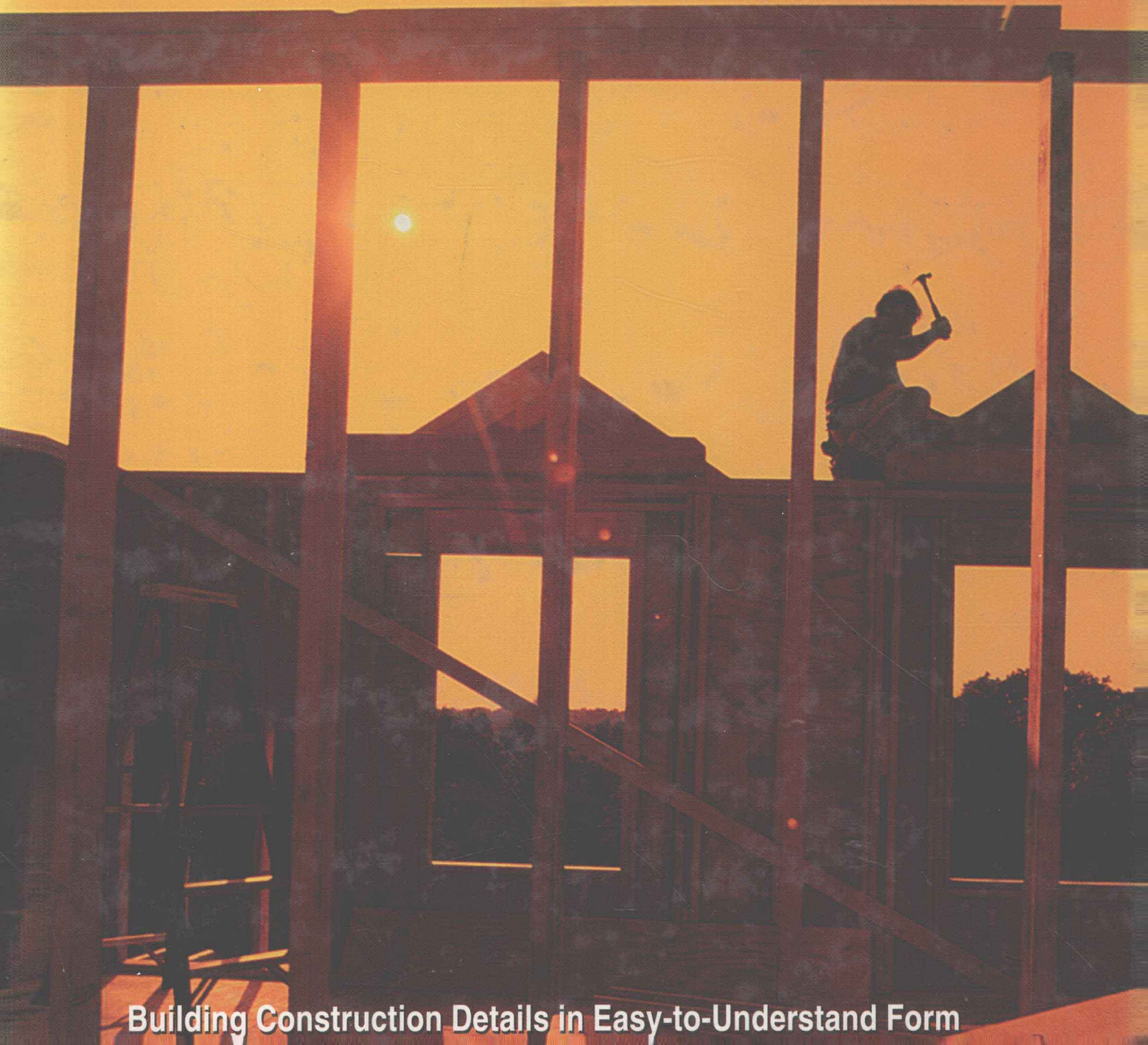


Modern Carpentry

Willis H. Wagner Howard Bud Smith



Building Construction Details in Easy-to-Understand Form

Modern Carpentry

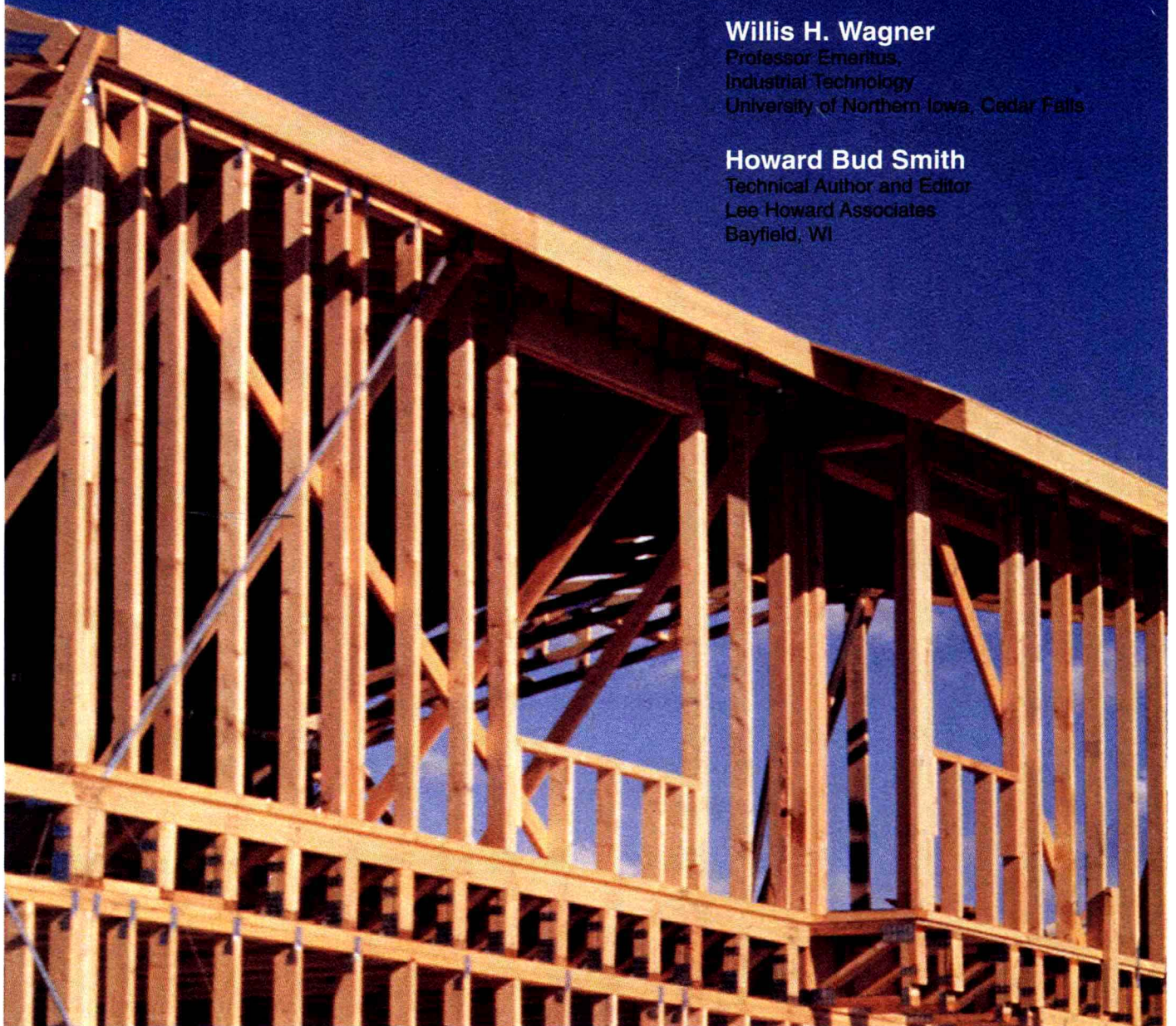
Building Construction Details in Easy-to-Understand Form

Willis H. Wagner

Professor Emeritus,
Industrial Technology
University of Northern Iowa, Cedar Falls

Howard Bud Smith

Technical Author and Editor
Lee Howard Associates
Bayfield, WI



Publisher
The Goodheart-Willcox Company, Inc.
Tinley Park, Illinois

Copyright 1996

by

THE GOODHEART-WILLCOX COMPANY, INC.

Previous editions copyright 1992, 1987, 1983, 1979, 1976,
1973, 1969

All rights reserved. No part of this book may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of The Goodheart-Willcox Company, Inc. Manufactured in the United States of America.

Library of Congress Catalog Card Number 95-12170
International Standard Book Number 1-56637-198-8

34567890-96-01 00 99 98 97

Library of Congress Cataloging-in-Publication Data

Wagner, Willis H.

Modern carpentry: building construction details in
easy-to-understand form / by Willis H. Wagner, (Howard
Sylvester Smith).

p. cm.

Includes index.

ISBN 1-56637-198-8

1. Carpentry. I. Smith, Howard Sylvester. II. Title.

TH 5606. W34 1996

694—dc20

95-12170

CIP



Introduction

Modern Carpentry is a colorful, easy-to-understand source of authoritative and up-to-date information on building materials and construction methods. It provides detailed coverage of all aspects of light frame construction. Included are site clearing, site layout, foundations, framing, insulating, sheathing, roofing, windows and doors, exterior finish, interior finish, and mechanical systems. Units are arranged in a logical sequence—similar to the order in which the various phases of construction are performed. Special emphasis is placed on safety and the use of modern tools, materials, and prefabricated components.

Information about building materials includes size and grade descriptions and also basic technical information that covers physical properties and other important characteristics. Scientific and technical discoveries have led to the development of many new materials. The proper use and application of these materials depend on a craftperson who has considerable knowledge of the material and how it will function in a completed structure.

Modern Carpentry includes basic information covering stair construction, chimney and fireplaces, systems-built structures, solar construction, remodeling, cabinet-making, painting, and decorating.

Modern Carpentry also serves as an introduction to other building trades. Information about electrical wiring, plumbing systems, and heating, ventilation, and air conditioning (HVAC) has been included to provide more exposure to the entire construction process.

Modern Carpentry contains more than 1600 carefully selected photos and drawings. Illustrations are accurately coordinated with written instructions and descriptions that are easy to read.

Modern Carpentry is designed to provide basic instruction for students in high school, vocational-technical schools, college classes, and apprentice training programs. It can also serve as a valuable reference for students in architectural drafting classes and for journeymen carpenters and construction supervisors. **Modern Carpentry** will enable do-it-yourselfers to handle many construction jobs that they would otherwise be reluctant to undertake.

Willis H. Wagner
Howard Bud Smith

New Additions to this Edition

Carpenters work closely with members of other building trades. A carpenter should have a general knowledge of what these other workers are doing and the relationship between the workers' tasks. Four new units have been added that discuss other trades:

- Unit 20—Painting, Finishing, and Decorating
- Unit 26—Electrical Wiring
- Unit 27—Plumbing Systems
- Unit 28—Heating, Ventilation, and Air Conditioning

Safety on the worksite is of paramount importance. Carpentry trainees must be taught to recognize and correct unsafe conditions and practices. Unit 2, General Safety Rules, has been added in this edition to provide this training.

An understanding of basic mathematics is a tool a carpenter will find as useful as any saw, drill, or hammer. Math is used to ensure that roofs slope properly, stairs rise evenly, and studs fit correctly. Appendix A, Carpentry Math Review, has been added to provide a “refresher course” of basic mathematics.

Special Features

Throughout the text, the following special features are used.

Safety

Safety-related items have been printed with red text to make them more noticeable. Read these items carefully—they are the most important lessons you will learn from this book.

Step-By-Step Procedures

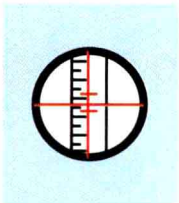
Tasks that require a series of steps to complete are set off from the text with a drawing of a sawhorse and the title of the task, such as:



Installing a Window

An ordered list of the procedures follows the title. When using the book for reference, these step-by-step procedures will be easy to find.

Tips



Brief suggestions and safety items appear in this form. A small boxed sketch, related to the topic, appears to the left of the text. Be sure to pay special attention to these tips.



Acknowledgments

The authors wish to thank the individuals and organizations listed below for the valuable information, photographs, and line illustrations they so willingly provided.

ABTco, Incorporated, Troy, MI
Acoustical and Board Products Association, Palatine, IL
ACE Hardware, Sister Bay, WI
Acme Brick Company, Fort Worth, TX
Agricultural Extension Service, University of Minnesota
Ahnen Gene, Bayfield, WI
Alcoa Building Products, Inc., Pittsburgh, PA
Alum-A-Pole Corporation, Scranton, PA
American Building Components, Omaha, NE
American Chemwood Corporation, Aurora, IL
American Institute of Timber Construction, Englewood, CO
American Olean Tile Company, Lansdale, PA
American Plywood Association, Tacoma, WA
American Standard, Incorporated, Chicago, IL
Amerock Corporation, Rockford, IL
Amoco Foam Products Company, Atlanta, GA
Andersen Corporation, Bayport, MN
Architectural Woodwork Institute, Arlington, VA
Arcways, Inc., Neenah, WI
Ark-Seal, Incorporated, Denver, CO
Armstrong World Industries, Incorporated, Lancaster, PA
Asphalt Roofing Manufacturers Association, New York, NY
Baldwin Hardware Corporation, Reading, PA
Bayfield Lumber Company, Bayfield, WI
Beecham Home Improvement Products, Dayton, OH
Benjamin Obdyke, Incorporated, Warminster, PA
Binks Manufacturing Company, Franklin Park, IL
Bird & Son, East Walpole, MA
Harry Black, Anamosa, IA
Black & Decker, Incorporated, Hunt Valley, MD
Blandin Wood Products Company, Grand Rapids, MI
Boise-Cascade Corporation, Boise, ID
Borden, Incorporated, New York, NY
Brammer Manufacturing Company, Chicago, IL
Bruce Hardwood Floors, Dallas, TX
Bullard Haven Technical School, Bridgeport, CT
The Burke Company, San Mateo, CA
C-E Morgan Building Products, Oshkosh, WI
Calculated Industries, Incorporated, Yorba Linda, CA

Canadian Plywood Association, North Vancouver, B.C., Canada
Cardinal Industries, Incorporated, Columbus, OH
Carrier International Corporation, New York, NY
Cascade Precast Concrete Products, Cascade, IA
Cella Barr Associates, Tucson, AZ
Cemco, Incorporated, Louisville, KY
CertainTeed Corporation, Valley Forge, PA
Citation Homes, Spirit Lake, IA
Clearfield Conveyors, Clearfield, UT
Colonial Stair and Woodwork Company, Jeffersonville, OH
Columns, Incorporated, Pearland, TX
Conestoga Wood Specialties, Incorporated, East Earl, PA
Construction Training School, St. Louis, MO
Council of Forrest Industries, North Vancouver, B.C., Canada
Crown Aluminum Industries, Corporation, Pittsburgh, PA
Dal-Tile Corporation, Dallas, TX
Daniel Woodhead Company, Northbrook, IL
David White Instruments, Division of Realist, Inc., Menomonee Falls, WI
Deft, Incorporated, Irvine, CA
Del Webb's Sun City, Tucson, AZ
Delta International Machine, Corporation, Pittsburgh, PA
Des Champs Laboratories, Incorporated, Natural Bridge, VA
Des Moines, Iowa Public Schools, Des Moines, IA
DeVilbiss Company, Toledo, OH
Dexter Industries, Windsor Locks, CT
Dickinson Homes, Incorporated, Kingsford, MI
District 1 Technical Institute, Eau Claire, WI
Duo-Fast Corporation, Franklin Park, IL
Dutcher Glass & Paint, Cedar Falls, IA
E.I. Dupont de Nemours and Company, Wilmington, DE
Eaton, Yale & Towne, Incorporated, White Plains, NY
Ekco Building Products Company, Canton, OH
Enercept, Incorporated, Watertown, SD
Flintkote Company, New York, NY
Foley Manufacturing Company, Minneapolis, MN
Folkers Construction, Dike, IA
Forest Products Laboratory, Madison, WI
Forestry Suppliers, Incorporated, Jackson, MS
Formica Corporation, Cincinnati, OH
Forslund Building Supply, Incorporated, Ashland, WI

Frank Paxton Lumber Company, Des Moines, IA
 GAF Building Materials Corporation, Wayne, NJ
 GB Electrical, Incorporated, Milwaukee, WI
 Gamble Brothers, Incorporated, Louisville, KY
 Gang-Nail Systems, Incorporated, Miami, FL
 Garlinghouse Company, Incorporated, Topeka, KS
 General Products Company, Incorporated,
 Fredericksburg, VA
 Georgia-Pacific Corporation, Atlanta, GA
 Gold Bond Building Products, Charlotte, NC
 Goldblatt Tool Company, Kansas City, KS
 Al Gordon Plumbing and Heating, Waterloo, IA
 Gory Associated Industries, Incorporated,
 North Miami, FL
 Greco Painting, Tucson, AZ
 Joe Griffith Construction, Cedar Falls, IA
 Grimes-Port Jones-Schwerdtfeger Architects,
 Incorporated, Waterloo, IA
 Grosse Steel Company, Incorporated, Cedar Falls, IA
 Gypsum Association, Evanston, IL
 H.L. Stud Corporation, Columbus, OH
 Haas Cabinet Company, Incorporated, Sellersburg, IN
 Hadley-Hobley Construction, Kansas City, MO
 John Hall Laminate Work, Cedar Falls, IA
 Harrington, Los Angeles, CA
 Headlee Roofing, Phoenix, AZ
 Homewood Scavenger Services, Incorporated,
 East Hazelcrest, IL
 Honeywell, Incorporated, Minneapolis, MN
 Hoxan America, Incorporated, Piscataway, NY
 HUD, Washington, DC
 I-XL Furniture Company, Goshen, IN
 Ideal Company, Waco, TX
 Independent Nail and Packing Company,
 Bridgewater, MA
 Insulspan, Nashville, TN
 Iowa Energy Policy Council, Des Moines, IA
 ITW Paslode, An Illinois Tool Works Co.,
 Lincolnshire, IL
 J. Rouleau and Associates, Hanover, NH
 Jacuzzi Whirlpool Bath, Incorporated, Walnut Creek, CA
 James Hardie Building Products, Fontana, CA
 John Dutcher Glass and Paint, Cedar Falls, IA
 John S. Tilley Ladders Company, Incorporated,
 Davenport, IA
 Johnson Manley Lumber Company, Tucson, AZ
 Journal of Light Construction, Richmond, VT
 Kasten-Weiler Construction, Fish Creek, WI
 KCPL
 Kentron Division, North American Reiss, Belle Mead, NJ
 Kitchen Kompact, Incorporated, Jeffersonville, IN
 Kohler Company, Kohler, WI
 KraftMaid Cabinetry, Incorporated, Cleveland, OH
 Kunkle Valve Company, Fort Wayne, IN
 L.J. Smith, Incorporated, Bowerston, OH
 L.S. Starrett, Company, Athol, MA
 Lennox Industries, Incorporated, Dallas, TX
 Libbey-Owens, Ford Glass Company, Toledo, OH
 LiteForm, Incorporated, Sioux City, IA
 Louisiana-Pacific Corporation, Portland, OR
 LTL Home Products, Incorporated, Schuylkill, PA
 Luxaire Heating and Air Conditioning, York, PA
 Macklanburg-Duncan, Oklahoma City, OK
 Majestic Company, Incorporated, Huntington, IN
 Makita USA, Incorporated, La Mirada, CA
 Malm Fireplaces, Incorporated, Santa Rosa, CA
 Manville Building Materials Corporation, Denver, CO
 Marquart Block Company, Waterloo, IA
 Marshfield Homes, Incorporated, Marshfield, WI
 Marvin Windows and Doors, Warroad, MN
 Masonite Corporation, Chicago, IL
 McDaniels Construction Company, Columbus, OH
 McRae True Value Hardware
 Mellin Well Service, Ashland, WI
 Memphis Hardwood Flooring Company, Memphis, TN
 Merrilat Industries, Incorporated, Adrian, MI
 MET-TILE, Incorporated, Ontario, Canada
 Milwaukee Electrical Tool Corporation, Brookfield, WI
 Monier Roof Tile Company, Irvine, CA
 Montachusett Regional Vo-Tech School, Fitchburg, MA
 National Building Code, Washington, D.C.
 National Decorating Products Association, St. Louis, MO
 National Forest Products Association, Washington, DC
 National Gypsum Company, Dallas, TX
 National Oak Flooring Manufacturers Association,
 Memphis, TN
 National Solar Heating and Cooling Center,
 Rockville, MD
 North Bennet Street School, Boston, MA
 Oak Flooring Institute, Memphis, TN
 Omni Products, Addison, IL
 Orem Research, Hinsdale, IL
 Osmose, Buffalo, NY
 Owens-Corning Fiberglass, Corporation, Toledo, OH
 Owner/Builder Directory, Incorporated, Berkeley, CA
 The Panel Clip Company, Farmington, MI
 Pass & Seymour, Incorporated, Syracuse, NY
 Patent Scaffolding Company, Long Island City, NY
 Pease Industries, Incorporated, Fairfield, OH
 Perlite Institute, Incorporated, New York, NY
 Peters Construction Company, Waterloo, IA
 Pierce Custom Homes, Limited, Green Valley, AZ
 Pittsburgh Corning Corporation, Pittsburgh, PA
 Pittsburgh Plate Glass Company, Pittsburgh, PA
 Porter-Cable Corporation, Jackson, TN
 Portland Cement Association, Skokie, IL
 Preway Incorporated, Wisconsin Rapids, WI
 RECON-Reconstruction Unlimited, Incorporated,
 Columbus, OH
 Red Cedar Shingle and Handsplit Shake Bureau,
 Seattle, WA
 Redman Industries, Incorporated, Dallas, TX
 Reed Manufacturing Company, Erie, PA
 Riviera Cabinets, Incorporated, Chesapeake, VA

Robbins/Sykes, Warren, AR
 Robert Bosch Power Tool Corporation, New Bern, NC
 Rock Island Millwork, Waterloo, IA
 Rokes Building and Supply, Waterloo, IA
 Rolscreen Company, Pella, IA
 Ronthor, Plastics Division, US Manufacturing Corporation, New York, NY
 Santa Rita High School, Tucson, AZ
 Senco Products, Incorporation, Cincinnati, OH
 Shakertown Corporation, Cleveland, OH
 Sherwin-Williams Company, Cleveland, OH
 Ship and Shore General Store, Dauphin Island, AL
 Simplex Products, Adrian, MI
 Simpson Strong Tie Company, Incorporated, San Leandro, CA
 Slant/Fin Corporation, Greenvale, NY
 Southern Forest Products Association, New Orleans, LA
 Spectra-Physics Laserplane, Incorporated, Dayton, OH
 Speed Cut, Incorporated, Corvallis, OR
 St. Paul Technical College, St. Paul, MN
 Stan Greer Millwork, Sierra Vista, AZ
 Stanley Door Systems, Farmington, CT
 Stanley Tools, Covington, GA
 Stanley Works, New Britain, CT
 Sterling, Rolling Meadows, IL
 Superior Fireplace Company, Fullerton, CA
 T.W. Lewis Construction Company, Tempe, AZ
 Tapco International, Plymouth, MI
 Technology Systems
 TECO/Lumberlok, Hayward, CA
 Therma-Tru Corporation, Bowling Green, OH
 Tibbias Flooring Company, Oneida, TN
 Timber Engineering Company, Washington, DC
 Timberpeg, Claremont, NH
 Tony's Construction, Incorporated, Tucson, AZ
 Trane Company, La Crosse, WI
 Trudeau Construction Company, Bayfield, WI
 Truss Plate Institute, Madison, WI
 Trussworks, Incorporated, Hayward, WI
 TrusWal Systems, Incorporated, Troy, MI
 U.S. Department of Agriculture, Washington, D.C.
 Ungrodt Hardware Company, Washburn, WI
 United Brotherhood of Carpenters & Joiners of America, Washington, DC
 United States Gypsum Company, Chicago, IL
 United States Steel Corporation, Pittsburgh, PA
 United Technologies Carrier, Indianapolis, IN
 Universal Form Clamp Company, Chicago, IL
 USG Corporation, Chicago, IL
 Vermiculite Institute, Minneapolis, MN
 Vermont American Tool Company, Lincolnton, NC
 VICA (Vocational Industrial Clubs of America), Leesburg, VA
 Village of Flossmoor, Flossmoor, IL
 Visador Company, Jacksonville, FL
 Wageman Construction, Cedar Falls, IA
 Wallace Murray Corporation, Nampa, ID
 Waterloo-Cedar Falls Iowa Daily Courier, Waterloo, IA
 Wausau Homes, Incorporated, Wausau, WI
 Wellborn Cabinet, Incorporated, Ashland, AL
 Weller, Division of Cooper Tools
 Western Wood Products Association, Portland, OR
 Weyerhaeuser Company, Tacoma, WA
 Whirlpool Corporation, Benton Harbor, MI
 William Powell Company
 Wiss
 Wolmanized Wood Producers
 Wood Conversion Company, St. Paul, MN
 Yankee Barn Homes, Incorporated, Grantham, NH
 Zimmerman Builders, Waterloo, IA



Contents

Section 1 Preparing to Build

Unit 1 Building Materials17

Lumber / Wood Structure and Growth / Kinds of Wood / Cutting Methods / Moisture Content and Shrinkage / Seasoning Lumber / Moisture Meters / Lumber Defects / Softwood Grades / Hardwood Grades / Lumber Stress Values / Lumber Sizes / Calculating Board Footage / Metric Lumber Measure / Panel Materials / Plywood / Grade-Trademark Stamp / Exposure Ratings / Span Ratings / HDO and MDO Plywood / Composite Board / Hard Board / Particleboard / Waferboard / Wood Treatments / Handling and Storage / Engineered Lumber / Nonwood Materials

Unit 2 General Safety Rules.....51

Clothing / Personal Protective Equipment / Hand Tools / Power Tools / Good Housekeeping / Decks and Floors / Scaffolds and Ladders / Falling Objects / Handling Pressure-Treated Lumber / Spray Painting / Lifting and Carrying / Fire Protection / First Aid

Unit 3 Hand Tools55

Measuring and Layout Tools / Saws / Planing, Smoothing, and Shaping Tools / Drilling and Boring Tools / Fastening Tools / Prying Tools / Gripping and Clamping Tools / Tool Storage / Care and Maintenance

Unit 4 Power Tools75

Power Tool Safety / Portable Circular Saws / Saber Saws / Chain Saws / Portable Electric Drills / Rotary Hammer and Hammer Drills / Power Planes / Portable Routers / Portable Sanders / Staplers and Nailers / Radial Arm Saws / Table Saws / Jointers / Special Saws / Saw Safety / Specialty Tools / Power Tool Care and Maintenance

Unit 5 Leveling Instruments101

Plot Plan / Establishing Building Lines / Care of Leveling Instruments / Setting Up Leveling Instruments / Sighting / The Horizontal Graduated Circle / Laying Out and Staking a Building / Finding Grade Level / Setting Footing Stakes / Contour Lines / Running Straight Lines with a Transit / Vertical Planes and Lines / Laserplane System

Unit 6 Plans, Specifications, and Codes114

Drawings in a Set of Plans / Stock Plans / Scale / Floor and Foundation Plans / Elevations / Framing Plan / Section and Detail Drawings / Lists of Materials / Symbols / How to Scale a Drawing / Changing Plans / Specifications / Modular Construction / Metric Measurement / Building Codes / Building Permits and Inspection

Section 2

Footings, Foundations, and Framing

Unit 7 Footings and Foundations143

Clearing the Site / Laying Out Building Lines / Excavation / Foundation Systems / Footings / Slabs / Forms for Footings / Concrete / Erecting Wall Forms / Placing Concrete / Concrete Block Foundation / Mortar / Laying Concrete Block / Lintels / Insulating Foundation Walls / Waterproofing / Backfilling / Slab-on-Ground Foundations / Basement Floors / Entrance Platforms and Stairs / Sidewalks and Drives / Screeding / Edging / Wood Foundations / Cold Weather Construction / Admixtures / Estimating Materials



Unit 8 Floor Framing179

Platform Framing / Balloon Framing / Girders and Beams / Steel Beams / Posts and Columns / Framing over Girders and Beams / Sill Construction / Termite Shields / Installing Sills / Joists / Laying Out Joists / Installing Joists / Framing Openings / Bridging / Special Framing Problems / Cutting Floor Joists / Low-Profile Floor Frames / Open Web Trusses / Solid Web Truss / Subfloors / Plywood / Glued Floor System / Installing Steel Joists / Estimating Materials



Unit 9 Wall and Ceiling Framing205

Parts of the Wall Frame / Corners / Partition Intersections / Rough Openings / Alternate Header Construction / Plate Layout / Story Pole / Master Stud Layout / Constructing Wall Sections / Partitions / Plumbing in Walls / Bracing / Tri-Level and Split-Level Framing / Wall Sheathing / Multistory Floor Framing / Ceiling Framing / Strongbacks / House Wrap / Framing with Steel / Estimating Materials / Estimating Studs

Unit 10 Roof Framing233

Roof Types / Roof Supports / Parts of a Roof Frame / Types of Rafters / Layout Terms and Principles / Using the Rafter Table / Using the Super Square / Erecting a Gable Roof / Gable End Frame / Hip and Valley Rafters / Jack Rafters / Valley Jacks / Erecting Jack Rafters / Special Problems / Roof Openings / Roof Anchorage / Collar Beams / Purlins / Dormers / Flat Roofs / Mansard Roofs / Gambrel Roofs / Special Framing / Roof Truss Construction / Bracing of Truss Rafters / Steel Roof Framing / Roof Sheathing / Installing Sheathing / Panel Clips / Estimating Materials / Model Construction

Section 3

Closing In

Unit 11 Roofing Materials and Methods272

Types of Materials / Roofing Terms / Preparing the Roof Deck / Asphalt Roofing Products / Underlayment / Drip Edge / Barrier at Eaves / Flashing / Installing Open Valley Flashing / Installing Woven Valley Flashing / Installing Closed-Cut Valley Flashing / Flashing at a Wall / Chimney Flashing / Chimney Saddle / Vent Stack and Skylight Flashing / Strip Shingles / Fastening Shingles / Starter Strips / First and Succeeding Courses / Hips and Ridges / Wind Protection / Individual Asphalt Shingles / Low Slope Roofs / Roll Roofing / Reroofing / Wood Shingles / Wood Shakes / Reroofing over Old Shingles / Tile Roofing / Metal Roofing / Aluminum Roofing / Terne Metal Roofing / Aluminum Shakes / Zinc-Aluminum Coated Steel Roofing / Cutting Metal Panels / Ridge Vents for Asphalt Roofing / Wood Gutters / Metal and Plastic Gutters / Estimating Materials / Safety





Unit 12 Windows and Exterior Doors317

Manufacture / Double-Hung Windows / Horizontal Sliding Windows / Casement Windows / Awning Windows / Hopper Windows / Multiple-Use Windows / Jalousies / Fixed Windows / Window Heights / Window Glass / Energy Efficient Windows / Double- and Triple-Sealed Windows / Low-Emissivity Glazing / Argon-Filled Insulating Glass / Screens / Muntins / Parts of Windows / Windows in Plans and Elevations / Window Sizes / Detailed Drawings / Jamb Extensions / Story Pole / Installing Windows / Glass Blocks / Installing Glass Blocks / Replacing Windows / Skylights / Exterior Door Frames / Installing Door Frames / Sliding Glass Doors / Garage Doors / Installing a Garage Door / Installing Bow and Box Bay Windows

Unit 13 Exterior Wall Finish351

Cornice Design / Parts of Cornice and Rake Sections / Cornice and Rake Construction / Prefabricated Cornice Materials / Metal Soffit Materials / Hanging Metal Soffit / Wall Finish / Horizontal Wood Siding / Wall Sheathing and Flashing / Estimating Siding / Vertical Siding / Wood Shingles / Shingle and Shake Panels / Re-Siding with Wood Shingles / Plywood Siding / Hardboard Siding / Siding Systems / Aluminum Siding / Vinyl Siding / Stucco / Exterior Insulation Finish System (EIFS) / Brick and Stone Veneer / Blinds and Shutters

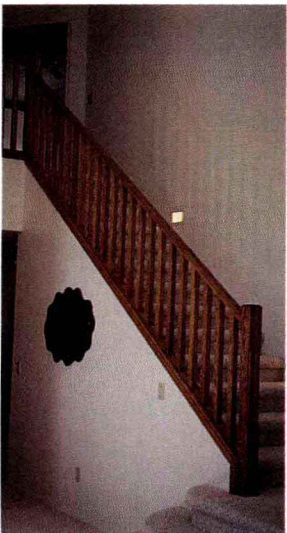
Section 4 Finishing

Unit 14 Thermal and Sound Insulation393

Building Sequence / How Heat is Transmitted / Conduction / Convection / Radiation / Thermal Insulation / Heat Loss Coefficient / Types of Insulation / Reflective Insulation / Where to Insulate / Basementless Structures / Insulating Existing Foundations / Condensation / Ventilation / Safety with Insulation / Installing Batts and Blankets / Installing Rigid Insulation / Insulating Basement Walls / Insulating Existing Structures / Stopping Air Infiltration / Estimating Materials / Acoustics and Sound Control / Acoustical Terms / Sound Intensity / Transmission / Wall Construction / Floors and Ceilings / Noise Reduction within a Space / How Acoustical Materials Work / Suspended Ceilings / Acoustical Plaster / Installation of Materials / Maintenance

Unit 15 Interior Wall and Ceiling Finish429

Drywall Construction / Single Layer Construction / Measuring and Cutting / Nails and Screws / Adhesive Fastening / Joint and Fastener Concealment / Steel Frame Applications / Double Layer Construction / Backing Board / Moisture-Resistant Wallboard / Veneer Plaster / Predecorated Wallboard / Wallboard on Masonry Walls / Installing Plywood / Hardboard / Plastic Laminates / Solid Lumber Paneling / Installing Solid Paneling at an Angle / Plaster / Plaster Base / Installing Lath / Metal Lath / Reinforcing / Plaster Grounds / Plaster Base on Masonry Walls / Plastering Materials and Methods / Ceiling Tile / Installing Furring / Installing Tile / Metal Track System / Suspended Ceiling / Estimating Materials / Determining Area of Rooms / Sheet Materials / Estimating Solid Paneling / Estimating Gypsum Lath



Unit 16 Finish Flooring463

Wood Flooring / Types of Wood Flooring / Sizes and Grades / Subfloors / Installing Wood Strip Flooring / Nailing / Laying Around Projections / Multiroom Layout / Estimating Strip Flooring / Wood Flooring over Concrete / Wood Block (Parquet) Flooring / Prefinished Wood Flooring / Underlayment / Cementitious Underlayment / Hardboard and Particleboard / Plywood / Resilient Floor Tile / Installing Resilient Tile / Spreading Adhesive / Laying Tile / Installing Resilient Tile over Concrete / Self-Adhering Tile / Sheet Vinyl Flooring / Ceramic Floor Tile / Installing Ceramic Tile

Unit 17 Stair Construction.....483

Types of Stairs / Parts and Terms / Stairwell Framing / Stair Design / Stair Calculations / Stairway Length / Stringer Layout / Treads and Risers / Winder Stairs / Open Stairs / Using Stock Stair Parts / Spiral Stairways / Disappearing Stair Units

Unit 18 Doors and Interior Trim.....501

Molding / Interior Door Frames / Installing Door Frames / Door Casing / Using Plinth Blocks / Panel Doors / Flush Doors / Sizes and Grades / Installing Doors / Installing Hinges / Doorstops / Door Locks / Deadbolts / Lock Installation / Thresholds and Door Bottoms / Prehung Door Unit / Sliding Doors (Pocket Type) / Folding and Bifolding Doors / Multipanel Folding Doors / Window Trim / Baseboard and Base Shoe

Unit 19 Cabinetmaking527

Drawings for Cabinetwork / Standard Sizes / Types of Construction / Factory-Built Cabinets / Cabinet Materials / Cabinet Installation / Cabinets for Other Rooms / Building Cabinets / Master Layout / Basic Framing / Facing / Drawer Guides / Drawers / Drawer Construction / Doors / Installing Flush Doors / Cutting and Fitting Lip Doors / Sliding Doors / Counters and Tops / Working Laminates / Adhering Laminates / Cabinet Hardware / Other Built-In Units / Sequence of Interior Finish

Unit 20 Painting, Finishing, and Decorating557

Safety / Painting and Finishing Tools / Brushes / Rollers, Pans, and Pads / Mechanical Spraying Equipment / Ladders and Scaffolds / Sanders / Painting, Finishing, and Decorating Materials / Paints, Varnishes, and Stains / Color Selection / Preparing Surfaces for Coating / Interior Painting / Exterior Painting / Roller and Pad Application / Working with Stains and Clear Finishes / Estimating Coatings / Problems with Coatings / Hanging Wall Coverings / Calculating Wall Covering / Preparing to Hang Wall Covering / Preparing the Wall Covering / Booking the Strips / Hanging Wall Covering around Openings



Section 5 Special Construction

Unit 21 Chimneys and Fireplaces581

Masonry Chimneys / Flue Linings / Construction / Masonry Fireplaces / Design Details / Hearth / Side and Back Walls / Damper and Throat / Smoke Shelf and Chamber / Flue Size / Construction Sequence / Special Designs / Built-In Circulars / Prefabricated Chimneys / Prefabricated Fireplaces / Chimneys for Prefabricated Fireplaces / Glass Enclosures

Unit 22 Post-and-Beam Construction595

Advantages / Foundations and Posts / Floor Beams / Beam Descriptions / Roof Beams / Fasteners / Partitions / Planks / Stressed Skin Panels / Box Beams / Laminated Beams and Arches / Prefabricating Post-and-Beam Structures

Unit 23 Systems-Built Housing611

Components / Transporting Systems-Built Homes / Types of Factory-Built Homes / The Modular House / Panelized Homes / Log Homes / On-Site Erection / Assembling a Panelized Home / Manufactured Homes



Unit 24 Passive Solar Construction.....627

How Radiation and Heat Act / Conduction / Convection / Types of Passive Solar Energy / Direct Gain System / Indirect Gain System / Water Storage Well / Isolated Gain System / Passive Solar Advantages / Passive Solar Disadvantages / Solar Heat Control / Overhangs / Movable Insulation / Venting / Orientation / Energy Balance / Building Passive Solar Structures / Sizing Thermal Storage Systems / Wall Thickness / Sizing Direct Gain Storage / Effect of Color on Collecting Surface / Wall Construction / Special Concerns / Designing the Isolated Grid System / Passive Thermosiphon System / Insulating Passive Solar Buildings



Unit 25 Remodeling, Renovating, and Repairing643

What Comes First? / Sequence of Exterior Renovation / Interior Renovation / Design of Old Structures / Replacing Rotted Sills / Hidden Structural Details / Removing Old Walls / Recognizing

Bearing Walls / Providing Shoring / Framing Openings in a Bearing Wall / Supporting Headers / Sizing Headers / Computing the Load / Concealed Headers and Saddle Beams / Small Remodeling Jobs / Replacing or Repairing Interior Doors / Installing New Windows / Repairing Wood Singles / Repairing Asphalt Shingles / Building Additions onto Homes / Solar Retrofitting / Basic Solar Designs / Thermosiphon / Responsible Renovation / Safety: Fall Protection

Section 6

Mechanical Systems

Unit 26 Electrical Wiring669

Tools, Equipment, and Materials / Materials / Basic Electrical Wiring Theory / Installing the Service / Reading Blueprints / Running Branch Circuits / Device Wiring / Electrical Troubleshooting / Testing Receptacles / Testing Switches / Testing Fixtures



Unit 27 Plumbing Systems683

Two Separate Systems / Tools / Materials / Fixtures / Printreading / Installing Plumbing / Connecting Pipe / Bending and Unrolling Copper Tubing / Other Considerations / Wells and Pumps / Unclogging Drains / Safety

Unit 28 Heating, Ventilation, and Air Conditioning701

Conservation Measures / HVAC Systems / Forced Air Systems / Installing and Maintaining Forced Air Systems / Warm Air Perimeter Systems / Hydronic Perimeter Heating System / Hydronic Radiant Heat / Air Cooling Systems / Ducts / Controls / Air Exchangers / Heat Pumps / Direct Heating Systems / Safety

Section 7

Scaffolds and Careers



Unit 29 Scaffolds and Ladders719

Types of Scaffolding / Manufactured Scaffolding / Mobile Scaffolding / Site-Constructed Wood Scaffolding / Brackets, Jacks, and Trestles / Safety Rules for Scaffolding / Ladders / Safety Rules for Ladders

Unit 30 Carpentry—A Career Path729

Economic Outlook for Construction / Employment Outlook / Job Opportunities / Training / Apprenticeship / Apprenticeship Stages / Personal Qualifications / Entrepreneurship / Characteristics of Entrepreneurs / Teaching as a Construction Career / Organizations Promoting Construction Training

Appendix A Carpentry Math Review739

Appendix B Technical Information745

Glossary771

Index781



Preparing to Build

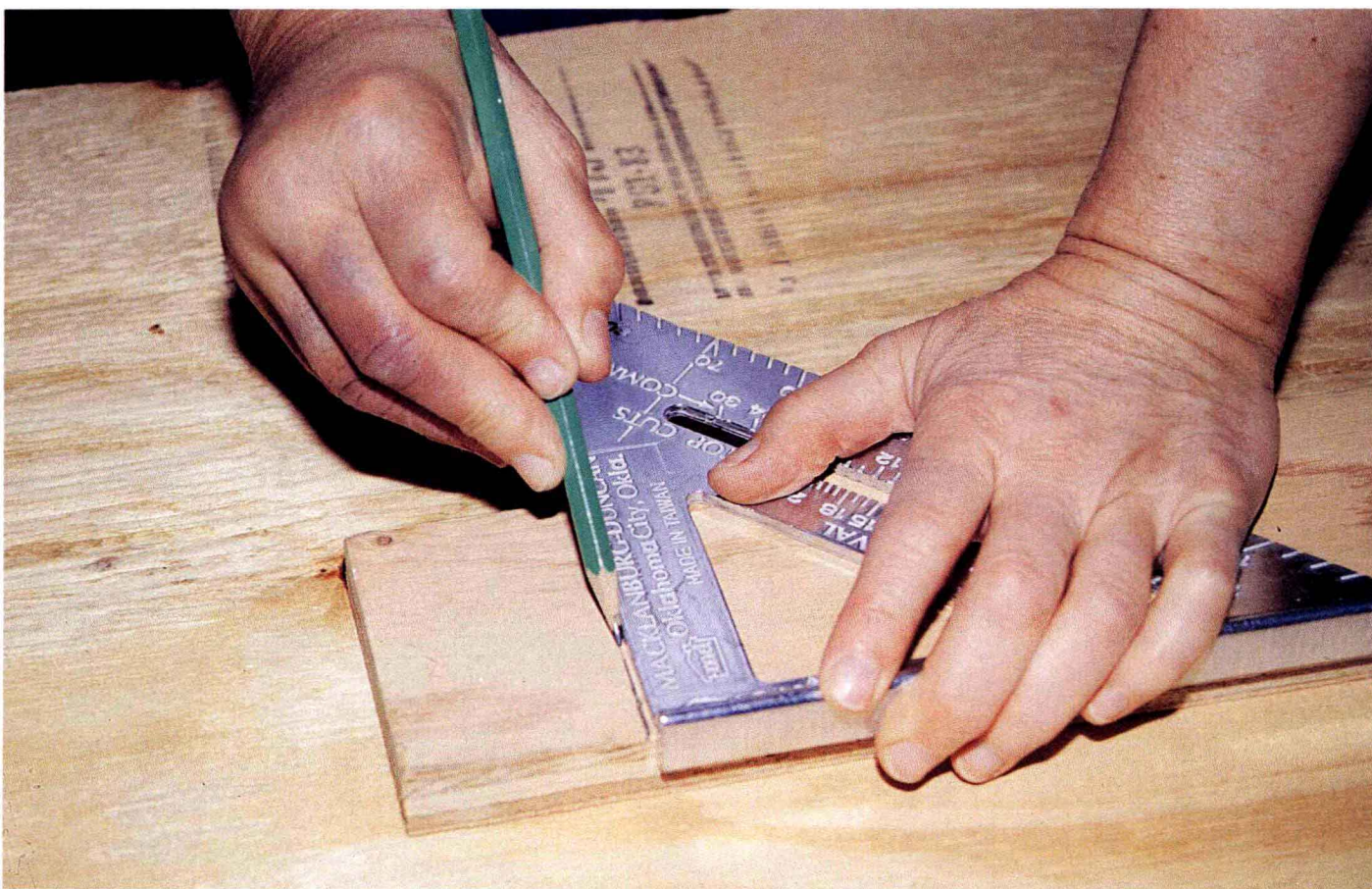
- Unit 1 Building Materials
- Unit 2 General Safety Rules
- Unit 3 Hand Tools
- Unit 4 Power Tools
- Unit 5 Leveling Instruments
- Unit 6 Plans, Specifications, and Codes







Construction drawings must be used as a guide throughout the construction process.



Before installing wood members, accurate measurements must be made to ensure proper fit.