Preface

Print Reading for Construction is a textbook for those who wish to learn basic print reading and increase their knowledge of construction drawings. The term *print reading*, as used in this textbook, refers to interpreting and visualizing construction drawings.

Print Reading for Construction is a combination text and workbook, or "write-in text." The text tells and shows how, and the workbook provides space for meaningful print reading, sketching, and estimating activities. Actual construction prints used with the text can be found in the **Large Prints** folder. They provide realistic job experience. The text is equally applicable for students studying construction, estimating, or construction management.

Print Reading for Construction is organized into sections based on a progression of topics from simple to complex. A list of *Technical Terms* opens each unit. *Learning Objectives* are presented to provide an overview of the content and define the most important skills you will learn in the unit. Each unit is followed by *Test Your Knowledge* questions. These brief questions will help you evaluate how well you understand the topics presented in the unit.

Most units include two or more *Activities* that provide you with practical print reading experience. Many of these will make use of the residential and commercial prints contained in the **Large Prints** folder. The write-in text format with perforations allows you to remove pages from the book, complete assignments, and turn them in directly to the instructor.

Using the Large Prints

The **Large Prints** folder contains seven sets of construction prints for the building projects referenced in this text. There are 140 total prints in the folder package. Included are sets for four residential building projects and three commercial building projects.

Print reading activities corresponding to each project are presented in this text. Three of the projects are referenced in the print reading activities in Units 8–17:

- The Sullivan Residence
- The Marseille Residence
- Delhi Flower and Garden Centers Greenhouse and Sales Building

The print reading activities for these projects appear at the end of each unit and are intended to be completed after studying the corresponding unit.

There are four building projects referenced in the *Advanced Print Reading Projects* section of this text. These include two residential projects and two commercial projects:

- Advanced Project A—Residence Mercedes Pointe
- Advanced Project B—The North House Residence
- Advanced Project C—Office and Warehouse
- Advanced Project D—Cincinnati Manor Building

The print reading activities for these projects are more extensive in scope and are intended for additional print reading practice.

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Organization of Large Prints

Prints in the **Large Prints** folder are arranged so that each building project is printed on one side of the sheets. This organization helps in locating information across multiple sheets. The projects are grouped in the **Large Prints** folder as follows:

Group A—Left Pocket:

Front of sheet:

- The Sullivan Residence (5 prints)
- The Marseille Residence (9 prints)
- Advanced Project A—Residence Mercedes Pointe (8 prints)
- Advanced Project B—The North House Residence (13 prints)

Back of sheet:

- Delhi Flower and Garden Centers Greenhouse and Sales Building (30 prints)
- Advanced Project C—Office and Warehouse (5 prints)

Group B—Right Pocket:

Front of sheet:

- Advanced Project C—Office and Warehouse (35 prints)

Back of sheet:

- Advanced Project D—Cincinnati Manor Building (35 prints)

Indexes for Large Prints

The following tables list the prints in the **Large Prints** folder for the projects referenced in Units 8–17. Indexes for the prints associated with the advanced print reading activities appear later in the text where the projects are referenced.

The Sullivan Residence Print Index (5 Prints)

Print Label	Sheet Number	Sheet Title
SUL-1	1	Exterior Elevations, Details, and Notes
SUL-2	2	Foundation Plan
SUL-3	3	First Floor Plan
SUL-4	4	Truss Profiles, Roof Plan, and Details
SUL-5	5	Exterior Elevations and Wall Section

The Marseille Residence Print Index (9 Prints)

Print Label	Sheet Number	Sheet Title
MAR-1	1	Exterior Elevations, Details, and Notes
MAR-2	2	Foundation Plan
MAR-3	3	First Floor Plan
MAR-4	4	Second Floor Plan
MAR-5	5	Truss Profiles, Roof Plan, and Details
MAR-6	6	Exterior Elevations and Sections
MAR-7	MP2	Foundation Mechanical/Plumbing Plan
MAR-8	MP3	First Floor Mechanical/Plumbing Plan
MAR-9	MP4	Second Floor Mechanical/Plumbing Plan

Delhi Flower and Garden Centers Greenhouse and Sales Building Print Index (30 Prints)

Print Label	Sheet Number	Sheet Title	Print Label	Sheet Number	Sheet Title
DEL-1	1	Title Sheet	DEL-16	S1.1	Foundation Plan
DEL-2	4	Existing Conditions/Demolition Plan	DEL-17	S1.2	Foundation Plan
DEL-3	5	Grading and Erosion Control Plan	DEL-18	S2.1	Roof Framing Plan
DEL-4	A0.1	Supplemental Specifications	DEL-19	S2.2	Framing Plans and Truss Elevations
DEL-5	A1.1	First Floor Plan	DEL-20	S3.1	Foundation Details
DEL-6	A1.2	First Floor Plan, Details	DEL-21	S4.1	Framing Details
DEL-7	A1.3	Mezzanine Plan	DEL-22	S5.1	Structural Notes
DEL-8	A2.1	Roof Plan	DEL-23	P1.1	Plumbing Plans
DEL-9	A3.1	Reflected Ceiling Plan	DEL-24	P2.1	Sanitary Isometric, Fixture Schedule, Plumbing Specs
DEL-10	A4.1	Exterior Elevations	DEL-25	M1.1	First Floor Mechanical Plan
DEL-11	A4.2	Exterior Elevations	DEL-26	M1.2	Mezzanine Mechanical Plan and Schedules
DEL-12	A5.1	Interior Elevations and Schedules	DEL-27	E1.1	First Floor Lighting Plan
DEL-13	A6.1	Enlarged Plans and Interior Elevations	DEL-28	E1.2	Lighting Plans and Schedules
DEL-14	A9.1	Interior Wall Sections	DEL-29	E2.1	First Floor Power Plan
DEL-15	A9.2	Exterior Wall Sections	DEL-30	E4.1	Riser Diagram, Panel Schedules, and Notes

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New to This Edition

This edition of **Print Reading for Construction** includes new illustrations and expanded coverage of topics throughout the text. The following is a summary of changes and new features in this edition.

- New photographic and drawing-based illustrations highlighting construction methods and materials discussed in the text.
- Expanded coverage on using metric scales in Unit 3, *Reading Measuring Tools and Using Scales*. Coverage explains how to make readings with metric scales, how to work with different metric scales, and typical metric drawing scales used on construction drawings.
- Clarification of the gage system used for classifying sheet metal gages in Unit 7, *Construction Materials—Types and Uses*.
- Expanded coverage on open-web steel joists in Unit 11, *Structural Prints*.
- Coverage on open-web truss joists (floor trusses) in Unit 12, *Residential Framing Prints*.
- Enhanced coverage on developing takeoffs and estimates in Unit 17, *Estimating Construction Costs*. New takeoff and estimating sheets are provided for use with the construction estimating activity at the end of the unit. In addition, a new Microsoft Excel® spreadsheet form is available for completing the assignment electronically as assigned by the instructor. The spreadsheet form includes the entries from the Materials List in Activity 17-1. Cells in the file contain mathematical formulas for automatically calculating total costs from data entered in the file.
- Additional questions are provided for student evaluation in the *Test Your Knowledge* review sections.
- New videos supplementing the text have been added to the instructor's resources to reinforce content and assist visual learners.

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About the Authors

Daniel P. Dorfmueller is an instructor and consultant for the construction industry. Mr. Dorfmueller resides in Lebanon, Ohio, and teaches print reading for construction and concrete courses. Mr. Dorfmueller has been involved in the construction industry for more than 45 years and has been teaching for more than 25 years.

Mr. Dorfmueller is a Fellow member of the American Concrete Institute (ACI) and has served on many ACI committees. Mr. Dorfmueller speaks at many construction-related trade shows such as the World of Concrete, Expo Hormigon in Chile, and the Art Deco convention, and has presented at events for various industry associations. He has written several articles and served as an adjunct instructor at Northern Kentucky University. Mr. Dorfmueller holds a bachelor's degree in architecture from the University of Cincinnati.

During his career, Dr. Walter C. Brown was a leading authority in the fields of drafting and print reading. He served as a consultant to industry on design and drafting standards and procedures and held a variety of professional offices of state and national associations.

Reviewers

The authors and publisher wish to thank the following industry and teaching professionals for their valuable input into the development of **Print Reading for Construction**.

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Jodie Eiland
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Shawnee, OK

G. Scott Fleming
Fleming College
Peterborough, ON

Louie G. Garcia
Sierra College
Rocklin, CA

Robert P. Gresko
Pennsylvania College of Technology
Williamsport, PA

Christophor Jurin
Construct-Ed
Telford, PA

Jonathan M. Keck
Ivy Tech Community College
Fort Wayne, IN

Benjamin King
Ohio State University ATI
Wooster, OH

Peter Kruppenbacher
Pennsylvania College of Technology
Williamsport, PA

Charles Mallia
Southern Technical College
Auburndale, FL

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York Technical College
Rock Hill, SC

Andrea Ofori-Boadu
North Carolina A&T State University
Greensboro, NC

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North Bay, ON

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Brick Institute of America
CertainTeed Corporation
CESO Engineers & Architects
Christensen, Cassidy, Billington and Candelaria, Inc., Architects
CITY Properties Group, LLC
Concrete Reinforcing Steel Institute
constructionphotographs.com
CR architecture + design
Cypress Specialty Steel Company
Dale/Incor
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LiveRoof, LLC
Marathon Steel Company
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McCabe Lumber
MeadowBurke
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The authors wish to express special appreciation to the companies that provided construction prints for the projects used in this textbook:

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Delhi Flower and Garden Center
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PE-Services
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Goodheart-Willcox Office and Warehouse Facility
Charles E. Smith, Areté 3 Ltd.

The Marseille Residence
Studer Residential Designs, Inc.
Schadler Plumbing
Doc Rusk Heating & Cooling

The North House Residence
Norris & Dierkers Architects/Planners, Inc.

Residence Mercedes Pointe
Eagle Custom Homes
McGill Smith Punshon, Inc.
Superior Designs, LLC

The Sullivan Residence
Studer Residential Designs, Inc.
Schadler Plumbing
Doc Rusk Heating & Cooling

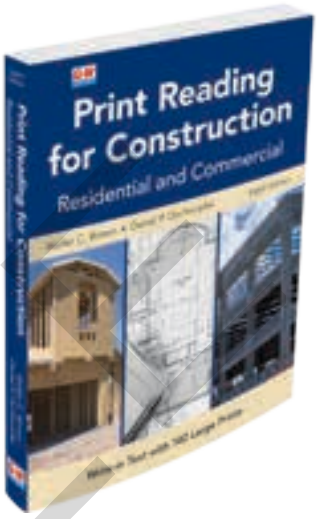
Dan Dorfmueller (best known as "dorf") thanks his wife, Deb, and his children and grandchildren for supporting the many hours spent on the revision of this book.

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TOOLS FOR STUDENT AND INSTRUCTOR SUCCESS

Student Tools

Student Text



Print Reading for Construction is designed to teach students how to read prints used in residential and commercial construction. It provides a practical way to help students learn and master the skill of print reading. Included with the text is a *Large Prints* folder with 140 construction prints from residential and commercial construction. Activity questions at the ends of units in the text are based on the prints and allow students to apply concepts and gain print reading experience. Questions in the *Advanced Projects* section provide greater challenge and give students valuable hands-on experience.

Print Reading for Construction covers both residential and commercial construction with a focus on construction methods and materials. The text covers introductory topics in depth to help ensure a full understanding of basic concepts before progressing to more advanced topics. Topics covered include construction drawing organization, construction math and related applications, using measuring tools, orthographic projection principles, reading specifications, architectural drawings, structural construction, wood and metal framing systems, mechanical building systems, and estimating. The text is extensively illustrated with clear and detailed examples that enhance learning. Review questions and print reading activities enable students to reinforce learning and use problem-solving skills.

Instructor Tools

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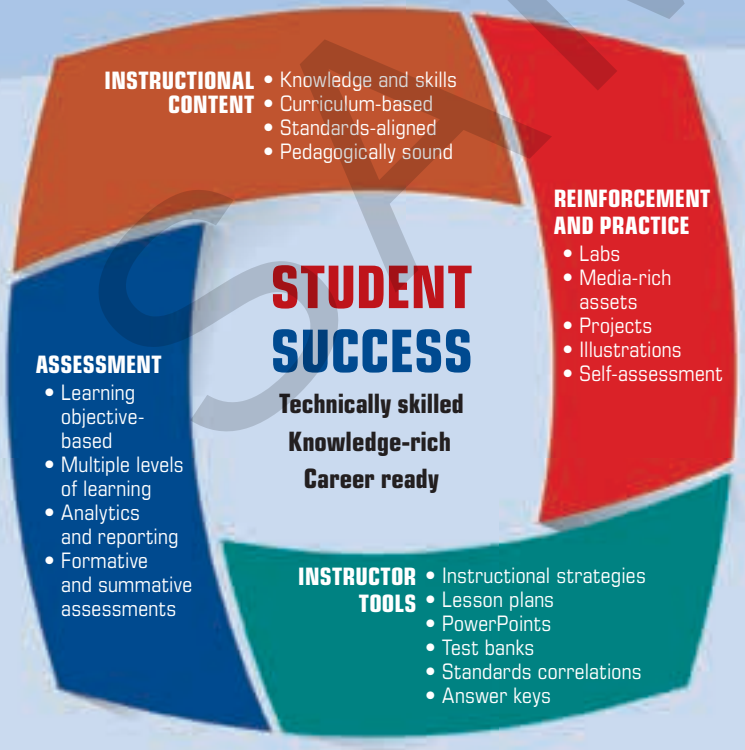
Instructor Resources One resource provides instructors with time-saving preparation tools such as answer keys, editable lesson plans, and other teaching aids.

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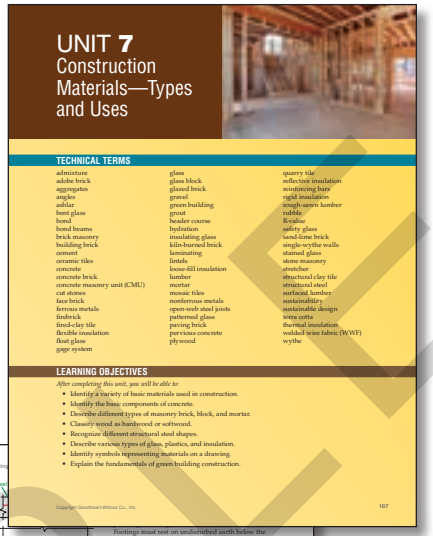
EMPLOYABILITY SKILLS · TECHNICAL SKILLS · ACADEMIC KNOWLEDGE · INDUSTRY RECOGNIZED STANDARDS

Features of the Textbook

The instructional design of **Print Reading for Construction** includes student-focused learning tools to help you succeed. This visual guide highlights these features.

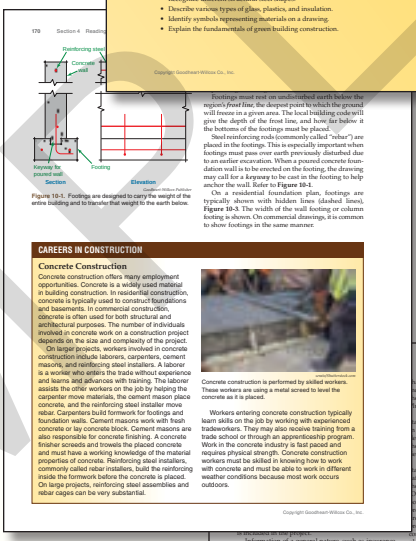
Unit Opening Materials

Each unit opener contains a list of technical terms and a list of learning objectives. The **Technical Terms** list the key words to be learned in the unit. Definitions for the **Technical Terms** are given in the Glossary. The **Learning Objectives** clearly identify the knowledge and skills to be gained when the unit is completed.



Additional Features

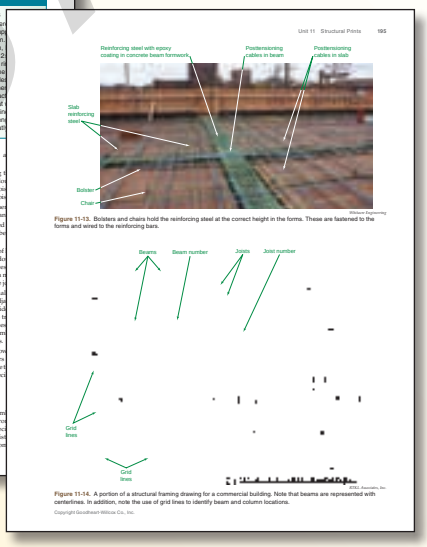
Additional features are used throughout the body of each unit to further learning and knowledge. **Careers in Construction** features provide information about career opportunities in the construction trades. **Green Building** features highlight key items related to green building technology, sustainability, energy efficiency, and environmental issues. **Notes** clarify explanations in the text and provide more detailed information about related topics.

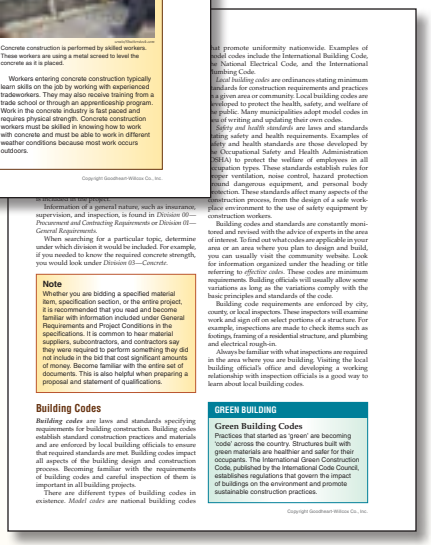


Illustrations

Illustrations have been designed to clearly and simply communicate the specific topic. Photographic images have been updated in this edition to show new technology and products in the construction industry.

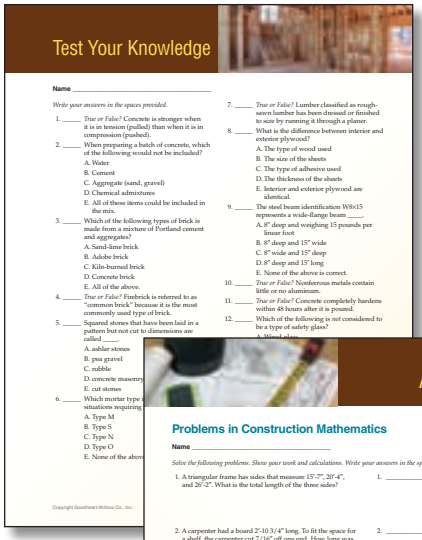






Review Content

Review content at the end of each unit provides an opportunity to reinforce learning and apply concepts. **Test Your Knowledge** questions enable you to demonstrate comprehension of the textbook content. **Activities** allow you to apply knowledge and solve problems. **Print Reading Activities** provide opportunities to apply print reading skills using prints in the **Large Prints** folder that accompanies the text. Use the corresponding prints to locate information and answer the questions. **Advanced Projects** are provided at the end of the text for additional practice in reading prints and completing exercises.

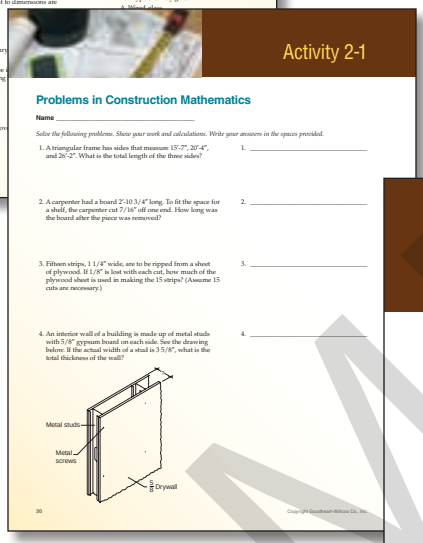

Test Your Knowledge

Name _____

Write your answers in the spaces provided.

1. _____ *True or False?* Concrete is stronger when it is in tension (pulled) than when it is in compression (pushed).
2. _____ When preparing a batch of concrete, which of the following would not be included?
   A. Water
   B. Cement
   C. Aggregate (sand, gravel)
   D. Chemical admixtures
   E. All of these items could be included in the mix.
3. _____ Which of the following types of brick is made from a mixture of Portland cement and aggregates?
   A. Sand-lime brick
   B. Adobe brick
   C. Kiln-burned brick
   D. Concrete brick
   E. All of the above.
4. _____ *True or False?* Firebrick is referred to as "common brick" because it is the most commonly used type of brick.
5. _____ Squared stones that have been laid in a pattern but not cut to dimensions are called _____.
   A. ashlar stones
   B. pea gravel
   C. rubble
   D. concrete masonry
   E. cut stones
6. _____ Which mortar type c
   situations requiring
   A. Type M
   B. Type S
   C. Type N
   D. Type O
   E. None of the above
7. _____ *True or False?* Lumber classified as rough-sawn lumber has been dressed or finished to size by running it through a planer.
8. _____ What is the difference between interior and exterior plywood?
   A. The type of wood used
   B. The size of the sheets
   C. The type of adhesive used
   D. The thickness of the sheets
   E. Interior and exterior plywood are identical.
9. _____ The steel beam identification W8×15 represents a wide-flange beam _____.
   A. 8" deep and weighing 15 pounds per linear foot
   B. 8" deep and 15" wide
   C. 8" wide and 15" deep
   D. 8" deep and 15' long
   E. None of the above is correct.
10. _____ *True or False?* Nonferrous metals contain little or no aluminum.
11. _____ *True or False?* Concrete completely hardens within 48 hours after it is poured.
12. _____ Which of the following is *not* considered to be a type of safety glass?
    A. Wired glass

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Activity 2-1

Problems in Construction Mathematics

Name _____

Solve the following problems. Show your work and calculations. Write your answers in the spaces provided.

1. A triangular frame has sides that measure 15'-7", 20'-4", and 26'-2". What is the total length of the three sides? 1. _____

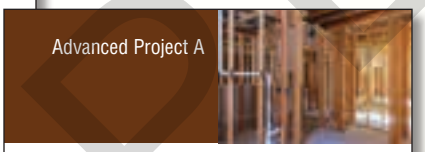
2. A carpenter had a board 2'-10 3/4" long. To fit the space for a shelf, the carpenter cut 7/16" off one end. How long was the board after the piece was removed? 2. _____

3. Fifteen strips, 1 1/4" wide, are to be ripped from a sheet of plywood. If 1/8" is lost with each cut, how much of the plywood sheet is used in making the 15 strips? (Assume 15 cuts are necessary.) 3. _____

4. An interior wall of a building is made up of metal studs with 5/8" gypsum board on each side. See the drawing below. If the actual width of a stud is 3 5/8", what is the total thickness of the wall? 4. _____

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Advanced Project A

Residence Mercedes Pointe

This project is based on drawings for the two-story brick and stone veneer residence shown in **Figure A-1.** *This large, four-bedroom, 3 1/2 bath home includes a 3-car garage, a study, and a screened porch and deck. Refer to Prints RMP-1 through RMP-8 in the Large Prints supplement when working on the following activities. An index is provided below. Note: The prints provided do not represent a complete set of drawings for the building.*



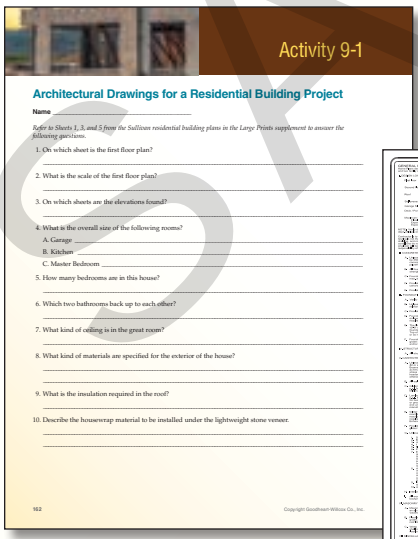
Figure A-1. Front elevation of the Residence Mercedes Pointe residence.

PRINT INDEX • RESIDENCE MERCEDES POINTE

PRINT LABEL	SHEET NUMBER	SHEET TITLE
RMP-1	1	FRONT & RIGHT ELEVATIONS
RMP-2	2	LEFT & REAR ELEVATIONS
RMP-3	3	FOUNDATION PLAN, SITE PLAN
RMP-4	4	FIRST FLOOR PLAN
RMP-5	5	SECOND FLOOR PLAN
RMP-6	7	FIRST FLOOR ELECTRICAL PLAN
RMP-7	9	WALL SECTIONS, STAIR SECTIONS
RMP-8	10	GENERAL NOTES, WALL SECTIONS

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Activity 9-1

Architectural Drawings for a Residential Building Project

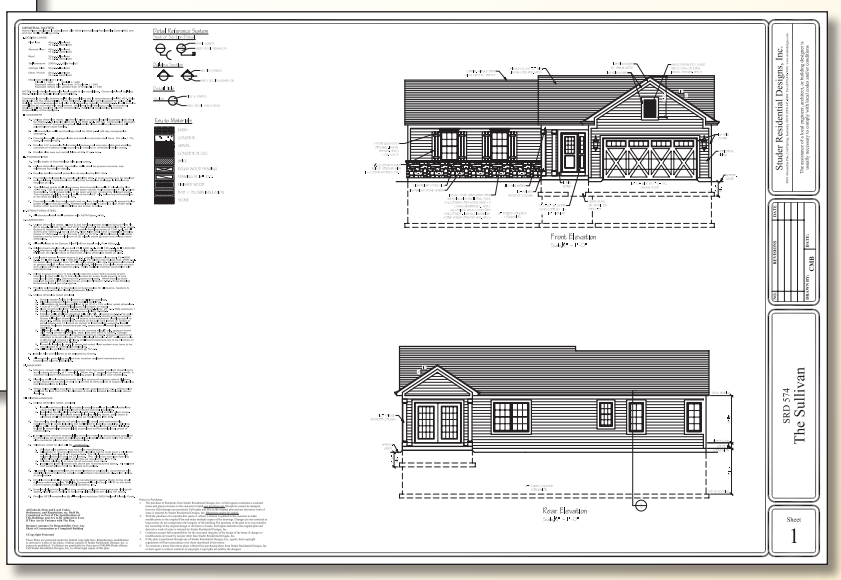
Name _____

Refer to Sheets 1, 3, and 5 from the Sullivan residential building plans in the Large Prints supplement to answer the following questions.

1. On which sheet is the first floor plan?
2. What is the scale of the first floor plan?
3. On which sheets are the elevations found?
4. What is the overall size of the following rooms?
   A. Garage _____
   B. Kitchen _____
   C. Master Bedroom _____
5. How many bedrooms are in this house?
6. Which two bathrooms back up to each other?
7. What kind of ceiling is in the great room?
8. What kind of materials are specified for the exterior of the house?
9. What is the insulation required in the roof?
10. Describe the housewrap material to be installed under the lightweight stone veneer.

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