-10t
- thermal conductivity, 4-13t
- Maple, bigleaf:
 - dimensional change coefficients, 13-16t
 - shrinkage values, 4-6t
 - strength properties, 5-5t, 5-10t
- Maple, hard:
 - characteristics, 2-8
 - charring rate data, 18-14t
 - connector joint strength, 8-21t
 - decay resistance, 14-5t
 - ease of bonding, 10-7t
 - heat release data, 18-12fig
 - locality of growth, 2-8
 - nomenclature, 6-5t
 - shock resistance, 2-8
 - species, 2-8
 - uses, 2-8
- Maple, Oregon, nomenclature, 6-5t
- Maple, red:
 - dimensional change coefficients, 13-16t
 - elastic ratio, 5-2t
 - Poisson ratio, 5-3t
 - shrinkage values, 4-6t
 - strength properties, 5-5t, 5-10t
 - thermal conductivity, 4-13t
- Maple, silver:
 - dimensional change coefficients, 13-16t
 - moisture content, 4-2t
 - penetration, 15-16t
 - shrinkage values, 4-6t
 - strength properties, 5-5t, 5-10t
 - thermal conductivity, 4-13t
- Maple, soft:
 - connector joint strength, 8-21t
 - ease of bonding, 10-7t
 - locality of growth, 2-8
 - nomenclature, 6-5t
 - species, 2-8
 - uses, 2-8
- Maple, sugar:
 - characteristics for painting, 16-5t
 - dimensional change coefficients, 13-16t
 - elastic ratio, 5-2t
 - fracture toughness, 5-27t, 5-28t
 - moisture content, 4-2t
 - penetration, 15-16t
 - Poisson ratio, 5-3t
 - shrinkage values, 4-6t
 - strength properties, 5-5t, 5-10t
 - thermal conductivity, 4-13t
 - toughness values, 5-27t
- Maple flooring:
 - availability, 6-16 to 6-17
 - grading, 6-6
- Maple Flooring Manufacturers Association, grading rules, 6-6
- Marishballi:
 - characteristics, 2-29 to 2-30
- locality of growth, 2-29 to 2-30
- mechanical properties, 5-19t, 5-23t
- resistance to fungi and insects, 2-30
- shrinkage values, 4-8t
- uses, 2-30
- Marine borer damage and control, 14-13 to 14-15
- Malayapis. *See* Lauans
- Mata-mata. *See* Manbarklak
- Mayflower. *See* Roble
- Mechanical interlocking and adhesives, 10-1 to 10-2
- Mechanical properties of wood adjusted for design use, 7-10 to 7-13
 - affected by:
 - adhesion to metals, 10-5
 - age, 5-41
 - changes in moisture content, 5-34
 - chemicals:
 - exposure to, 5-41
 - treatment, 5-41 to 5-43
 - cross grain, 5-30
 - decay, 5-43 to 5-44
 - duration of load, 5-39 to 5-40
 - fire-retardant treatments, 18-15
 - insect damage, 5-44
 - knots, 5-26 to 5-27
 - juvenile wood, 5-32 to 5-33
 - mold and stain fungi, 5-43
 - rate of loading, 5-38
 - slope of grain, 5-30t
 - temperature, 5-35 to 5-38
 - waterborne preservatives, 5-42
 - relation to specific gravity, 5-26, 5-29t
 - relation to stress grades, 7-2
- Medium-density fiberboard:
 - grade stamp, 11-14fig
 - properties, 11-13, 12-5, 12-6t
 - resins used, 11-13
 - standards, 11-3t
 - uses, 11-13
 - with veneer overlay, 11-15, 11-16fig
- Medium-density hardboard, finishes, suitability and expected service life, 16-17t
- Medium density overlays:
 - finishes, suitability and expected service life, 16-17t
 - to improve paintability of plywood, 16-9
- Melamine adhesives:
 - performance over time, 10-21 to 10-22
 - use with composite products, 11-4
 - working and strength properties, and uses, 10-11t to 10-13t
- Meranti:
 - characteristics, 2-30
 - color, 2-30t
 - decay resistance, 14-5t
 - dimensional change coefficient, 13-17t
 - ease of bonding, 10-7t
 - locality of growth, 2-30
- machinability, 2-30
- mechanical properties, 5-21t, 5-25t
- uses, 2-30
- Merbau:
 - characteristics, 2-30
 - locality of growth, 2-30
 - machinability, 2-30
 - mechanical properties, 5-19t, 5-23t
 - resistance to insects, 2-30
 - shrinkage values, 4-8t
 - uses, 2-30
- Mersawa:
 - characteristics, 2-31
 - decay resistance, 14-5t
 - locality of growth, 2-31
 - machinability, 2-31
 - mechanical properties, 5-19t, 5-23t
 - resistance to fungi and insects, 2-31
 - shrinkage values, 4-8t
 - uses, 2-31
- Metal bonding, 10-5
- Metal plate connectors, 8-25, 8-26fig
- Mildew:
 - discoloration of wood, 16-28 to 16-29, 16-28fig
 - removal, 16-28 to 16-29
- Mill glaze, 16-26 to 16-27
- Mill work, finishes, suitability and expected service life, 16-17t
- Modified woods:
 - formaldehyde-treated wood:
 - dimensional stability, 19-9t, 13-12
 - mechanical properties, 19-11 to 19-12
 - resistance to fungi, 19-12
 - chemical modification:
 - antishrink efficiency calculations, 19-12
 - conditions for, 19-12
 - chemicals used, 19-12
 - dimensional stability, 19-9t, 19-11
 - mechanical properties, 19-11 to 19-12
- cost, 19-5
- dimensional stability, 19-9t
- purposes, 19-4 to 19-5
- resin-treated compressed wood
- (Compreg):
 - advantages, 19-5
 - dimensional stability, 19-9t
 - molding, 19-5, 19-9
 - plasticizers, 19-5
 - properties, 19-5, 19-6t
 - strength properties, 19-7t to 19-8t
 - thermal expansion coefficients, 19-8t
 - uses, 19-9
- resin-treated wood (Impreg):
 - bulking agents, 19-4 to 19-5
 - dimensional stability, 19-9t
 - process, 19-5
 - properties, 19-6t
 - strength properties, 19-7t to 19-8t

Index

- untreated compressed wood (Staypak):
 - appearance, 19-10
 - dimensional stability, 19-9t
 - properties, 19-9 to 19-10, 19-6t
 - purpose, 19-9
 - strength properties, 19-7t to 19-8t
 - uses, 19-9 to 19-10
- untreated heated wood (Staywood):
 - loss of mechanical and strength properties, 19-9
 - purpose, 19-9
- wood-polymer composites:
 - advantages, 19-11 to 19-12
 - changing characteristics, 19-11 to 19-12
 - monomers, 19-11
 - species used, 19-11
 - strength properties, 19-11t
 - uses, 19-11
- wood treated with polyethylene glycol (PEG):
 - dimensional stability, 19-9t
 - finishing, 19-10
 - process, 19-10
 - uses, 19-10
- Modulus of elasticity:
 - and columns with flanges, 9-8
 - coefficient of variation, 5-26t
 - discussed, 5-3
 - effect of temperature, 5-35, 5-36fig, 5-37t
 - of machine graded lumber, 7-7 to 7-8
 - of visually graded lumber, 7-6 to 7-7 values, 5-2t
- Modulus of rigidity:
 - discussion, 5-3
 - ratios, 5-3t
- Modulus of rupture:
 - and moisture content, 7-11, 7-11t, 7-12fig
 - coefficient of variation, 5-26t
 - defined, 5-3
 - effect of temperature, 5-36fig, 5-36t, 5-37fig
 - of beams, 9-5, 9-6
 - temperature effect, 5-36
- Moisture blisters, 16-26
- Moisture content:
 - adsorption/desorption curve, 4-5fig
 - adjustment for, 7-12
 - and decay, 14-4
 - and electrical resistance, 4-15
 - and heat capacity, 4-11
 - changes in finished ponderosa pine sapwood, 16-14fig
 - definition, 4-2, 16-6
 - determined by:
 - electrical method, 13-2 to 13-3
 - ovendrying method, 13-2, 13-2eq
 - dimensional changes, 10-6 to 10-8
 - effect on bonded joints, 10-9
 - effect of strength properties, 5-34, 5-35fig
 - equilibrium:
 - discussion, 4-3, 4-3fig
 - relative humidity as related to, 4-4t
 - green wood, 4-1, 4-2t
 - heartwood, 4-2t
 - in wood exposed outdoors, 16-7
 - recommended for:
 - exterior siding, 13-5t
 - flooring, 13-5t
 - furniture, 13-5t
 - interior woodwork, 13-5t
 - laminated members, 13-5, 13-5t
 - lumber, 13-3, 13-4t, 13-5t
 - plywood, 13-5, 13-5t
 - sheathing, 13-5t
 - timbers, 13-3
 - trim, 13-5t
 - veneer, 13-3
 - sapwood, 4-2t
 - shrinkage as related to, 4-5 to 4-7, 4-10
 - shrinkage curves, 4-7fig
 - specific gravity, 4-7, 4-9, 4-10fig
- Moisture content of dried lumber:
 - air-dry, 13-11
 - kiln dry, 13-12
 - shipping dry, 13-11
- Moisture content during transit and storage:
 - finish and factory lumber, 13-14
 - general, 13-14, 13-15t
 - plywood and structural items, 13-14
- Moisture-gradient, typical in lumber, 13-6, 13-7fig
- Molding resin-treated compressed wood (Compreg), 19-5, 19-9
- Molds:
 - appearance of, 14-2
 - distinction from stain, 14-2
 - effect on wood, 14-2
- Moment capacity, 9-5, 9-5eq
- Mora:
 - characteristics, 2-31
 - locality of growth, 2-31
 - mechanical properties, 5-19t, 5-23t
 - resistance to fungi and insects, 2-31
 - shrinkage values, 4-8t
 - uses, 2-31
 - workability, 2-31
- Multiple-fastener joints, 8-24 to 8-25, 8-24eq
- Nails:
 - lateral resistance of common wire nails:
 - pre-1991:
 - equations, 8-8
 - lateral load coefficients, 8-6t
 - load-slip curve, 8-6, 8-6fig
 - post-1991:
 - direction of driving, effect of, 8-6
 - load-slip curves, 8-8, 8-8eq, 8-9fig
 - moisture content, effect of, 8-8
 - seasoning, effect of, 8-8
 - shank form, effect of, 8-8
 - spacing, 8-7
 - yield model theory, 8-6, 8-7eq, 8-9fig, 8-7t
 - sizes:
 - box nails, 8-2t
 - common, 8-2fig
 - helically and annularly threaded, 8-2, 8-2t
 - penny size, 8-2
 - wire nails, 8-2, 8-2t
 - toenailed joints, strength of, 8-5
 - withdrawal resistance:
 - affected by, 8-2, 8-3
 - allowable loads, 8-6
 - clinched nails, 8-5
 - corrosion, 8-5
 - density of wood, effect of, 8-3
 - direction of driving, 8-5
 - etched nails, 8-4
 - load displacement curve, 8-3, 8-3fig
 - moisture content, effect of, 8-3, 8-4
 - nail heads, 8-4
 - nail points, effect of, 8-4
 - plywood, 8-6
 - prebored lead holes, effect of, 8-5
 - seasoning, effect of, 8-3
 - shank form, effect of, 8-4
 - surface coatings, effect of, 8-3 to 8-4
 - surface coating, used for 8-4
- Nanoindentation hardness, 5-15
- Naphthenate, copper:
 - color transfer and changes, 15-6
 - effectiveness, 15-6
 - retention levels for various wood products, 15-4t, 15-5t
 - solution values, 15-3 to 15-9
 - Southern pine sapwood stakes retention and life span test results, 15-7t, 15-8t
 - treatment for cutting pretreated wood, 15-25
- Naphthenate, zinc:
 - effectiveness, 15-11
 - inappropriate uses, 15-11
 - properties, 15-11
- National Grading Rule, 7-2, 7-3, 7-3t
- National Fire Protection Association, 18-2, 18-5
- National Hardwood Lumber Association, 6-2, 6-4t
- National Oak Flooring Manufacturers Association, grading rules, 6-6 to 6-7
- Nomenclature, 6-5t, 6-13t
- Nuclear radiation:
 - discussion, 4-17
 - effect on wood strength, 5-43

- Oak:
 for casing and base, 6-17
 used in piles, 6-20
- Oak, black:
 strength properties, 5-5t, 5-10t
 thermal conductivity, 4-13t
- Oak, bur:
 strength properties, 5-6t, 5-11t
 thermal conductivity, 4-13t
- Oak, California black, moisture content, 4-2t
- Oak, cherrybark, strength properties, 5-5t, 5-10t
- Oak, chestnut, strength properties, 5-6t, 5-11t
- Oak, laurel, strength properties, 5-5t, 5-10t
- Oak, live, strength properties, 5-6t, 5-11t
- Oak, northern red:
 characteristics for painting, 16-5t
 fracture toughness, 5-28t
 strength properties, 5-5t, 5-10t
- Oak, overcup:
 strength properties, 5-6t, 5-11t
 tensile strength, 5-26t
 toughness values, 5-27t
- Oak, pin:
 strength properties, 5-5t, 5-10t
 tensile strength, 5-26t
 toughness values, 5-27t
- Oak, post, strength properties, 5-6t, 5-11t
- Oak, red:
 availability for purchase, 6-17
 characteristics, 2-8
 charring rate data, 18-14t
 connector joint strength, 8-21t
 dimensional change coefficient, 13-16t
 ease of bonding, 10-7t
 elastic ratio, 5-2t
 erosion of planed surfaces, 16-12t
 flame spread index, 18-4t
 flammability data, 18-10t
 heat release data, 18-12fig
 locality of growth, 2-8
 mechanical properties, 5-19t, 5-23t
 nomenclature, 6-5t
 Poisson ratio, 5-3t
 penetration, 15-16t
 shrinkage values, 4-6t
 species, 2-8
 uses, 2-8
- Oak, scarlet:
 strength properties, 5-5t, 5-10t
 toughness values, 5-27t
- Oak, southern red:
 moisture content, 4-2t
 strength properties, 5-5t, 5-10t
 thermal conductivity, 4-13t
- Oak, swamp chestnut, strength properties, 5-6t, 5-11t
- Oak, swamp white, strength properties, 5-6t, 5-11t
- Oak, tropical:
 characteristics, 2-31
 locality of growth, 2-31
 resistance to fungi, 2-31
 specific gravity, 2-31
 uses, 2-31
- Oak, water:
 moisture content, 4-2t
 strength properties, 5-5t, 5-11t
- Oak, white:
 characteristics, 2-1, 2-8 to 2-9
 characteristics for painting, 15-16t
 charring rate equation, 18-13
 connector joint strength, 8-21t
 decay resistance, 2-9, 14-5t
 dimensional change coefficient, 13-16t
 ease of bonding, 10-7t
 elastic ratio, 5-2t
 flame spread index, 18-4t
 locality of growth, 2-8 to 2-9
 nomenclature, 6-5t
 penetration, 15-16t
 Poisson ratio, 5-3t
 shrinkage values, 4-6t
 species, 2-8 to 2-9
 strength properties, 5-6t, 5-11t
 uses, 2-9
- Oak, willow, moisture content, 4-2t
- Oak flooring, 6-6
- Obeche:
 characteristics, 2-31 to 2-32
 decay resistance, 14-5t
 dimensional change coefficient, 13-17t
 ease of bonding, 10-7t
 locality of growth, 2-44
 machinability, 2-32
 mechanical properties, 5-19t, 5-23t
 shrinkage values, 4-8t
 uses, 2-32
- Ofram. *See* Limba
- Oilborne preservatives. *See* preservatives, oilborne
- Oil-type preservatives, strength loss, 5-42
- Okoume:
 characteristics, 2-32
 decay resistance, 14-5t
 dimensional change coefficient, 13-17t
 ease of bonding, 10-7t
 locality of growth, 2-32
 machinability, 2-32
 mechanical properties, 5-20t, 5-24t
 shrinkage values, 4-8t
 uses, 2-32
- Old house borer, 14-10
- Oligomeric alkylphenol polysulfide (PXTS), 15-9
- Opaque finishes, 16-32
- Opepe:
 characteristics, 2-32
 ease of bonding, 10-7t
- locality of growth, 2-32
 machinability, 2-32
 mechanical properties, 5-20t, 5-24t
 resistance to decay and insects, 2-32
 shrinkage values, 4-8t
 uses, 2-32
- Ordinary construction:
 code requirements for fire protection, 18-2
 description, 18-2
- Oriented strandboard:
 adhesive application or blending, 11-10
 adhesives used, 11-7
 certification, 11-10, 11-8fig
 defined, 11-7
 drying process, 11-8, 11-10
 finishes, suitability and expected service life, 16-17t
 grade stamps, 11-8fig
 hot pressing, 11-10
 manufacturing process, 11-8, 11-10, 11-10fig
 mat formation, 11-10
 mechanical properties, 12-5t
 species used, 11-8
 specific gravity, 12-5t
 standards, 11-3t
 stranding process, 11-8
- Oriented strand lumber, 11-21
- Orthotropic nature of wood, 5-1
- Osage-orange:
 decay resistance, 14-5t
 ease of bonding, 10-7t
 nomenclature, 6-5t
- Ossol. *See* Manni
- Otie. *See* Ilomba
- Ovankol (*See also* Bengé):
 mechanical properties, 5-20t, 5-24t
 shrinkage values, 4-8t
- Ovendry weight, specific gravity, 4-9, 4-9t
- Oxine copper:
 composition, 15-11
 corrosiveness, 15-11
 retention levels for various wood products, 15-4t, 15-5t
 Southern pine sapwood stakes retention and life span test results, 15-7t to 15-8t
 toxicity, 15-11
- Pacific yew, nomenclature, 6-14t
- Paint:
 adhesion bandage test, 16-28
 application and maintenance, 16-19t, 16-20 to 16-21
 characteristics of wood, 16-5t
 cracking, 16-26
 discussed, 16-26 to 16-27
 disposal, 16-36
 failure caused by:
 dimensional changes in wood, 16-7

Index

- earlywood/latewood band, 16-2
 - face checks in plywood, 16-9, 16-9fig
 - grain orientation, 16-8
 - moisture content of wood, 16-6 to 16-7
 - temperature at time of painting, 16-22 to 16-23
 - texture of wood, 16-9
 - water soluble extractives, 16-29
 - weathering, 16-11
 - failure in finger-jointed lumber, 16-9 to 16-10
 - lead-based:
 - dust from, 16-36 to 16-37
 - health effects, 16-36 to 16-37
 - removal of, 16-36 to 16-37
 - use of, 16-36
 - mildew removal, 16-29
 - moisture blisters, 16-26
 - on treated wood, 16-24
 - on preweathered panels, 16-12
 - peeling:
 - avoiding with proper painting, 16-24
 - caused by water, intercoat, 16-27
 - protection against moisture, 16-13
 - preweathering before painting, 16-13
 - repainting, 16-24, 16-32 to 16-33
 - removal, 16-35 to 16-36
 - service life, 16-25
 - strippers:
 - chemical:
 - alkali-based, 16-36
 - solvent-based, 16-36
 - mechanical, 16-35
 - “safe”, 16-36
 - VOC regulation compliance, 16-15 to 16-16
 - Pallet and container stock, 6-17
 - Palosapis. *See* Mersawa
 - Panel products:
 - classification, 11-5fig
 - fiberboard, 11-12 to 11-15
 - oriented strandboard, 11-7 to 11-10
 - particleboard, 11-10 to 11-12
 - performance standards, 11-3t
 - plywood, 11-5 to 11-7
 - product standards, 11-3t
 - Paper-based plastic laminates:
 - decorative laminates:
 - process, 19-12 to 19-13
 - thicknesses, 19-13
 - uses, 19-12 to 19-13
 - industrial laminates:
 - cost advantage, 19-12
 - papreg, 19-13
 - resins used, 19-13
 - strength, 19-12, 19-7t to 19-8t
 - uses, 19-12
 - lignin-filled laminates:
 - strength properties, 19-14
 - resins used, 19-14
 - shrinking and swelling, 19-13
 - Paper-faced overlays:
 - manufacture, 19-14
 - types:
 - decoratives, 19-13
 - masking, 19-14
 - structural, 19-14
 - uses, 19-13
 - Papreg, 19-13
 - Para-Angelim (*See also* Sucupira):
 - mechanical properties, 5-20t, 5-24t
 - shrinkage values, 4-8t
 - Parallell strand lumber, 11-21
 - Parana pine:
 - characteristics, 2-39
 - decay resistance, 14-5t
 - dimensional change coefficient, 13-17t
 - ease of bonding, 10-7t
 - locality of growth, 2-39
 - mechanical properties, 5-20t, 5-24t
 - shrinkage values, 4-8t
 - uses, 2-39
 - Particleboard, 11-10 to 11-12
 - adhesives, 11-11
 - certification, 11-12
 - finishing, 11-12
 - hot pressing, 11-12
 - mat formation, 11-11
 - mechanical properties, 12-5t
 - particle classifications and conveying, 11-11
 - particle drying, 11-11
 - production, 11-11
 - resins and wax, 11-11
 - screw withdrawal, 8-10
 - specific gravity, 12-5t
 - standards, 11-3t
 - uses, 11-11
 - Pau marfim:
 - characteristics, 2-32 to 2-33
 - dimensional change coefficient, 13-17t
 - ease of bonding, 10-7t
 - locality of growth, 2-32
 - machinability, 2-32
 - mechanical properties, 5-20t, 5-24t
 - resistance to decay, 2-32
 - shrinkage values, 4-8t
 - specific gravity, 2-32
 - strength values, 2-32
 - uses, 2-33
 - Pecan (*See also* Hickory, pecan):
 - nomenclature, 6-5t
 - Pecky cypress, 2-11
 - Pentachlorophenol:
 - and nonpressure treatments, 15-20 to 15-21
 - approved uses, 15-10
 - effect on mechanical properties of wood, 15-20
 - effectiveness, 15-10
 - EPA-approved consumer information sheet, 15-2
 - handling precautions, 15-2
 - ineffective against marine borers, 15-10
 - paintability, 15-10
 - retentions for various wood products, 15-4t, 15-5t
 - solution standards, 15-10
 - solution performance, 15-10
 - use site precautions, 15-2
- Peroba, white. *See* Peroba de Campos
- Peroba de campos:
 - characteristics, 2-33
 - locality of growth, 2-33
 - machinability, 2-33
 - mechanical properties, 5-20t, 5-24t
 - resistance to decay, 2-33
 - shrinkage values, 4-8t
 - uses, 2-33
- Peroba rosa:
 - characteristics, 2-33
 - ease of bonding, 10-7t
 - locality of growth, 2-33
 - mechanical properties, 5-20t, 5-24t
 - resistance to fungi and insects, 2-33
 - shrinkage values, 4-8t
 - uses, 2-33
- Persimmon:
 - dimensional change coefficient, 13-16t
 - ease of bonding, 10-7t
 - nomenclature, 6-5t
 - shrinkage values, 4-6t
- Phenolic adhesives:
 - performance over time, 10-22, 10-22fig
 - structural performance, 10-11t to 10-13t
 - use with composite products, 11-3, 11-5
 - working and strength properties, and uses, 10-11t to 10-13t
- Phenolic resins:
 - for laminates, 19-13
- Pholads, 14-14
- Photodegradation. *See* Weathering
- Piles:
 - knots, effect on strength, 5-26 to 5-28
 - marine, protection against insects, 14-14 to 14-15
 - preservative retention levels, 15-4t to 15-5t
 - preservative treatments, 6-22
 - service life, 6-22
 - standards and specifications, 6-18t, 6-20 to 6-21
 - standards for end-bearing piles, 6-21
 - for friction piles, 6-21
 - straightness, 6-21
 - strength properties, 7-14
 - timber availability, 6-20
 - weight and volume, 6-21 to 6-22

- Pilon:
 characteristics, 2-33
 locality of growth, 2-33
 mechanical properties, 5-20t, 5-24t
 resistance to insects, 2-33
 uses, 2-33
 workability, 2-33
- Pine, Caribbean:
 characteristics, 2-39
 ease of bonding, 10-7t
 locality of growth, 2-39
 machinability, 2-39
 mechanical properties, 5-20t, 5-24t
 resistance to insects, 2-39
 shrinkage values, 4-8t
 uses, 2-39
- Pine, eastern white:
 characteristics, 2-13
 characteristics for painting, 16-5t
 connector joint strength, 8-21t
 decay resistance, 14-5t
 dimensional change coefficient, 13-16t
 ease of bonding, 10-7t
 flame spread index, 18-4t
 locality of growth, 2-13
 mechanical properties, 5-14t, 5-15t
 nomenclature, 6-13t
 penetration, 15-16t
 shock resistance, 2-13
 shrinkage values, 4-6t
 tensile strength, 5-26t
 thermal conductivity, 4-14t
 toughness values, 5-28t
 uses, 2-13
 workability, 2-13
- Pine, jack:
 characteristics, 2-13
 decay resistance, 14-5t
 dimensional change coefficient, 13-16t
 locality of growth, 2-13
 mechanical properties, 5-14t, 5-15t
 nomenclature, 6-13t
 penetration, 15-16t
 shock resistance, 2-13
 shrinkage values, 4-6t
 strength properties, 5-7t, 5-12t
 thermal conductivity, 4-14t
 toughness values, 5-28t
 uses, 2-13
- Pine, loblolly:
 decay resistance, 14-5t
 dimensional change coefficient, 13-16t
 elastic ratio, 5-2t
 erosion of planed surfaces, 16-12t
 moisture content, 4-2t, 5-34t
 penetration, 15-16t
 Poisson ratio, 5-3t
 shrinkage values, 4-6t
 strength properties, 5-7t, 5-12t
 tensile strength, 5-26t
- thermal conductivity, 4-14t
 toughness values, 5-28t
- Pine, lodgepole:
 characteristics, 2-13 to 2-14
 decay resistance, 14-5t
 dimensional change coefficient, 13-16t
 elastic ratio, 5-2t
 flame spread index, 18-4t
 locality of growth, 2-13 to 2-14
 mechanical properties, 5-14t, 5-15t
 moisture content, 4-2t
 nomenclature, 6-13t
 penetration, 15-16t
 Poisson ratio, 5-3t
 shock resistance, 2-14
 shrinkage values, 2-14, 4-6t
 strength properties, 5-7t, 5-12t
 thermal conductivity, 4-14t
 toughness values, 5-28t
 used for poles, 6-19
 workability, 2-14
 uses, 2-14
- Pine, longleaf:
 decay resistance, 14-5t
 dimensional change coefficient, 13-16t
 elastic ratio, 5-2t
 moisture content, 4-2t, 5-34t
 nomenclature, 6-13t
 Poisson ratio, 5-3t
 shrinkage values, 4-6t
 strength properties, 5-7t, 5-12t
 thermal conductivity, 4-14t
- Pine, ocote:
 characteristics, 2-39
 locality of growth, 2-39
 mechanical properties, 5-20t, 5-24t
 resistance to fungi, 2-39
 shrinkage values, 4-8t
 strength properties, 2-39
 uses, 2-39
- Pine, pitch:
 characteristics, 2-14
 decay resistance, 14-5t
 locality of growth, 2-14
 nomenclature, 6-13t
 shock resistance, 2-14
 shrinkage values, 2-14, 4-6t
 strength properties, 5-7t, 5-12t
 thermal conductivity, 4-14t
 uses, 2-14
- Pine, pond:
 characteristics, 2-14
 decay resistance, 14-5t
 dimensional change coefficient, 13-16t
 locality of growth, 2-14
 elastic ratio, 5-2t
 Poisson ratio, 5-3t
 shock resistance, 2-14
 shrinkage values, 2-14, 4-6t
 strength properties, 5-8t, 5-13t
- uses, 2-14
- Pine, ponderosa:
 characteristics, 2-14
 characteristics for painting, 16-5t
 connector joint strength, 8-21t
 decay resistance, 14-5t
 dimensional change coefficient, 13-16t
 ease of bonding, 10-7t
 elastic ratio, 5-2t
 erosion of planed surfaces, 16-12t
 flame spread index, 18-4t
 for siding, 6-16
 fracture toughness, 5-28t
 Jeffrey, 2-14
 locality of growth, 2-14
 mechanical properties, 5-14t, 5-15t
 moisture content, 4-2t
 changes in finished sapwood samples, 16-14fig
 moisture-excluding effectiveness of finishes on, 16-14t
 nomenclature, 6-13t
 penetration, 15-16t
 Poisson ratio, 5-3t
 shock resistance, 2-14
 shrinkage values, 4-6t
 strength properties, 5-8t, 5-13t
 thermal conductivity, 4-14t
 toughness values, 5-28t
 used for poles, 6-19
 uses, 2-14
- Pine, radiata:
 characteristics, 2-39 to 2-40
 ease of bonding, 10-7t
 locality of growth, 2-39
 machinability, 2-40
 mechanical properties, 5-20t, 5-24t
 uses, 2-40
- Pine, red:
 characteristics, 2-14
 connector joint strength, 8-21t
 decay resistance, 14-5t
 dimensional change coefficient, 13-16t
 flame spread index, 18-4t
 heat release index, 18-10t
 locality of growth, 2-14
 mechanical properties, 5-14t, 5-15t
 moisture content, 4-2t, 5-34t
 penetration, 15-16t
 preservative treatments to prevent marine borer attacks on piles, 15-5t
 Poisson ratio, 5-3t
 shock resistance, 2-14
 shrinkage values, 4-6t
 strength properties, 5-8t, 5-13t
 thermal conductivity, 4-14t
 toughness values, 5-28t
 uses, 2-14
- Pine, sand, strength properties, 5-8t, 5-13t
- Pine, scots, fracture toughness, 5-28t

Index

- Pine, shortleaf:
dimensional change coefficient, 13-16t
elastic ratio, 5-2t
moisture content, 4-2t
shrinkage values, 4-6t
strength properties, 5-8t, 5-13t
thermal conductivity, 4-14t
toughness values, 5-28t
- Pine, slash:
dimensional change coefficient, 13-16t
decay resistance, 14-5t
elastic ratio, 5-2t
Poisson ratio, 5-3t
shrinkage values, 4-6t
strength properties, 5-8t, 5-13t
thermal conductivity, 4-14t
toughness values, 5-28t
- Pine, southern:
characteristics, 2-14 to 2-15
characteristics for painting, 16-5t
charring rate data, 18-14t
charring rate equation, 18-13
connector joint strength, 8-21t
decay resistance, 14-5t
ease of bonding, 10-6, 10-7t
erosion of planed surfaces, 16-12t
flame spread index, 18-4t
flammability data, 18-10t
for flooring, 6-16 to 6-17
fracture toughness, 5-28t
grading, 6-8
kiln drying schedule, 13-8, 13-11t
moisture content and property values, 5-36t
nomenclature, 6-13t
preservative retention and life span tests, 15-7t to 15-8t
preservative treatments to prevent marine borer attacks on piles, 15-5t
shock resistance, 2-15
shrinkage values, 2-15, 4-6t
species, 2-14 to 2-15
used for piles, 6-20
used for poles, 6-19
uses, 2-15
- Pine, spruce:
characteristics, 2-15
decay resistance, 14-5t
locality of growth, 2-15
strength properties, 5-8t, 5-13t
uses, 2-15
- Pine, sugar:
characteristics, 2-15
connector joint strength, 8-12t
decay resistance, 14-5t
dimensional change coefficient, 13-16t
ease of bonding, 10-7t
elastic ratio, 5-2t
locality of growth, 2-15
moisture content, 4-2t
nomenclature, 6-14t
penetration, 15-16t
Poisson ratio, 5-3t
shock resistance, 2-15
shrinkage values, 2-15, 4-6t
strength properties, 5-8t, 5-13t
thermal conductivity, 4-14t
uses, 2-15
workability, 2-15
- Pine, Virginia:
characteristics, 2-15 to 2-16
decay resistance, 14-5t
dimensional change coefficient, 13-16t
locality of growth, 2-15
shock resistance, 2-15
shrinkage values, 4-6t
strength properties, 5-8t, 5-13t
tensile strength, 5-26t
toughness values, 5-28t
uses, 2-16
- Pine, western white:
characteristics, 2-16
characteristics for painting, 16-5t
connector joint strength, 8-21t
decay resistance, 14-5t
dimensional change coefficient, 13-16t
ease of bonding, 10-7t
elastic ratio, 5-2t
flame spread index, 18-4t
for siding, 6-17
fracture toughness, 5-28t
heat release data, 18-12fig
locality of growth, 2-16
mechanical properties, 5-14t, 5-15t
moisture content, 4-2t
paintability rating, 16-14fig
Poisson ratio, 5-3t
shock resistance, 2-16
shrinkage values, 4-6t
strength properties, 5-8t, 5-13t
thermal conductivity, 4-14t
uses, 2-16
workability, 2-16
- Pitch pockets:
description, 5-33
effect on strength, 5-33
in lumber stress grading, 7-5
species involved, 5-33
- Pith, 3-2, 3-2fig
- Piquia:
characteristics, 2-33 to 2-34
locality of growth, 2-33
machinability, 2-34
mechanical properties, 5-20t, 5-24t
shrinkage values, 4-8t
resistance to fungi and insects, 2-34
uses, 2-34
- Plainsawn lumber:
advantages, 3-15t
method of producing, 3-14
shrinkage, 4-5
- Plasticizing adhesive polymers, 10-9
- Plasticizing wood:
bent wood members, 19-2
bending operation and apparatus, 19-4
characteristics of bent wood, 19-4
chemicals used, 19-2
fixing the bend, 19-4
laminated members, 19-2 to 19-3
moisture content of bending stock, 19-3 to 19-4
principles of plasticizing and bending, 19-1
resin-treated compressed wood, 19-5
selection of stock, 19-3
steaming, 19-1
veneered curved members, 19-3
- Plastering, care during construction, 13-19
- Plastic bonding, 10-5
- Plastic-coated nails, 8-4
- Port-Orford Cedar, *See* Cedar, Port-Orford
- Plywood:
adhesives, 11-7
advantages over solid wood, 11-6
assembly, 11-5
classification by:
 exposure capability, 11-7
 grades, 11-7
description, 11-5
erosion of planed surfaced, 16-12t
finishes, suitability and expected service life, 16-17t
finishing, 16-16
fire-retardant treated, 18-15
grade stamp, 11-8fig, 11-9fig
in light-frame construction, 17-3
mechanical properties, 11-6, 12-4t
plies, 14-6
plies, 11-6
preservative retention levels, 15-4t to 15-5t
product standard, 11-7, 11-3t
protecting from decay, 14-6
specialty panels, 11-7
specific gravity, 12-4t
standards, 11-3t
types:
 construction and industrial, 11-7
 hardwood and decorative, 11-7
 weathering of, 16-9
- Plywood curved members:
bent after gluing:
 common hardwoods for, 19-3
 procedure for, 19-2
bent and glued simultaneously:
 advantages, 19-2 to 19-3
 procedure for, 19-2
- Poisson's ratio:
discussion, 5-2
values, 5-3t

- Pole buildings, 17-4 to 17-5, 17-5fig, 17-6fig, 6-20
- Poles:
- availability, 6-19
 - characteristics relating to:
 - Douglas-fir, 6-19
 - lodgepole pine, 6-19
 - ponderosa pine, 6-19
 - southern pine, 6-19
 - western larch, 6-19
 - western redcedar, 6-19
 - control of mold, stain, and decay, 14-6
 - form and taper, 6-20 to 6-21, 6-20t
 - preservation and seasoning, 6-22
 - preservative treatment, retention levels, 15-4t to 15-5t
 - specifications, 6-18t
 - service life, 6-22
 - species selection, 6-19
 - standards and specifications, 6-18t
 - strength properties, 7-13 to 7-14
 - weight and volume, 6-21 to 6-22
- Polymeric methylene diphenyl diisocyanate (PMDI) adhesives, 10-14
- Polymerization, effect on mechanical properties, 5-43
- Polymers, organic and synthetic, and adhesion, 10-9 to 10-10
- Polymers, analytic chemical and mechanical testing, 10-19 to 10-20
- Polyurethane bonding with wood and nonwood composites, 10-5
- Polyurethane adhesives:
- performance over time, 10-21 to 10-22
 - structural performance, 10-11t to 10-13t
 - working and strength properties, and uses, 10-11t to 10-13t
- Polyvinyl adhesives:
- structural performance, 10-11t to 10-13t
 - working and strength properties, and uses, 10-11t to 10-13t
- Porches:
- cleaning before refinishing, 16-23 to 16-24
 - finishing, 16-25
 - pests, 14-13
- Pores. *See* Vessels
- Portland-cement-bonded composites, 11-24, 12-9
- Post-frame buildings, 17-4 to 17-5, 17-5fig, 17-6fig
- Pre-drying, 13-6
- Prefinished wood products, 16-25
- Preservative penetration:
- heartwood, 15-13 to 15-15, 15-16t
 - incising, effect of, 15-17 to 15-18
 - sapwood, 15-13 to 15-15, 15-16t
 - softwoods, 15-16t
- Preservative-pressure-treated wood, EPA-approved customer information sheets, 15-2
- Preservative retention tests, pressure treated, 15-4t to 15-5t
- Preservatives:
- copper-containing, control of marine borers with, 14-14 to 14-15
 - effect on mechanical properties, 15-20
 - effect on paintability, 16-24 to 16-25
 - effect on strength of oil-type, 5-42
 - EPA regulations, 15-1 to 15-2
 - inorganic arsenicals:
 - EPA-approved information sheet, 15-2
 - handling precautions, 15-2
 - use site precautions, 15-2
 - oilborne, various types:
 - alkyl ammonium compound:
 - effectiveness, 15-12
 - in ammoniacal copper quat, 15-5
 - solubility, 15-5
 - chlorothalonil/chlorpyrifos:
 - component ratios, 15-12
 - effectiveness, 15-12
 - chlorpyrifos:
 - effectiveness, 15-12
 - in combination, 15-12
 - copper naphthenate:
 - color transfer and changes, 15-11
 - effectiveness, 15-11
 - retention levels for various wood products, 15-4t to 15-5t
 - solution values, 15-11
 - Southern pine sapwood stakes retention and life span test results, 15-7t to 15-8t
 - treatment for cutting pretreated wood, 15-18
 - creosote, coal-tar:
 - advantages, 15-10
 - appearance, 15-10
 - composition variability, 15-10
 - EPA-approved customer information sheet, 15-2
 - effect on mechanical properties, 15-20 to 15-21
 - for non-pressure treatments, 15-20
 - handling precautions, 15-2
 - in pressure treatment process, 15-18
 - odor and vapors, 15-2
 - retention levels for various wood products, 15-4t to 15-5t
 - standards, 15-2
 - temperature for pressure treating, 15-18
 - treatment for cutting pretreated wood, 15-18
 - use site precautions, 15-2
 - volatility, 15-10
 - creosote-coal-tar solutions:
 - properties, 15-10
 - retention levels for various wood products, 15-4t to 15-5t
 - standards by volume, 15-10
 - temperature for pressure treating, 5-41
 - creosote-petroleum oil solutions:
 - retention levels for various wood products, 15-4t to 15-5t
 - oxine copper:
 - composition, 15-11
 - corrosiveness, 15-11
 - retention levels for various wood products, 15-4t to 15-5t
 - Southern pine sapwood stakes retention and life span test results, 15-7t to 15-8t
 - toxicity, 15-11
 - pentachlorophenol solutions:
 - and nonpressure treatments, 15-20
 - solution standards, 15-10 to 15-11
 - solution performance, 15-10 to 15-11
 - pentachlorophenol:
 - approved uses, 15-10
 - effect on mechanical properties of wood, 15-20
 - effectiveness, 15-10
 - EPA-approved consumer information sheet, 15-2
 - handling precautions, 15-2, 15-10
 - ineffective against marine borers, 15-10
 - paintability, 15-10
 - retention levels for various wood products, 15-4t to 15-5t
 - Southern pine sapwood stakes retention and life span test results, 15-7t to 15-8t
 - use site precautions, 15-2
 - propiconazole:
 - effectiveness, 15-9
 - solubility, 15-9
 - uses, 15-9
 - tebuconazole:
 - effectiveness, 15-9
 - solubility, 15-9
 - zinc naphthenate:
 - effectiveness, 15-11
 - inappropriate uses, 15-11
 - properties, 15-11
 - 3-iodo-2-propynyl butyl carbamate:
 - effectiveness, 15-11
 - paintability, 15-11
 - retail marketing, 15-11
 - use in combination, 15-11
 - uses, 15-11
 - 4, 5-dichloro-2-N-octyl-4-isothiazolin-3-one:
 - effectiveness, 15-12
 - inappropriate uses, 15-12
 - solubility, 15-12
 - waterborne, general:

Index

- and non-pressure treatment, 15-12
 - application and maintenance of exterior wood finish, 16-19t
 - effectiveness, 15-12
 - effect on mechanical properties, 5-41 to 5-43
 - effect on strength, 5-41 to 5-43
 - finishing, 16-24
 - for marine piles, 15-3
 - initial kiln-drying temperature, 5-42
 - paintability, 15-12
 - post-treatment kiln drying
 - temperatures, 5-42 to 5-43
 - retention levels effect of strength, 5-15
 - retention levels for various wood products, 15-4t to 15-5t
 - retentions necessary for marine borer protection, 15-5t
 - temperature considerations, 15-3
 - waterborne, various types:
 - acid copper chromate (ACC):
 - components, 15-3
 - effectiveness and leaching, 15-3
 - retention levels for various wood products, 15-4t to 15-5t
 - Southern pine sapwood stakes retention and life span test results, 15-7t to 15-8t
 - temperature for pressure treating, 15-21
 - alkaline copper quat (ACQ):
 - common types, 15-5
 - composition of common types, 15-5t
 - retention levels for various wood products, 15-4t
 - ammoniacal copper zinc arsenate (ACZA):
 - composition, 15-3
 - replacement for ACA, 15-3
 - retention levels for various wood products, 15-4t to 15-5t
 - temperature for pressure treating, 15-20
 - use, 15-3
 - use with Douglas-fir, 15-3 to 15-4
 - chromated copper arsenate (CCA):
 - common types, 15-4 to 15-5
 - component substitutions, 15-4 to 15-5
 - composition of common types, 15-5t
 - effectiveness of common types, 15-4 to 15-5
 - effect on adhesion, 10-4
 - finishing wood treated with, 16-24 to 16-25
 - resistance to marine borers, 15-5
 - retention levels for various wood products, 15-4t to 15-5t
 - Southern pine sapwood stakes retention and life span test results, 15-7t to 15-8t
 - temperature for pressure treating, 15-20
 - use with Douglas-fir, 15-3 to 15-4
 - copper azole - Type A (CBAType A):
 - retention levels for various wood products, 15-4t to 15-5t
 - solution percentages, 15-6
 - temperature for pressure treating, 15-20
 - copper bis(dimethylthiocarbamate) (CDDC):
 - retention levels for various wood products, 15-4t to 15-5t
 - solution percentages, 15-6
 - temperature for pressure treating, 15-20
 - uses, 15-6
 - copper HDO (CXA), 15-6
 - copper naphthenate (waterborne), 15-6
 - EL2, 15-8
 - ICC-ES evaluation report
 - preservatives, 15-9
 - inorganic boron (borax/boric acid):
 - acceptable compounds, 15-6, 15-8
 - effectiveness, 15-6, 15-8
 - solubility, 15-6, 15-8
 - temperature for pressure treating, 15-20
 - uses, 15-6, 15-8
 - KDS, 15-8
 - oligomeric alkylphenol polysulfide (PXTS), 15-9
 - propiconazole, 15-9
 - tebuconazole, 15-9
 - propiconazole-tebuconazole-imidacloprid (PTI), 15-9
 - Preservatives, recommended retentions, 15-21, 15-4t to 15-5t
 - Preservatives, water-repellant, and non-pressure treatments:
 - effectiveness, 15-12
 - federal specifications, 15-12
 - uses, 15-12
 - Preservative-treated wood:
 - best management practices, 15-23 to 15-24
 - cut surfaces, protection of, 15-18
 - effect on adhesion, 10-6
 - finishing, 16-24
 - handling, 15-23 to 15-24
 - inspection, 15-25, 15-26fig
 - quality assurance, 15-25 to 15-26, 15-26fig
 - seasoning required, 15-24
 - service life, 15-25
 - specifications, 15-25
 - strength as affected by preservatives, 15-25
 - timing of use, 15-25
 - Preservative treatment for:
 - composite products, 11-15
 - light-frame construction, 17-2
 - Preservative treatment, effect on strength, 7-13
 - Preservative treatment, preparing for:
 - air-drying practices, 15-16
 - conditioning green lumber, 15-17
 - Boulton or boiling-undervacuum process, 15-17
 - steaming-and-vacuum process, 15-17
 - cutting and framing:
 - common uses, 15-18
 - potential size changes, 15-18
 - timing, 15-18
 - drying, 15-17 to 15-18
 - incising:
 - method, 15-17, 15-17fig
 - purpose, 15-17
 - primary species, 15-17
 - peeling, 15-17, 15-17fig
 - preventing decay while drying, 15-16
- Preservative treatments, nonpressure:
 - Boucherie process for green unpeeled poles, 15-21
 - brushing:
 - application, 15-22
 - choice of preservative, 15-22
 - effectiveness, 15-22
 - penetration obtained, 15-22
 - cold-soaking process:
 - effectiveness, 15-21
 - method, 15-21
 - retentions and penetrations, 15-21
 - compared to pressure treatment, 15-21
 - diffusion processes:
 - butt or groundline treatment of poles or posts, 15-21
 - double diffusion, 15-21
 - dipping:
 - effectiveness, 15-20
 - method, 15-20
 - penetration obtained, 15-20
 - steeping process:
 - effectiveness, 15-21
 - method, 15-21
 - wood used, 15-21
 - tire-tube method for green, unpeeled fencepost, 15-17
 - vacuum processes:
 - contrasted to pressure treating, 15-21
 - effectiveness, 15-21
 - methods, 15-21
 - uses, 15-21
- Preservative treatments, pressure:
 - advantages, 15-20

- and preservative temperature, 15-20
empty-cell processes:
 Lowry process, 15-20
 Rueping process, 15-18 to 15-19
full-cell process:
 description, 15-18
 following other conditioning, 15-18
modified full-cell, 15-18
penetration and retention levels, 15-18
pressures used, 15-18
- Primavera:
 availability, 2-34
 characteristics, 2-34
 dimensional change coefficient, 13-17t
 locality of growth, 2-34
 machinability, 2-34
 mechanical properties, 5-20t, 5-24t
 resistance to fungi, 2-34
 shrinkage values, 4-8t
 uses, 2-34
- Propiconazole:
 effectiveness, 15-9
 solubility, 15-9
 uses, 15-9
- Purlins and glulam beam construction, 17-7
- Purpleheart:
 characteristics, 2-34
 decay resistance, 14-5t
 ease of bonding, 10-7t
 locality of growth, 2-34
 machinability, 2-34
 mechanical properties, 5-20t, 5-24t
 shrinkage values, 4-8t
 uses, 2-34
- Pycnanthus. *See* Ilomba
- Quartersawn lumber:
 advantages, 3-15t
 method of producing, 3-14
 shrinkage, 4-5
- Quality control in preservative-treated wood, 15-25, 15-26fig
- Radius-edged decking, 6-8
- Rafters in light-frame construction, 17-3 to 17-4
- Ramin:
 characteristics, 2-34
 decay resistance, 14-5t
 dimensional change coefficient, 13-17t
 ease of bonding, 10-7t
 locality of growth, 2-34
 mechanical properties, 5-20t, 5-24t
 resistance to decay, 2-34
 shrinkage values, 4-8t
 uses, 2-34
 workability, 2-34
- Rays, definition and discussion, 3-9 to 3-10, 3-11 to 3-12
- Reaction wood:
 compression wood, 3-13, 5-31
 increase in density, 5-31
 shrinkage, 4-5, 5-32
 tension wood, 3-13, 5-32
- Redcedar, eastern. *See* Cedar, Eastern red
- Redcedar, western. *See* Cedar, Western red
- Redwood:
 characteristics, 2-17
 characteristics for painting, 16-5t
 charring rate data, 18-14t
 connector joint strength, 8-21t
 decay resistance, 2-17, 14-5t
 dimensional change coefficient, 13-16t
 ease of bonding, 10-7t
 elastic ratio, 5-2t
 erosion of planed surfaces, 16-12t
 flame spread index, 18-4t
 flammability data, 18-10t
 for finish board, 6-17
 for siding, 6-16
 heat release data, 18-12fig
 locality of growth, 2-17
 moisture content, 4-2t, 5-34t
 nomenclature, 6-14t
 paintability rating, 16-14fig
 penetration, 15-16t
 preservative pressure and temperature, 15-20
 shrinkage values, 4-6t
 strength properties, 5-8t, 5-13t
 tensile strength, 5-26t
 thermal conductivity, 4-14t
 toughness values, 5-28t
 uses, 2-17
 workability, 2-17
- Relative humidity:
 equilibrium moisture content, 4-3
 moisture content of wood, 4-4t, 16-6 to 16-7
- Remedial treatment, 14-7, 14-9
- Resorcinol adhesives:
 performance over time, 10-21 to 10-22, 10-22fig
 structural performance, 10-11t to 10-13t
 working and strength properties, and uses, 10-11t to 10-13t
- Roble:
 characteristics, 2-34
 ease of bonding, 10-7t
 locality of growth, 2-34 to 2-35
 machinability, 2-35
 mechanical properties, 5-20t, 5-24t
 resistance to decay, 2-35
 shrinkage values, 2-35, 4-8t
 uses, 2-35
- Rolling shear strength, defined, 5-17
- Roof beams and water ponding, 9-8
- Rosewood, ease of bonding, 10-7t
- Rosewood, Brazilian:
 characteristics, 2-35
 locality of growth, 2-35
 machinability, 2-35
 mechanical properties, 5-20t, 5-24t
 resistance to fungi and insects, 2-35
 shrinkage values, 4-8t
 uses, 2-35
- Rosewood, Indian:
 characteristics, 2-35
 locality of growth, 2-35
 machinability, 2-35
 mechanical properties, 5-20t, 5-24t
 shrinkage values, 4-8t
 uses, 2-35
- Round timber and ties:
 availability, 6-19 to 6-20
 durability, 6-22
 form, 6-20 to 6-21
 material requirements, 6-18 to 6-19
 standards and specifications, 6-18t
 strength properties, 7-13
 weight and volume, 6-21 to 6-22
- Sande:
 characteristics, 2-35 to 2-36
 decay resistance, 14-5t
 locality of growth, 2-35
 machinability, 2-36
 mechanical properties, 5-20t, 5-24t
 resistance to decay and insects, 2-36
 shrinkage values, 4-8t
 uses, 2-36
 fire resistance, 18-7
- Santa Maria:
 characteristics, 2-36
 dimensional change coefficient, 13-17t
 locality of growth, 2-36
 machinability, 2-36
 mechanical properties, 5-20t, 5-24t
 resistance to insects, 2-36
 uses, 2-36
- Sapele:
 characteristics, 2-36
 decay resistance, 14-5t
 ease of bonding, 10-7t
 locality of growth, 2-36
 machinability, 2-36
 mechanical properties, 5-20t, 5-24t
 shrinkage values, 4-8t
 uses, 2-36
- Sap stain, 13-10, 13-13fig, 14-2
- Sapwood:
 function, 3-2
 in visual stress grading, 7-5
 location, 3-2, 3-2fig
 moisture content, 4-2t
 moisture content and drying, 13-7
 preservative retention and stake lifespan, 15-7t to 15-8t
- Sassafras:
 characteristics, 2-9

Index

- decay resistance, 2-9, 14-5t
- dimensional change coefficient, 13-16t
- locality of growth, 2-9
- nomenclature, 6-5t
- shock resistance, 2-9
- shrinkage values, 4-6t
- strength properties, 5-6t, 5-11t
- uses, 2-9
- Screws, lag:
 - description, 8-12
 - post-1991 lateral load, yield model theory, 8-13 to 8-14, 8-7t, 8-13t
 - pre-1991 lateral loads, 8-13 to 8-14, 7-12eq, 8-12t, 8-13fig
 - lateral resistance, 8-13, 8-14t
 - lubrication, 8-14
 - prebored lead hole, size required, 8-11, 8-13fig
 - spacing, 8-16
 - withdrawal resistance, 8-10 to 8-13, 8-10eq
- Screws, tapping:
 - described, 8-10
 - use in particleboard, 8-11
 - withdrawal loads, 8-11, 8-11eq
 - withdrawal resistance, 8-10
- Screws, wood:
 - gauges, 8-11t
 - ateral load coefficients, 8-6t
 - lateral resistance, 8-10 to 8-11, 8-10eq, 8-11eq
 - lead hole and load, 8-11
 - lubrication, 8-10
 - penetration depth and load, 8-11
 - sizes, 8-11t
 - types, 8-10, 8-10fig
 - withdrawal loads for particleboard, 8-11, 8-11eq
 - withdrawal resistance, 8-10 to 8-11, 8-11eq
 - yield model theory, 8-8t, 8-11
- Seasoning and lumber purchasing considerations, 6-17 to 6-18
- Selangan Batu. *See* Balau
- Select lumber availability, 6-16 to 6-17
- Sepetir:
 - characteristics, 2-36
 - decay resistance, 14-5t
 - locality of growth, 2-36
 - mechanical properties, 5-20t, 5-24t
 - shrinkage values, 4-8t
 - uses, 2-36
 - workability, 2-36
- Seraya, white:
 - characteristics, 2-36 to 2-37
 - decay resistance, 14-5t
 - locality of growth, 2-36
 - machinability, 2-37
 - uses, 2-37
- Shakes:
 - in lumber stress grading, 7-4 to 7-5
- Shear strength parallel to grain:
 - coefficient of variation, 5-26t
 - defined, 5-3
- Shear stress of beams, 9-6
- Sheathing and light-frame construction, 17-3, 17-4fig
- Shingles and shakes, availability, 6-17
- Shingles, finishes, suitability and expected service life, 16-17t
- Shipworms, 14-13
- Shrinkage:
 - adjustment for design use, 7-10
 - affect on painting, 16-3, 16-4t
 - coefficients for changing moisture content by species, 13-16t, 13-17t
 - coefficient of variation, 4-7, 4-9
 - compression wood, 4-7
 - discussion, 4-5 to 4-9
 - fiber saturation point as related to, 4-2
 - longitudinal, 4-5
 - moisture content curves, 4-5fig
 - of domestic woods, 4-6t
 - of imported woods, 4-8t
 - radial, 4-6t, 4-8t
 - species, 4-6t, 4-8t
 - tangential, 4-6t, 4-8t
 - volumetric, 4-6t, 4-8t
- Siding:
 - and mill glaze, 16-26 to 16-27
 - availability, 6-16
 - back-priming, 16-25
 - finishes, suitability and expected service life, 16-17t
 - lumber finishing, 16-8 to 16-9
 - prefinished at the factory, 16-25
 - removing weathered surface, 16-13
 - use of plywood, 16-9
- Silverballi, brown. *See* Kaneelhart
- Size factor:
 - for design use, 7-11 to 7-12
 - procedures for design use:
 - in-grade test, 7-11 to 7-12
 - small clear, 7-11
- Slash-grained lumber. *See* Flat-grained
- Slope of grain:
 - determination, 5-28 to 5-30, 5-29eq
 - in visual sorting, 7-4
 - relationship to fiber orientation, 5-30fig
 - types, 5-29 to 5-31
- Smoke:
 - approaches for dealing with, 18-6
 - carbon monoxide, 18-6
 - defined, 18-6
 - release rate, 18-11
 - tests for determining yield, 18-9 to 18-10
 - toxicity, 18-10
- Soft rot, 14-4
- Softwood lumber:
 - American Lumber Standard, 6-7
 - classification by grades:
 - factory and shop lumber:
 - factory (shop) grades, 6-10
 - industrial clears, 6-10
 - ladder and pole stock, 6-10
 - moulding stock, 6-10
 - tank stock, 6-10
 - structural lumber:
 - dimension lumber, 6-8
 - structural laminations, 6-8
 - yard lumber:
 - common lumber, 6-7, 6-8fig
 - select lumber, 6-7 to 6-8
 - development of grading rules, 6-7
 - drying targets, 13-5
 - grading organizations, 6-9t
 - kiln drying schedules, 13-8 to 13-9, 13-11t
 - manufacture:
 - size, 6-10, 6-11t
 - surfacing, 6-11
 - patterns, 6-11, 6-12fig
 - species, 6-13t to 6-15t
- Softwoods:
 - availability, 2-2
 - bending properties, 19-3
 - charring rates, 18-14t
 - definition, 2-2
 - flame spread index, 18-4t
 - flammability data, 18-10t
 - heat release data, 18-12fig
 - imported, 2-38 to 2-40
 - moisture content, heartwood and sapwood, 4-2t
 - preservative penetration, 15-7t to 15-8t
 - relationship of mechanical properties to specific gravity, 5-29t
 - species by region, 2-3t
 - thermal conductivity, 4-14t
 - uses, 2-2
- Sorption hysteresis, discussed, 4-3
- Solvents and adhesion, 10-9
- Sound, speed of, 5-17
- Southern pine sapwood stakes, preservative retention and life span tests, 15-7t to 15-8t
- Soybean adhesives:
 - structural performance, 10-11t to 10-13t
 - working and strength properties, and uses, 10-11t to 10-13t
- Spanish-cedar:
 - characteristics, 2-37
 - decay resistance, 14-5t
 - dimensional change coefficient, 13-17t
 - ease of bonding, 10-7t
 - locality of growth, 2-37
 - mechanical properties, 5-21t, 5-25t
 - shrinkage values, 4-8t
 - uses, 2-37
 - workability, 2-37

- Specific gravity:
 and paintability of wood, 16-1, 16-2 to 16-7
 and weathering of wood, 16-11
 coefficient of variation, 4-7, 4-9, 4-9t, 5-26t
 definition, 4-7
 density as a function of, 4-9t, 4-11t
 influence on mechanical properties, 5-26, 5-29t
 moisture content, 4-1, 4-3fig, 4-5fig
 of reaction wood, 5-31
- Speed of sound, 5-17
- Sphaeroma, 14-14
- Spikes, 8-9
- Spiral grain, 5-30, 5-30fig
- Splits:
 in lumber stress grading, 7-4
- Spruce, black:
 dimensional change coefficient, 13-16t
 mechanical properties, 5-14t, 5-15t
 moisture content, 4-2t
 shrinkage values, 4-6t
 strength properties, 5-8t, 5-13t
 thermal conductivity, 4-14t
- Spruce, Eastern:
 characteristics, 2-17
 flame spread index, 18-4t
 locality of growth, 2-17
 nomenclature, 6-14t
 species, 2-17
 uses, 2-17
 workability, 2-17
- Spruce, Engelmann:
 characteristics, 2-17
 characteristics for painting, 16-5t
 charring rate data, 18-14t
 connector joint strength, 8-21t
 dimensional change coefficient, 13-16t
 elastic ratio, 5-2t
 erosion of planed surfaces, 16-12t
 locality of growth, 2-17
 mechanical properties, 5-14t, 5-15t
 moisture content, 4-2t
 nomenclature, 6-14t
 penetration, 15-16t
 Poisson ratio, 5-3t
 shock resistance, 2-17
 shrinkage values, 4-6t
 strength properties, 5-8t, 5-13t
 tensile strength, 5-26t
 thermal conductivity, 4-14t
 toughness values, 5-28t
 uses, 2-17
- Spruce, red:
 connector joint strength, 8-21t
 dimensional change coefficient, 13-17t
 fracture toughness, 5-28t
 mechanical properties, 5-14t, 5-15t
 moisture content, 5-34t
 shrinkage values, 4-6t
 strength properties, 5-8t, 5-13t
 thermal conductivity, 4-14t
 uses, 2-18
- Spruce, Sitka:
 characteristics, 2-17 to 2-18
 connector joint strength, 8-21t
 dimensional change coefficient, 13-17t
 ease of bonding, 10-7t
 elastic ratio, 5-2t
 flame spread index, 18-4t
 locality of growth, 2-17
 mechanical properties, 5-14t, 5-15t
 moisture content, 4-2t, 5-34t
 nomenclature, 6-14t
 penetration, 15-16t
 Poisson ratio, 5-3t
 shock resistance, 2-18
 shrinkage values, 4-6t
 strength properties, 2-18, 5-8t, 5-13t
 tensile strength, 5-26t
 thermal conductivity, 4-14t
 uses, 2-18
- Spruce, white:
 connector joint strength, 8-21t
 dimensional change coefficient, 13-17t
 mechanical properties, 5-14t, 5-15t
 penetration, 15-16t
 strength properties, 5-8t, 5-13t
 thermal conductivity, 4-14t
- Stability:
 beams:
 water ponding, 9-9, 9-9eq
 lateral-torsion buckling, 9-9 to 9-10, 9-9eq, 9-10t
 deck support, effect of, 9-9, 9-9eq, 9-10fig
 built-up and spaced columns, 9-8, 9-8eq
 column flanges, 9-8, 9-8eq
 long columns, 9-7, 9-7eq
 interaction of buckling modes, 9-9 to 9-10, 9-9eq, 9-10eq
 short columns, 9-7 to 9-8, 9-8eq, 9-8fig
- Stain:
 penetrating:
 use on exterior plywood, 16-9
 semi-transparent:
 application and maintenance, 16-19t, 16-19 to 16-20
 discussed, 16-17
 refinishing, 16-18 to 16-20
 solid color:
 and mill glaze, 16-26 to 16-27
 application and maintenance, 16-19t, 16-19 to 16-20
 discussed, 16-22
 reconstituted wood products, 16-25
 refinishing, 16-22
 use on floors, 16-33 to 16-34
- Stains. *See also* Discoloration
- Stains, chemical, discussed 14-2
- Stains, fungal:
 blue, 16-30
 discussed, 14-1 to 14-2
 distinction from mold, 14-2
 during drying, 13-10, 13-13fig
 effect on wood, 14-2
- Stains, iron, 16-30
- Stake tests with preservatives, pressure-treated, 15-7t to 15-8t
- Standard lengths of lumber, 6-3
- Standard lumber abbreviations, 6-23 to 6-25
- Standard thicknesses of lumber:
 for flooring, 6-6
 table, 6-6t
- Standard widths of lumber, 6-3
- Staples, 8-9 to 8-10
- Starch adhesive, structural performance, 10-11t to 10-13t
- Staywood, 19-10
- Staypak:
 appearance, 19-10
 dimensional stability, 19-9t
 properties, 19-6t, 19-9 to 19-10
 purpose, 19-10
 strength properties, 19-7t to 19-8t
 uses, 19-10
- Sterilization of wood. *See* Heat sterilization
- Sticker stain during drying, 13-10, 13-14fig
- Stiffeners and glulam beam construction, 17-7
- Stiffness, affected by knots, 7-4
- Storage of lumber:
 care in yards, 13-14 to 13-15, 14-7
 green or partially seasoned, 13-14
 storage shed temperature, 13-14t
- Storing lumber:
 finish and factory items, 13-14
 sheathing and structural items, 13-14
- Strength and duration of load adjustments, 7-12
- Strength ratio:
 definition, 7-3
 equations, 7-6, 7-6fig
 estimating, 7-5
 ranges in visual grading, 7-6
- Strength properties:
 bird pecks, effect of, 5-33
 compression failures, effect of, 5-33
 creep, 5-39
 dead trees, 5-34
 derived for small clear wood, 7-5
 duration of load, effect, 5-39 to 5-40
 extractives, effect of, 5-34
 fire-retardant treatments, 5-41 to 5-42
 for commercially important woods, 5-4t to 5-13t
 insect damage, effect of, 5-44
 juvenile wood, 5-32 to 5-33
 knots, effect of, 5-26 to 5-28

Index

- moisture content as related to, 5-5
- nuclear radiation, 5-43
- pitch pockets, effect of, 5-33
- rate of loading, 5-38
- slope of grain, 5-28 to 5-31
- treatment, effect of, 7-13
- Strength, related to slope, 5-31t
- Stress equations:
 - axial load:
 - tensile stress, 9-4, 9-4eq
 - short-block compressive stress, 9-4, 9-4eq
 - bending:
 - notches, slits and holes, effect 9-6 to 9-7
 - size effect, 9-5, 9-5eq
 - straight beam stresses, 9-4
 - tapered beam stresses, 9-4 to 9-6, 9-5fig, 9-5eq, 9-6eq
 - time effects, 9-6
 - water ponding, 9-6
 - combined bending and axial load:
 - concentric load, 9-6, 9-6eq
 - eccentric load, 9-7, 9-7eq
 - torsion, 9-7, 9-7fig, 9-7eq
- Stress-graded lumber, American Standard lumber sizes, 6-11t
- Stress grading:
 - American Lumber Standard Committee (ALSC):
 - accredited rules-writing and independent agencies, 7-2t
 - American Softwood Standard, 7-2
 - National Grading Rule, 7-3, 7-3t
 - American Society of Testing and Materials (ASTM):
 - calculating clear wood properties for visual stress grades, 7-3
 - design properties, 7-1
 - strength ratio, 7-3
 - U.S. responsibility structure, 7-2, 7-2fig
- Stress, relationship between constant load and failure, 5-39 to 5-40, 5-39fig, 5-40fig
- Structural composite lumber (SCL) in bridges, 17-9
- Structural flakeboard and light-frame construction, 17-3
- Sucupira:
 - characteristics, 2-37
 - decay resistance, 14-5t
 - ease of bonding, 10-7t
 - locality of growth, 2-37
 - mechanical properties, 5-21t, 5-25t
 - resistance to fungi and insects, 2-37
 - shrinkage values, 4-8t
 - uses, 2-37
 - workability, 2-37
- Sugarberry (*See also* Hackberry)
- Suradan. *See* Pilon
- Sweetgum:
 - characteristics, 2-9
 - characteristics for painting, 16-5t
 - connector joint strength, 8-21t
 - decay resistance, 14-5t
 - dimensional change coefficient, 13-16t
 - ease of bonding, 10-7t
 - elastic ratio, 5-2t
 - flame spread index, 18-4t
 - interlocked grain, 2-9
 - locality of growth, 2-9
 - moisture content, 4-2t
 - penetration, 15-16t
 - shock resistance, 2-9
 - shrinkage values, 4-6t
 - strength properties, 5-6t, 5-11t
 - thermal conductivity, 4-13t
 - toughness values, 5-27t
 - uses, 2-9
- Swelling, coefficient for changing moisture content, by species, 13-16t to 13-17t
- Sycamore:
 - characteristics for painting, 16-5t
 - decay resistance, 14-5t
 - ease of bonding, 10-7t
 - nomenclature, 6-5t
- Sycamore, American:
 - characteristics, 2-9
 - connector joint strength, 8-21t
 - dimensional change coefficient, 13-16t
 - locality of growth, 2-9
 - moisture content, 4-2t
 - penetration, 15-16t
 - shock resistance, 2-9
 - shrinkage values, 4-6t
 - strength properties, 5-6t, 5-11t
 - thermal conductivity, 4-13t
 - uses, 2-9
- Tamarack:
 - characteristics, 2-18
 - characteristics for painting, 16-5t
 - decay resistance, 14-5t
 - dimensional change coefficient, 13-17t
 - locality of growth, 2-18
 - mechanical properties, 5-14t, 5-15t
 - moisture content, 4-2t, 5-34t
 - nomenclature, 6-14t
 - penetration, 15-16t
 - shrinkage values, 4-6t
 - strength properties, 5-8t, 5-13t
 - uses, 2-18
- Tangare. *See* Andiroba
- Tanoak:
 - characteristics, 2-9 to 2-10
 - decay resistance, 14-5t
 - dimensional change coefficient, 13-16t
 - locality of growth, 2-9
 - machinability, 2-10
 - nomenclature, 6-5t
 - shrinkage values, 4-6t
 - strength properties, 2-9, 5-6t, 5-11t
 - uses, 2-10
- Teak:
 - characteristics, 2-37 to 2-38
 - decay resistance, 14-5t
 - dimensional change coefficient, 13-17t
 - ease of bonding, 10-7t
 - locality of growth, 2-37
 - machinability, 2-38
 - mechanical properties, 5-21t, 5-25t
 - shrinkage values, 4-8t
 - uses, 2-38
- Tebuconazole:
 - effectiveness, 15-9
 - solubility, 15-9
- Temperature, effect on:
 - fatigue strength, 5-40 to 5-41
 - mechanical properties:
 - irreversible effects, 5-37 to 5-38, 5-38fig
 - reversible effects, 5-35 to 5-36, 5-36fig
 - properties, 7-13, 7-13t
 - relative humidity and moisture content, 4-4t
- Tensile strength, end-grain bonded joints, 10-18
- Tensile strength parallel to grain:
 - average values, 5-26t
 - coefficient of variation, 5-26t
 - defined, 5-3
- Tensile strength perpendicular to grain, 5-3
- Tension wood:
 - definition, 5-32
 - density increase, 5-31
 - description, 5-32
 - effect on strength, 5-32
 - shrinkage, 5-32
- Texture of wood, 3-13 to 3-14
- Texture, effect on paintability, 16-6
- Termites:
 - damage caused by, 14-8t, 14-11fig
 - nonsubterranean, 14-12
 - subterranean, 14-11 to 14-12
 - termite-resistant wood, 14-12 to 14-13
- Thermal, conductivity of wood:
 - definition, 4-10
 - determination, 4-12
 - factors affecting, 4-10, 4-11
 - selected species, 4-13t to 4-14t
- Thermal diffusivity of wood, 4-12
- Thermal expansion, 4-14
- Thermal properties of wood, 4-10
- Thermoplastics and adhesion, 10-9 to 10-10
- Ties:
 - availability, 6-20
 - preservative penetration levels, 15-4t to 15-5t
 - service life, 6-23
 - sizes, 6-20

- standards and specifications, 6-18t
 strength properties, 7-14
 weight and volume, 6-21 to 6-22
- Timber:
 inventory, 2-2
 resources, 2-2
- Timber bridges:
 glulam, 17-7, 17-9, 17-9fig
 log stringer, 17-8
 sawn lumber, 17-9
 structural composite lumber, 17-9
- Timber buildings:
 arch structure, 17-8
 dome, 17-8, 17-8fig
 glulam beam, 17-7
 mill-type construction:
 fire resistance, 17-7
 specifications, 17-7
 timber frame houses, 17-6 to 17-7,
 17-7fig
- Timbers, recommended moisture content,
 13-3
- Timber from dead trees, properties of, 5-34
- Time, effect on strength:
 creep, 5-39
 duration of load, 5-39 to 5-40
- Tornillo:
 characteristics, 2-38
 decay resistance, 14-5t
 locality of growth, 2-38
 mechanical properties, 5-21t, 5-25t
 uses, 2-38
 workability, 2-38
- Torsion, strength, 5-15
- Toughness:
 average values, 5-27t, 5-28t
 coefficient of variation, 5-26t
 defined, 5-25
- Tracheids, description and function, 3-9
- Transverse and volumetric shrinkage of
 wood, 4-5 to 4-7
- Treated wood recycling and disposal,
 15-26
- Trebol. *See* Macawood
- Trim, exterior:
 care during construction, 13-19
 recommended moisture content, 13-5t
- Trusses:
 care during construction, 13-8 to 13-19
 in light-frame construction, 17-4
 in pole and post-frame construction,
 17-4 to 17-6
- Truss plates, 8-25, 8-25fig
- Tupelo:
 characteristics, 2-10
 connector joint strength, 8-21t
 locality of growth, nomenclature, 6-5t
 shock resistance, 2-10
 species, 2-10
 uses, 2-10
- Tupelo, black:
 dimensional change coefficient, 13-16t
 moisture content, 4-2t
 shrinkage values, 4-6t
 strength properties, 5-6t, 5-11t
 thermal conductivity, 4-13t
- Tupelo, swamp, moisture content, 4-2t
- Tupelo, water:
 dimensional change coefficient, 13-16t
 moisture content, 4-2t
 shrinkage values, 4-6t
 strength properties, 5-6t, 5-11t
 thermal conductivity, 4-13t
- Urea and dimethylol urea for plasticizing
 wood, 19-1
- Urea adhesives:
 performance over time, 10-21 to 10-22,
 10-22fig
 structural performance, 10-11t to 10-13t
 use with composite products, 11-3
 working and strength properties, and
 uses, 10-11t to 10-13t
- Van der Waal's forces, 10-1 to 10-2
- Varnish:
 application and maintenance, 16-19t
 clear, 16-21
 use on boats, 16-25
 use on floors, 16-33 to 16-34
- Veneer:
 and adhesion, 10-3 to 10-4
 use with plywood, 11-5
- Veneered curved members, 19-3
- Ventilation and anobiids, 14-10
- Vertical-grained lumber. *See* Edgegrained
 lumber
- Vessel:
 definition, 2-2
 function, 3-10 to 3-11
- Vibration properties, 5-17
- Virola. *See* Banak
- Visual grades in the National Grading
 Rule, 7-3t
- Visual grading:
 deriving strength properties for small
 clear wood, 7-5 to 7-6, 7-5fig
 deriving modulus of elasticity for small
 clear wood, 7-5, 7-6fig
 in-grade procedures, 7-7
 sorting criteria, 7-3 to 7-4
- Visual sorting criteria in lumber stress
 grading:
 checks and splits, 7-4
 decay, 7-5
 density, 7-5
 explanation, 7-3
 heartwood and sapwood, 7-5
 knots, 7-3 to 7-4
 pitch pockets, 7-5
- shakes, 7-4
 slope of grain, 7-4
 wane, 7-5
- Waika. *See* Manni
- Walele. *See* Ilomba
- Wallaba:
 characteristics, 2-38
 decay resistance, 14-5t
 ease of bonding, 10-7t
 locality of growth, 2-38
 machinability, 2-38
 mechanical properties, 5-21t, 5-25t
 resistance to insects, 2-38
 shrinkage values, 4-8t
 uses, 2-38
- Walnut, black:
 availability at retail yards, 6-16
 characteristics, 2-10
 characteristics for painting, 16-5t
 decay resistance, 14-5t
 dimensional change coefficient, 13-16t
 ease of bonding, 10-7t
 elastic ratio, 5-2t
 kiln drying schedule, 13-11t
 locality of growth, 2-10
 moisture content, 4-2t
 nomenclature, 6-5t
 Poisson ratio, 5-3t
 shock resistance, 2-10
 shrinkage values, 4-6t
 strength properties, 5-6t, 5-11t
 uses, 2-10
 workability, 2-10
- Wane in lumber stress grading, 7-5
- Wapa. *See* Wallaba
- Warp:
 and finishing, 16-13 to 16-14
 and weathering, 16-11
 during drying, 13-7
- Waterborne preservatives. *See*
 Preservatives, waterborne
- Waterponding, effect on bending stress, 9-8
- Water repellants (*See also* water repellent
 preservative):
 application and maintenance, 16-19t,
 16-20
 discussed, 16-13
 moisture-excluding coatings, different
 from, 16-13
 used as a finish, 16-13
- Water-repellent preservatives:
 application and maintenance, 16-19t
 as a first step in finishing, 16-11
 back-priming, 16-25
 caution in use, 16-25
 effect of use on window sash and frame,
 16-18fig
 on wood exposed to marine
 environments, 16-24 to 16-25

Index

- paintability, 16-24 to 16-25
- refinishing, 16-25
- used as a finish, 16-25
- use on edges of reconstituted wood products, 16-10
- use on end grain, 16-6fig
- Wax in composite products, 11-5
- Weathering of wood:
 - and mill glaze, 16-26 to 16-27
 - artist's rendition of, 16-11fig
 - as a natural finish, 16-16
 - effect on extractives, 16-7
 - effect on lignin, 16-11
 - effect on paint adhesion, 16-12
 - erosion rates for hardwoods and softwoods, 16-12t
 - in marine environments, 16-24 to 16-25
 - of finishes, 16-16
 - process, 16-24
 - warp, 16-12 to 16-13
- Western redcedar, used for poles, 6-19
- White-cedar:
 - Atlantic. *See* Cedar, Atlantic white
 - Northern. *See* Cedar, Northern white
- White rot, 14-4
- Willow, black:
 - characteristics, 2-10
 - decay resistance, 14-5t
 - dimensional change coefficient, 13-16t
 - ease of bonding, 10-7t
 - locality of growth, 2-10
 - nomenclature, 6-5t
 - penetration, 15-16t
 - shock resistance, 2-10
 - shrinkage values, 4-6t
 - strength properties, 5-6t, 5-11t
 - toughness values, 5-27t
 - uses, 2-10
- Withdrawal resistance:
 - of lag screws, 8-12 to 8-13
 - of nails, 8-2 to 8-5
 - of wood screws, 8-10 to 8-11
- Wood buildings, consideration:
 - moisture control:
 - effect on heat flow, 17-11
 - mold, mildew, mites and health, 17-10
 - moisture control strategies, 17-11
 - paint failure and appearance problems, 17-11
 - structural failure, 17-11
 - sound control, 17-11 to 17-12, 17-12t
 - structural performance and serviceability, 17-9 to 17-10
 - thermal insulation and air infiltration control, 17-9 to 17-10
- Wood cells. *See* cells of wood
- Wood cleaners and brighteners, 16-34 to 16-35
- Wood Components Manufacturers Association, 6-4, 6-4t
- Wood fillers, 16-33
- Wood identification, 3-16
- Wood-thermoplastic composites:
 - materials, 11-25
 - production, 11-26
 - with high thermoplastic composites:
 - advantages, 11-26
 - compounding, 11-26
 - disadvantages, 11-26
 - manufacture, 11-26
 - mechanical properties, 12-9t
 - specific gravity, 12-9t
 - with low thermoplastic composites:
 - manufacture, 11-27
- Wood screws. *See* screws, wood
- Work to maximum load in bending, 5-3
- Yang. *See* Keruing
- Yellow-cedar. *See* Cedar, yellow
- Yellow-poplar:
 - characteristics, 2-10 to 2-11
 - characteristics for painting, 16-5t
 - charring rate data, 18-14t
 - connector joint strength, 8-21t
 - decay resistance, 14-5t
 - dimensional change coefficient, 13-16t
 - ease of bonding, 10-7t
 - elastic ratio, 5-2t
 - erosion of planed surfaces, 16-12t
 - flame spread index, 18-4t
 - fracture toughness, 5-27t, 5-28t
 - locality of growth, 2-10
 - moisture content, 4-2t
 - penetration, 15-16t
 - Poisson ratio, 5-3t
 - shock resistance, 2-11
 - shrinkage values, 4-6t
 - strength properties, 5-6t, 5-11t
 - thermal conductivity, 4-13t
 - toughness values, 5-27t
 - uses, 2-11
- Zinc-coated nails, 8-3
- Zinc naphthenate:
 - effectiveness, 15-11
 - inappropriate uses, 15-11
 - properties, 15-11

