

7962 DRAFTING II- ARCHITECTURAL

CURRICULUM GUIDE

SUMMER 2005



Trade & Industrial Education
Career-Technical Education



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Career-Technical Education
North Carolina Department of Public Instruction

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FOREWORD

This course is focused on the principles, concepts, and the use of complex graphic tools utilized in the field of architecture, structural systems, and construction trades. Emphasis is placed on the application of CAD tools in the creation of floor plans, foundation plans, basic roof plans, wall sections, and elevation drawings.

Mathematical, scientific, and visual design concepts are reinforced. Work-based learning strategies appropriate for this course are apprenticeship and cooperative education. Hands-on work experiences and SkillsUSA-VICA leadership activities provide many opportunities to enhance classroom instruction and career development.

Skills in communication, mathematics, science, leadership, teamwork, and problem-solving are reinforced in this course. Job shadowing is an appropriate work-based learning strategy for this course.

This curriculum was developed as a resource for teachers to use in planning and implementing a competency-based instructional management drafting program in their school. These materials are tools used in the curriculum management process. Included are specific learning objectives, recommended activities, performance assessments, equipment lists, facility design specifications, a bibliography of reference media, and the names and addresses of media vendors.

It is our goal to provide the children of our state an education of the highest quality. As this guide reflects our goal of continuous improvement, we encourage you to communicate to us ways to improve the material within this publication. Your suggestions will be welcomed and appreciated.

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The following individuals developed the Summer 2005 Drafting Architectural II blueprint, curriculum guide, and classroom and secure test-item banks:

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New Bern High School
Havelock High School
South View High School
Scotland High School
Northern Durham High School
Jacksonville High School

We would like to extend our gratitude and thanks to those who have contributed their time and effort to previous versions of the Drafting Architectural Curriculum. We appreciate their hard work. Finally, we would like to thank the teachers, directors, and others who have taken their time to critique our progress and offer suggestions during this process. Our work is better for their effort.

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USING THE CURRICULUM MATERIALS

Purpose

The *Drafting Architectural II Curriculum Materials* were developed as a resource for teachers to use in planning and implementing a competency-based instructional management drafting program in their school. These materials are tools used in the curriculum management process.

Curriculum Guide Description

Drafting Architectural II was designed to be a one unit course (135-180 hours of instruction). This course is focused on the principles, concepts, and use of complex graphic tools utilized in the field of architecture, structural systems, and construction trades. Emphasis is placed on the application of CAD tools in the creation of floor plans, foundation plans, basic roof design, sections and details, and elevation drawings. Mathematics, science, and visual design concepts are reinforced. Work-based learning strategies appropriate for this course are apprenticeship and cooperative education. Hands-on work experiences and SkillsUSA-VICA leadership activities provide many opportunities to enhance classroom instruction and career development.

General Instruction

Drafting Architectural II may be taught using individualized, whole class, or small team instructions, or a combination of each. Regardless of the method used, it is essential that the activities reflect the competencies and objectives of this course.

The course demands much from the students and teacher in terms of its complexity and the brevity of time in which the material is to be mastered. Because of time limitations and the amount of material to be covered, one should not teach objectives as discrete units of instruction. Objectives must be taught concurrently within the larger context of activities. This allows for the efficient use of time as well as reflecting good pedagogy.

Blueprint

The blueprint (See the *Drafting Architectural II Blueprint* on the following pages) lists the competencies that the student is to achieve. Competencies are mastered when a student completes the objectives. Course weight is the degree of importance given to each objective in relation to the entire course of study. This in turn will determine the number of test-items per objective on any test developed by the State Department of Education. For example, on a state EOC 100 item assessment, a cognitive objective having a value of 10% will have 10 test-items representing that objective.

Units of Instruction

The *Units of Instruction* section is designed to give the teacher detailed information directly correlated to the blueprint and test-item bank. It attempts to explain in more detail what information or behavior the student is expected to know or do. Unless a student has an individualized education plan, he/she will be expected to become competent in all areas covered within this course at the end of 135-180 hours of instruction. It is important to recognize that **UNIT SEQUENCING DOES NOT IMPLY SEQUENCE OF INSTRUCTION**. Therefore, information within the course should be used where it makes sense and best fits. Using information from a variety of competencies and objectives are used when it is most pedagogically sound.

Leadership Development Unit

Objective 2.01.01 explains job-seeking skills. This section is particularly useful to those teachers and students who participate in *SkillsUSA-VICA*.

Objective 2.01.02 requires students to participate in a job interview. This section is also particularly useful to those teachers and students who participate in *SkillsUSA-VICA*.

Computer Aided Drafting (CAD) Unit

Objective 2.02.01 reviews common terms and definitions relating to Computer Aided Drafting covered in *Drafting 1* and introduces CAD commands specific to Architectural Drafting.

Objective 2.02.02 requires students to construct architectural drawings using CAD.

Objective 2.02.03 requires students to critique CAD drawings. Rubrics are included for performance assessment.

Floor Plans Unit

Objective 203.01 introduces students to terms and definitions related to single-level residential space planning.

Objective 203.02 acquaints students with accepted principles of single-view residential space planning.

Objective 203.03 covers door and window types.

Objective 203.04 introduces students to floor plan symbols.

Objective 203.05 identifies terms and symbols used to indicate electrical fixtures.

Objective 203.06 demonstrates the rules and standards for electrical placement.

Objective 203.07 presents the steps in drawing, dimensioning, and annotating a single-level floor plan.

Objective 203.08 requires students to draw a single-level residential floor plan. A rubric is included for this performance assessment.

Foundation Plans Unit

Objective 204.01 introduces students to terminology related to foundation plans.

Objective 204.02 identifies common foundation systems.

Objective 204.03 covers footing and foundation wall construction.

Objective 204.04 explains the purpose of a foundation plan and describes its features.

Objective 204.05 requires students to draw a foundation plan. A rubric is included for this performance assessment.

Basic Roof Design Unit

Objective 205.01 introduces students to terms and definitions related to roof plans.

Objective 205.02 explains the concepts of roof construction.

Objective 205.03 requires students to draw roof plans. A rubric is included for this performance assessment.

Sections and Details Unit

Objective 206.01 introduces students to terms and definitions related to wall sections and details.

Objective 206.02 covers concepts of wood sill and floor construction.

Objective 206.03 covers concepts of wood frame wall construction.

Objective 206.04 analyzes insulation and vapor barrier materials and construction.

Objective 206.05 explains the purpose and features of wall sections.

Objective 206.06 requires students to draw typical wall sections. A rubric is included for this performance assessment.

Exterior Elevations

Objective 207.01 introduces terms and definitions related to exterior elevations.

Objective 207.02 demonstrates the purpose and features of an exterior elevation.

Objective 207.03 requires students to draw exterior elevations. A rubric is included for this performance assessment.

Bibliography/References (Appendix A)

This section provides the names, authors, and publishers of the text listed within the Units of Instruction section.

Vendor's Addresses for Texts, Literature, and Video (Appendix B)

We have included a partial listing of where and whom to contact for obtaining texts, literature, software, and videos.

Equipment List (Appendix C)

The equipment list (updated as of this printing, Summer 2005), gives the minimum number of tools, equipment, and software necessary for the instruction of Drafting Architectural II.

Facility Design Specification (Appendix D)

These are facility design specifications for the Drafting-Architectural II and Drafting-Architectural III programs.

Drafting Architectural II Curriculum Products Evaluation Form (Appendix E)

Included in this guide is an evaluation form. We sincerely want your thoughtful suggestions for improving the curriculum products. Many of the improvements within this guide and the test-item bank is the result of teachers who have taken the time to make suggestions for improvement. Please take the time to respond to us on ways to improve our work.

Final Comment

If you have any questions regarding any aspect of this course, curriculum guide, test-item bank, equipment, literature, or software needs, please call or write Tom Shown 919.870.3880, tshown@dpi.state.nc.us

VoCATS

Course Blueprints

Trade & Industrial Education

7962 Drafting - Architectural II

*Public Schools of North Carolina
State Board of Education • Department of Public Instruction
Office of Instructional and Accountability Services
Division of Instructional Services*

*Raleigh, North Carolina
Summer 2005*

Special thanks to the following educators and business people who reviewed and approved this blueprint for technical content and appropriateness for the industry.

Robin Migliorato – New Bern High School

Tony Bello – Havelock High School

Scott Marshall – South View High School

Celeste Morton – Scotland High School

Rhonda Myers – Northern Durham High School

Bryant A. York – Jacksonville High School

This blueprint has been reviewed by business and industry representatives for technical content and appropriateness for the industry. Contact tshown@dpi.state.nc.us for more information.

VoCATS Course Blueprint

A course blueprint is a document laying out the framework of the curriculum for a given course.

Shown on the blueprint are the units of instruction, the core competencies in each unit, and the specific objectives for each competency. The blueprint illustrates the recommended sequence of units and competencies and the cognitive and performance weight of the objective within the course.

The blueprint is intended to be used by teachers in planning the course of work for the year, preparing daily lesson plans, and constructing instructionally valid assessments.

For additional information about this blueprint, contact program area staff. For additional information about the VoCATS Competency Achievement Tracking System, contact program area staff or VoCATS, Workforce Development, Division of Instructional Services, North Carolina Department of Public Instruction, 301 North Wilmington Street, Raleigh, North Carolina 27601-2825, 919/715-1674, email: rwelfare@dpi.state.nc.us.

Interpretation of Columns on VoCATS Course Blueprints

No.	Heading	Column information
1	Comp# Obj.#	Comp=Competency number (three digits); Obj.=Objective number (competency number plus two-digit objective number).
2	Unit Titles/Competency and Objective Statements	Statements of unit titles, competencies per unit, and specific objectives per competency. Each competency statement or specific objective begins with an action verb and makes a complete sentence when combined with the stem "The learner will be able to. . ." (The stem appears once in Column 2.) Outcome behavior in each competency/objective statement is denoted by the verb plus its object.
3	Time Hrs	Space for teachers to calculate time to be spent on each objective based on the course blueprint, their individual school schedule, and the students' performance on preassessments.
4&5	<u>Course Weight</u> Cognitive Performance	Shows the relative importance of each objective, competency, and unit. Weight is broken down into two components: cognitive and performance. Add the cognitive and performance weights shown for an objective in columns 4 and 5 to determine its total course weight. Course weight is used to help determine the percentage of total class time that is spent on each objective. The VoCATS Annual Planning Calendar shows how to use the course weight to determine the approximate number of days to be devoted to each objective. The breakdown in columns 4 and 5 indicates the relative amount of class time that should be devoted to cognitive and performance activities as part of the instruction and assessment of each objective. Objectives with performance weight should include performance activities as part of instruction and/or assessment.
6	Type Behavior	Classification of outcome behavior in competency and objective statements. (C=Cognitive; P=Psychomotor; A=Affective)
7	Integrated Skill Area	Shows links to other academic areas. Integrated skills codes: A=Arts; C=Communications; CD=Career Development; CS=Information/Computer Skills; H=Health and Safety; M=Math; SC=Science; SS=Social Studies.
8	Core Supp	Designation of the competencies and objectives as Core or Supplemental. Competencies and objectives designated "Core" must be included in the Annual Planning Calendar and are assessed on the statewide pre- and postassessments..

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TRADE AND INDUSTRIAL EDUCATION
COURSE BLUEPRINT for 7962 DRAFTING – ARCHITECTURAL II
(Recommended hours of instruction: 135-180 hours)

Comp # Obj #	Unit Titles/Competency and Objective Statements (The Student will be able to:)	Time Hours	Course Weight		Type Behavior	Integrated Skill Area	Core Supp
			Cognitive	Performance			
1	2		4	5	6	7	8
			100%				
	Total Course Weight		93%	7%			
A	LEADERSHIP DEVELOPMENT		2%	1%			
D201.00	Demonstrate job seeking and interview skills.		2%	1%	C3PA	CD	Core
<i>D201.01</i>	<i>Identify jobs and job ethics associated with architectural drafting.</i>		<i>2%</i>		<i>C1</i>	<i>CD</i>	<i>Core</i>
<i>D201.02</i>	<i>Participate in a job interview.</i>			<i>1%</i>	<i>C3PA</i>	<i>CD</i>	<i>Core</i>
B.	CAD						
D202.00	Utilize Computer Aided Drafting (CAD) skills to produce drawings.		4%	1%			Core
<i>D202.01</i>	<i>Identify common terms and definitions relating to Computer Aided Drafting.</i>		<i>1%</i>		<i>C1</i>		<i>Core</i>
<i>D202.02</i>	<i>Construct architectural drawings using CAD.</i>		<i>1%</i>		<i>C3</i>		<i>Core</i>
<i>D202.03</i>	<i>Critique CAD drawings.</i>		<i>1%</i>		<i>C3</i>		<i>Core</i>
C.	FLOOR PLANS						
D203.00	Draw floor plans		38%	1%			Core
<i>D203.01</i>	<i>Identify terms and definitions related to single-level residential space planning.</i>		<i>7%</i>		<i>C1</i>		<i>Core</i>
<i>D203.02</i>	<i>Analyze accepted principles of single-view residential space planning.</i>		<i>9%</i>		<i>C3</i>		<i>Core</i>
<i>D203.03</i>	<i>Determine door and window types.</i>		<i>4%</i>		<i>C3</i>		<i>Core</i>
<i>D203.04</i>	<i>Identify floor plan symbols.</i>		<i>10%</i>		<i>C1</i>		<i>Core</i>
<i>D203.05</i>	<i>Identify terms and symbols used to indicate electrical fixtures.</i>		<i>3%</i>		<i>C1</i>		<i>Core</i>
<i>D203.06</i>	<i>Demonstrate the rules and standards for electrical fixture placement.</i>		<i>1%</i>		<i>C3</i>		<i>Core</i>
<i>D203.07</i>	<i>Demonstrate the steps in drawing, dimensioning, and annotating a single-level floor plan.</i>		<i>4%</i>		<i>C3</i>		<i>Core</i>
<i>D203.08</i>	<i>Draw a single-level residential floor plan.</i>			<i>1%</i>	<i>C3P</i>		<i>Core</i>
D.	FOUNDATION PLANS						

Comp # Obj #	Unit Titles/Competency and Objective Statements (The Student will be able to:)	Time Hours	Course Weight		Type Behavior	Integrated Skill Area	Core Supp
			Cognitive	Performance			
1	2		4	5	6	7	8
D204.00	Draw foundation plans.		20%	1%			Core
D204.01	<i>Identify terminology related to foundation plans.</i>		8%		C1		Core
D204.02	<i>Identify common foundation systems.</i>		3%		C1		Core
D204.03	<i>Explain footing and foundation wall construction.</i>		8%		C3		Core
D204.04	<i>Explain the purpose of a foundation plan and describe its features</i>		1%		C3		Core
D204.05	<i>Draw a foundation plan.</i>			1%	C3P		Core
E.	BASIC ROOF DESIGN						
D205.00	Draw roof plans.		6%	1%			Core
D205.01	<i>Identify terms and definitions related to roof plans.</i>		4%		C1		Core
D205.02	<i>Apply concepts of roof construction.</i>		2%		C3		Core
D205.03	<i>Draw roof plans.</i>			1%	C3P		Core
F.	SECTIONS AND DETAILS						
D206.00	Draw wall sections and details.		14%	1%			Core
D206.01	<i>Identify terms and definitions related to wall sections and details.</i>		8%		C1		Core
D206.02	<i>Apply concepts of wood sill and floor construction.</i>		2%		C3		Core
D206.03	<i>Apply concepts of wood frame wall construction.</i>		2%		C3		Core
D206.04	<i>Analyze insulation and vapor barrier materials and construction</i>						
D206.05	<i>Determine the purpose and features of a wall section.</i>		1%		C3		Core
D206.06	<i>Draw typical wall sections.</i>			1%	C3P		Core
G.	EXTERIOR ELEVATIONS						
D207.00	Draw exterior elevations.		9%	1%			Core
D207.01	<i>Identify terms and definitions related to exterior elevations.</i>		6%		C1		Core
D207.02	<i>Demonstrate the purpose and features of an exterior elevation.</i>		3%		C3		Core
D207.03	<i>Draw exterior elevations.</i>			1%	C3P		Core

UNIT A

Leadership Development



UNIT A: Leadership Development

Competency: 201.00

Demonstrate job-seeking and interview skills.

Objective: 201.01

Identify jobs and job ethics associated with architectural drafting.

A. Terms and definitions

1. Applicant – The person applying for a job
2. Resume – Brief summary of one's qualifications and work related experiences
3. Employment agency – Business designed to help people find work (public and private)
4. Garnishment – Act of withholding wages or other property to satisfy a debt
5. Extracurricular activities – Clubs, organizations, and other social and church groups in which one participates
6. Employment Wanted ad – Classified advertisement placed by someone seeking employment with listed qualifications
7. Interview – Meeting between the job applicant and the employer for questioning and evaluation of qualifications
8. Application – Printed form where an applicant provides information about job history, education, personal experiences, and references
9. Employer – Person representing a business that is looking for qualified workers
10. Want ad – Classified advertisement telling what kind of job opening is available and the desired qualifications
11. Qualifications – Experience, education, and physical characteristics that suit a person to a job
12. Portfolio – Binder containing examples of drawings, letters, etc. that show how a person is qualified for a job opening
13. Equal opportunity employer – Business that advertises the fact that no discrimination is practiced

14. Follow-up letter – Letter mailed to the employer after the interview; used to refresh the interviewer about the applicant's qualifications and thank the interviewer
15. Fringe benefits – Types of services provided by the employer in addition to wages
16. Blind ad – Classified advertisement that lists desirable work traits and only lists a phone number, not a company name (Used so that only qualified applicants will call and the company will not be overwhelmed by applicants that just want to work for the company)

B. Suggestions to find out about job openings

1. Classified advertisements (Newspapers and Magazines)
2. Employment offices (Public and Private)
3. Local businesses (Chamber of Commerce listing)
4. Check with relatives
5. Check with school personnel
6. Internet sites with job openings

C. Write a résumé

1. There are many formats for the appearance of a résumé. Choose one that best fits your needs and emphasizes your particular job skills.
2. A résumé should be typed, not written, and kept to one page.
3. Use your best English since many employers will not consider interviewing people who turn in résumés that have misspellings or grammatical errors.
4. Your name and address should be prominent at the top left or middle of the page at the top. Make sure to include a phone number with area code where messages can be left.
5. There are things that should not be included on a résumé (eg. weight, height, marital status, photo, why you left your last job, religious and political affiliations, etc).
6. Your career objective should be general and not be limited to one specific job unless you are already experienced in that area.

7. In your educational background be sure to include all schools attended, dates attending these schools, and degrees earned. If you include specific courses taken at one or more of these schools, make sure the courses are specific to the career objective.
8. List all your past employment beginning with the most recent and moving backward.
9. If you have little experience, you must be specific to include the skills useful to your career objective.
10. If there is enough space, be sure to include hobbies, interests, extracurricular activities, and awards.
11. List at least three people with addresses and phone numbers for references. It is better if these people will give good references that are related to your career objective.
12. A résumé should be printed on bond paper; it is a very important document.

D. Prepare a letter of application

1. Use a simple and accepted form for appearance
 - a. Neatly type the letter
 - b. Use spelling and grammar check
 - c. Use a good 8 ½ x 11 bond paper, not personal stationary
 - d. Use the employer's full name, full title, and full address
 - e. Include your full name and address
2. Include proper information
 - a. Write to a specific person even if you must call and find out who it should be
 - b. Be brief and specific (do not repeat information)
 - c. Cover all the points in the order of the help wanted ad
3. End the letter correctly for a business letter
4. Use a permanent address
5. Staple résumé to the letter to make sure they stay together
6. Wait one week to make a follow-up call if not contacted
7. Check back about once a month for possible openings

E. Prepare a follow-up letter

1. Qualifications

- a. Typed using spelling and grammar check
- b. Clean, neat, and attractive arrangement on the page
- c. Send within two days after the interview

2. Cover specific points in the letter

- a. Express appreciation for the interviewer's time and interest
- b. Summarize briefly your qualifications and interest for the job opening
- c. Include your name, address, and phone number

3. Make a last bid for the job by giving prime examples of your work habits

F. Properly complete a job application

1. Use a good pen with blue or black ink
2. Have a copy of your resume
3. Do not hurry; review form before beginning and after completed
4. Follow all directions
5. Write clearly, legibly, and neatly
6. Answer all questions briefly and honestly
7. Questions that do not apply to you should be answered with ***Not Applicable*** or ***NA***
8. Do not make cross out marks
9. Use "open" for salary until discussion in an interview

G. Please see the questions written in your classroom test-item bank. These will reflect the content to be covered.

H. For more detailed information, use your T&I Leadership Teacher Guide: Level III, Job-Seeking Skills.

UNIT A: Leadership Development

Competency: 201.00

Demonstrate job-seeking and interview skills.

Objective: 201.02

Participate in a job interview.

A. Characteristics employers look for during a job interview

1. Desire to give an honest day's work for a day's pay
2. Desire to help others on the job
3. Desire to improve one's job skills
4. Dependable and dedicated to the job and company
5. Interested and enthusiastic about the job and company

B. Proper dress for a job interview

1. A first impression is a lasting impression
 - a. Applicants are trying to sell themselves to the company in return for a job
 - b. An attitude that 'the "real me" is more important than what is worn today' is a mistake because the company will probably never get to know the "real you"
2. Make sure the dress fits the job for which you are interviewing
 - a. Always dress a little better for an interview than you would for a day on the job
 - b. Never dress too casual
3. Make sure clothing is conservative and coordinated
 - a. Consider colors, patterns, textures
 - b. Dress as an adult
4. On the day of the interview, be well groomed
 - a. Hair should be trimmed and in place, including facial hair
 - b. Clothes should be well fitting but not too tight and not too loose
 - c. Make sure colognes and perfumes are appropriate and not too strong
 - d. Leave sunglasses in the car

C. Different types of documentation needed when applying for a job

1. Resume – A resume is a brief summary of one's qualifications and work-related experiences
2. Letter of application – A letter that states the applicant's interest in a job opening and briefly tells an employer how the applicant can help the company; a copy of one's resume is usually included
3. Job application – A formal printed form on which a job applicant includes personal information, job history, education history, and references
4. Follow-up letter – A letter mailed after a job interview that thanks the employer for the interview and reminds the employer of how the applicant's qualifications can help the company

D. Types of information that should be obtained before and during a job interview

1. Before the job interview
 - a. Services or products that the company provides
 - b. Length of time that a company has been in business
 - c. Has the company recently expanded or changed operations?
 - d. Position and name of person doing the interview
 - e. Salary typical for the job at other companies for someone with your experience
2. During the job interview
 - a. Working conditions (hours, pay dates, dress regulations)
 - b. Security measures of the company (criminal background check, etc.)
 - c. Safety precautions of the company (safety shoes, safety glasses, etc.)
 - d. Public relations
 - e. Fringe benefits (health insurance, dental insurance, sick days with or without pay, paid vacation etc/)
 - f. Advancement opportunity for seniority

E. List of items to take to a job interview

1. Two copies of resume and references
2. Driver's license and other proof of identity

3. A black pen

- F. Job interview guidelines

1. Prepare for the interview

- a. Take two copies of resume
 - b. Driver's license and another proof of identity
 - c. A black pen

2. Interviewing practices

- a. Arrive approximately five minutes early
 - b. Attend the interview alone
 - c. Introduce yourself to the receptionist; state the purpose of the visit
 - d. Shake hands after the interviewer extends their hand
 - e. Sit down only after the interviewer indicates you should
 - f. Sit quietly and let the interviewer open the interview
 - g. Maintain good posture and good eye contact
 - h. Do not smoke or chew gum
 - i. Be brief, positive, and honest answering questions
 - j. Ask questions about the job and company at the end of the interview

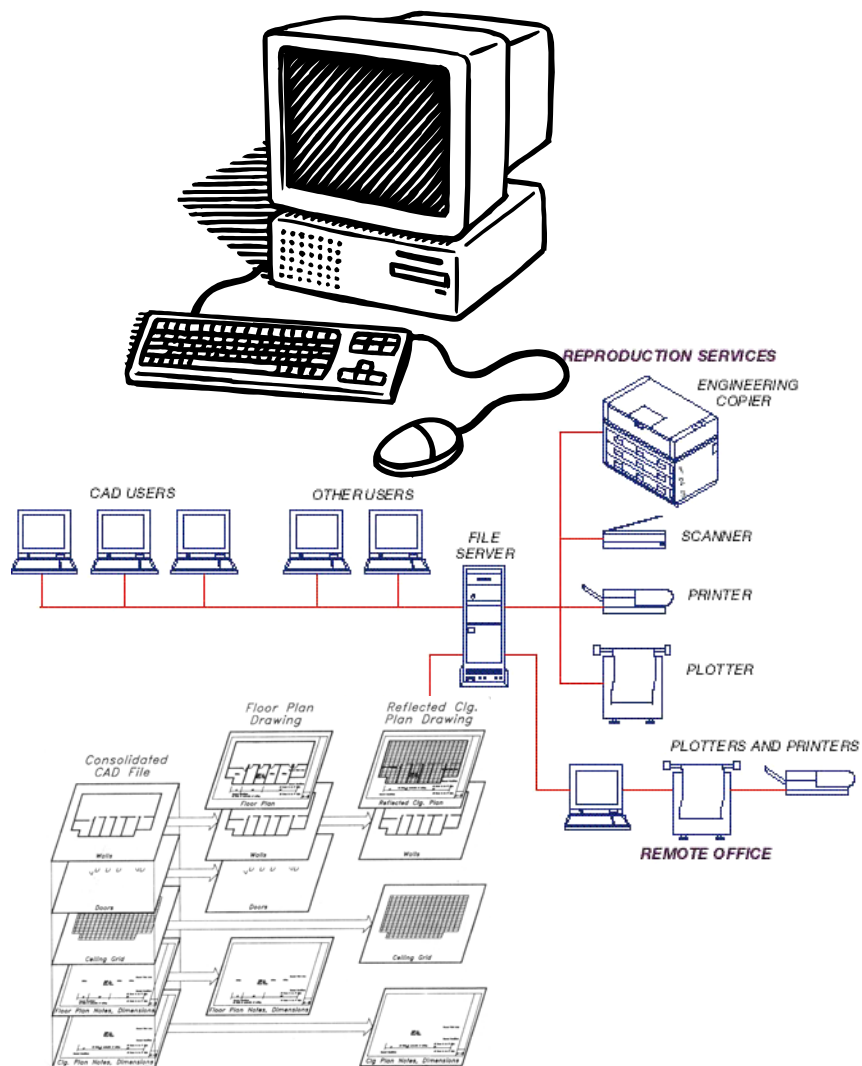
3. Sample interview questions

- a. Where do you attend school? When will you graduate?
 - b. Do you earn any of your expense money while attending school?
 - c. How do you think your curriculum in school has prepared you for this career?
 - d. Why did you leave your previous job?
 - e. Are you in good health?
 - f. What are some of your special abilities? What skills do you possess?
What tools or equipment can you operate?
 - g. What personal characteristics do you possess that will enable you to be successful in this career?
 - h. Do you work best with other people or alone?
 - i. Do you require attention? How does criticism affect you?
 - j. Do you have any questions to ask us?

- G. Please see the questions written in your classroom test-item bank. These will reflect the content to be covered.**
- H. For more detailed information, use your T&I Leadership Teacher Guide: Level III, Job Interview Skills.**

UNIT B

Computer Aided Drafting



UNIT B: Computer Aided Drafting (CAD)

Competency: 202.00

Utilize Computer Aided Drafting (CAD) skills to produce drawings.

Objective: 202.01

Identify common terms and definitions relating to Computer Aided Drafting.

1. Plotter – A wide format printer used in drafting to print drawings created by a CAD system
2. Cursor - The symbol or icon which represents the current mouse location relative to the drawing window. The cursor may appear as crosshairs or another symbol depending on the CAD software used
3. DXF (**D**rawing **eX**change **F**ormat) - created by Autodesk. An ASCII text file that has become an industry standard drawing file compatible with most CAD systems
4. Grid – A pattern of regularly spaced dots or lines that aids in the alignment of drawings. Most CAD systems have a SNAP feature that will position the cursor directly to each grid point
5. Hardcopy – The actual printed drawing outputted by a printer, plotter, copier, or diazo
6. Line - A universal CAD command used to create an entity defined by two endpoints
7. Line Width - A property assigned to any line, circle, curve, or arc describing how thick a line or other object appears on the screen or hardcopy
8. Move - An editing tool that moves entities to a different location either manually or by a set of inputted coordinates
9. Copy - An editing tool that copies entities to a different location either manually or by a set of inputted coordinates
10. Rotate – An editing tool that rotates objects or groups of objects based on a chosen point of rotation and angle
11. Scale - An editing tool that changes the size of an entity. Scale can be implemented by proportion/ratio or adjusted manually
12. Drawing Scale - The relative size at which a drawing is viewed or plotted/printed on the screen. Scale is often represented as a ratio where 1:1 = full scale; 1:12 denotes 1" = 1'-0"; 1:48 denotes 1/4"=1'-0"; etc.
13. Symbol Library – A collection of pre-drawn symbols or drawings that can be readily inserted into drawings in order to save drawing time
14. Trim - An editing tool that removes overlapping entities

15. Units - Units of measurement in a CAD system, which can be typically configured in metric or English
16. Zoom – The method of enlarging or reducing the view of images on the screen for ease of use. Zooming does not affect the actual dimensions of the object

UNIT B: COMPUTER AIDED DRAFTING (CAD)

Competency: D202.00

Utilize Computer Aided Drafting (CAD) skills to produce drawings.

Objective: D202.02

Construct Architectural Drawings using CAD.

A. The student will be able to:

1. Start the computer and launch the CAD software.
2. Create, properly name, and save a new drawing. Files should be managed so that the student can retrieve the saved drawings readily on a daily basis.
3. Setup or modify proper drawing units.
4. Create a title block with all the pertinent information.
5. Develop the drawing by using proper CAD techniques with drawing tools, commands, or symbol libraries.
6. Apply dimensions and annotations to the drawing.
7. Create a hardcopy of the completed drawing.

UNIT B: COMPUTER AIDED DRAFTING (CAD)

Competency: D202.00

Utilize Computer Aided Drafting (CAD) skills to produce drawings.

Objective: D202.03

Critique CAD Drawings.

CAD Drawing Technique

• Drawing setup • Dimensioning, and text size, units, etc. • File correctly saved • Line weights and colors appropriate • Drawings neatly laid out to balance space on the page • No stray lines or improper marks	0-25 points	Rating

Library Symbols

• Industry accepted standards for symbols used • Symbols correctly sized and located • Correctly oriented and positioned	0-25 points	Rating

Architectural Dimensioning

	0-25 points	Rating
• Dimensional styles appropriate. • Annotations appropriate style and size • Hard copy printed to scale • All required dimensions clear and visible • Dimensions balanced and easily read		

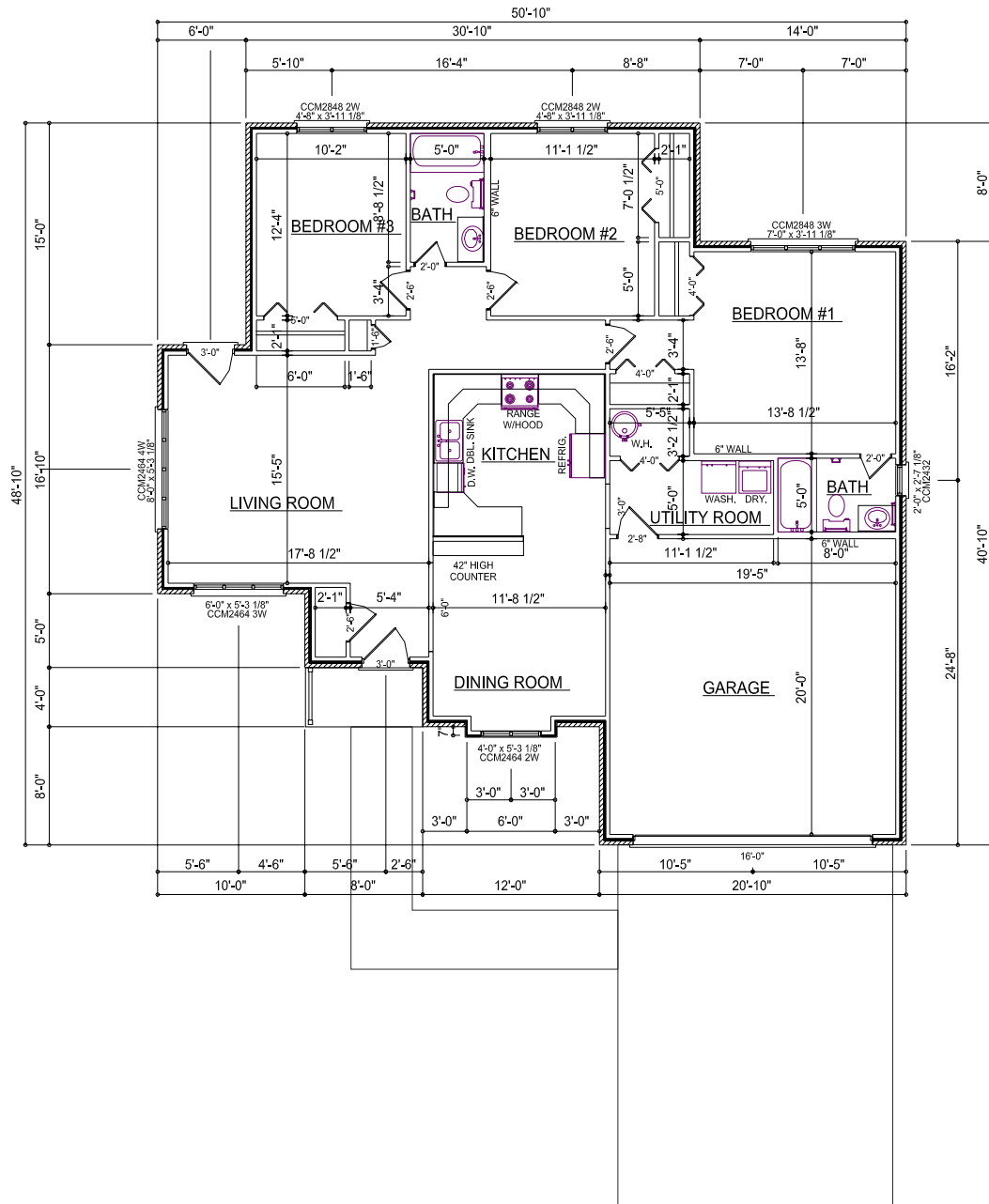
Time Management

	0-25 points	Rating
• Drawings completed in a timely manner • Drawings finished completely as requested • Proper use of all available resources to complete drawing		

Total Points: _____

UNIT C

Floor Plans



UNIT C: Floor Plans

Competency: 203.00

Draw Floor Plans

Objective: 203.01

R1, pgs.125-153

Identify terms and definitions related to single-level residential space planning.

Terms and Definitions

1. Alcove – a small room adjoining a larger room often separated by an archway
2. Apron – the inside trim board placed below a window sill
3. Bidet – a low bowl-shaped bathroom fixture with running water for personal hygiene
4. Breezeway – a covered walkway with open sides between two different parts of a structure
5. Casing - the decorative trim that covers the joint between the jamb and rough opening (inside and outside)
6. Cavity wall – a masonry wall formed with two wythes with an air space between each face
7. Closed Plan – cubicle-like rooms with little chance for overflow into other rooms
8. Compartmentalized – term used to indicate a water closet that is partitioned off from other bathroom fixtures
9. Cutting Plane – lines used to show where an object is to be sectioned
10. Deck – exterior floor that is supported on at least two opposing sides by adjoining structures, piers, or posts
11. Egress – a term used in building codes to describe access
12. Floor plan – architectural drawing of a room or building as seen from above
13. Half Bath – bathroom containing water closet and lavatory only
14. Header - the horizontal structural member used to support other structural members over openings
15. Jamb - the frame that is fitted inside the rough opening which encloses the door sash
 - a. Head jambs extend across the top of opening.
 - b. Side jambs extend vertically.

- c. The jamb may come as part of a packaged door unit.
- 16. Laundry – a room designed for the specific purpose of washing, drying, folding, ironing clothes
- 17. Lavatory – a fixture that is designed for washing hands and face, usually found in a bathroom
- 18. Master Bedroom – the largest bedroom in a home, generally with a bath adjoining the room
- 19. Masonry – stone, brick, concrete, hollow tile, concrete block, gypsum block, or other similar building units or materials or a combination of the same, bonded together with mortar to form a wall, pier, buttress, or similar mass
- 20. Modular – building parts that have been preassembled either in a plant or on-site
- 21. Mullions -- vertical and horizontal members between window and door units
- 22. Muntins -- divide the glass into smaller panes
- 23. Open Plan – plan in which rooms are not closed off from each other; minimal walls
- 24. Plumbing Wall – the walls in a building where plumbing pipes are installed
- 25. Porch – a covered entrance to a structure
- 26. Patio – ground-level exterior entertaining area that is made of concrete, stone, brick, or treated wood
- 27. Sheathing – a covering material placed over walls, floors and roofs which serves as a backing for finishing materials
- 28. Sill - the horizontal member placed at the bottom of walls and openings in walls
- 29. Swing – the opening direction of a door opens based on the hinge location; right or left hand
- 30. Threshold - the beveled member directly under a door
- 31. Utility Room – a room that includes space for washing, drying, folding, mending, ironing, and storing clothes as well as long-term storage of dry and canned food and a freezer
- 32. Water Closet – a water-flushing plumbing fixture, such as a toilet, that is designed to receive and discharge human excrement

UNIT C: Floor Plans

Competency: 203.00

Draw Floor Plans

Objective: 203.02

R1, pgs. 125-152 & 160-162

Analyze accepted principles of single-view residential space planning.

A. Determine the owner's needs

1. The success of a design depends upon how well the structure represents the lifestyle and meets the needs of the user
2. Consider the needs and desires of the client
 - a. Prepare a list that includes design considerations and requirements:
 - 1) Family structure and number
 - 2) Family or individuals' interests and activities
 - 3) Financial considerations
 - 4) Location of lot
 - 5) Number of levels
 - 6) Architectural style
 - 7) Zoning ordinances and covenants

B. Levels

1. One-story homes contain no stairs. They are often more costly to build and require a larger lot.
2. One and one-half story homes contain a steep roof that allows for the attic to be used as living space with dormers projecting from the roof to let in air and light
3. Two-story homes are economical to build due to smaller roof and foundation area
4. Split-level homes are developed for a sloping lot, separating sleeping, living, and recreation on different levels

C. Traffic patterns

1. Main traffic areas include the halls, stairs, foyers, entrances to rooms, and exterior entrances
 2. Room space can be disrupted when used for passage
 3. Analyze traffic flow by tracing various routes through the house
 4. Halls
 - a. Minimum width of 3'-0"
 - b. Consider furniture movement
 - c. Overly long halls waste useful space
 5. Plan door locations to guide traffic through rooms
 6. Doors and openings located near a corner of a room usually result in less wasted space
 7. Entrances
 - a. Usually include an outside and inside waiting area
 - b. Flooring materials should not be affected by water or dirt
 - c. Minimum of 2 entrances
 - d. Main house entrance
 - 1) Should be easily identifiable
 - 2) Should include coat closet
 - 3) Should include a foyer if space permits
 - i. Size depends on size of house
 - ii. Often omitted in small houses
 - 4) Should be able to view visitors without opening a door
 - 5) Minimum entry door is 3'-0"
 - e. Service entrance
 - 1) Leads to service areas (laundry, kitchen, utility, mudroom, etc.)
 - 2) Minimum entrance is 2'-8"
- D. Room planning
1. Living area
 - a. Includes the living room, dining room, foyer, recreation or family room, great rooms, sunroom, home office, den, or other gathering spaces

b. Types of floor plans

- 1) Closed/Formal plans contain access through doors or openings
 - i. Found frequently in traditional style homes
- 2) Open/Informal plans include partial separations or may combine several spaces (rooms) into one open area
 - i. Area rugs or furniture provide a visual separation
 - ii. Floor height elevations may differentiate rooms

c. Living room

- 1) Size and layout is determined by its purpose
 - i. TV room
 - ii. Center of activities
 - iii. Entertaining guests
 - iv. Furniture
 - v. Living habits of occupants
- 2) Limit traffic patterns through living areas
- 3) Centrally located and near an entrance
- 4) Consider views to outside
- 5) Dining and entertaining are closely related and should be located in close proximity to each other.

d. Dining room

- 1) Size and layout is determined by its purpose
 - i. Closed/Formal or Open/Informal plan
 - ii. Presence of smaller eating areas
 - iii. Number of guests to be served
 - iv. Furniture
- 2) Should be adjacent to kitchen and living area
- 3) May be accessible to porch or deck for outside dining
- 4) Allow ample space for serving and movement

2. Sleeping area

- a. Includes bedrooms, baths, dressing rooms, and closets
- b. Homes are categorized by the number of bedrooms and baths.

- c. Three bedroom homes are most common.
- d. Often grouped together in a quiet, separate wing or level
- e. Master bedroom may be separated from other bedrooms
- f. Bedroom size and layout is related to furniture and function
 - 1) Minimum size is 70 square feet or 9' in any direction
 - 2) Consider furniture items and size to be used
 - 3) Allow space for movement around furniture
 - 4) Consider planned activities
 - i. Writing
 - ii. Reading
 - iii. Watching TV
 - iv. Hobbies
- g. Typically, bedrooms should be accessible to a hall
 - 1) Doors should swing into the bedroom
 - 2) Minimum width of door to bedroom is 2'-6"
 - 3) Door size should allow for furniture movement
- h. Windows
 - 1) Used for ventilation and light
 - 2) Must be included as means of egress
 - 3) Windows use wall space that could be used for furniture arrangement
- i. Dressing areas
 - 1) May be an alcove or a separate room
 - 2) May include sinks, make-up counters, mirrors, chairs, closets, and other dressing related items
 - 3) Often adjacent to master bath
- j. Bathrooms
 - 1) Includes plumbing fixtures such as the water closet, shower, tub, lavatory (sink), and bidet
 - i. Lavatories may be wall-hung, pedestal, or countertop
 - ii. Various sizes and styles of fixtures are available

- iii. Allow 15" minimum from center line of water closet to wall adjacent fixture
 - 2) Plumbing wall for water closet should be constructed of a minimum of 2"x 6" studs.
 - 3) May be compartmentalized
 - 4) Bedrooms should be placed close to a bath or have an adjacent bath.
 - 5) The Master Bedroom usually has an adjacent bath.
 - 6) Bath sizes vary widely according to space available.
 - i. Minimum size for full bath is 5'-0"x 8'-0"
 - ii. A half-bath contains a lavatory and a water closet
 - iii. Minimum size for half-bath is 3'-0"x 7'-0"
 - 7) Bath furnishings may include built-in clothes hampers, shelves for linen, counter space, medicine cabinet and mirrors
 - 8) Must have natural ventilation and/or fan to remove moisture
 - 9) Grouping baths increases efficiency by allowing for centralized plumbing.
 - 10) Modifications may be required for special medical/disabled clients
 - 11) Linen closets should be minimum of 18" deep.
3. Service area
- a. Kitchen
 - 1) Purpose is food preparation but may include dining, laundry, and storage
 - 2) Kitchen is made up of three work centers:
 - i. Food storage and preparation (refrigerator, cabinets, pantry, countertops)
 - ii. Cooking (range, oven, microwave, countertops)
 - iii. Clean-up (sink, dishwasher, countertops)
 - 3) Work triangle measures efficiency.

- i. A line from the center front of each work center makes up the work triangle.
 - ii. The sum of all sides of the work triangle should not exceed 22'.
 - iii. When possible, traffic lanes should not impede the work triangle.
- 4) Countertops and cabinets must be sufficient to allow for kitchen operations and storage.
 - i. Draw base cabinets 24" deep and wall cabinets 12" deep
 - ii. Draw wall cabinets as hidden lines
- 5) Kitchen styles
 - i. Straight line
 - i. Used in apartments, cottages, or other smaller spaces
 - ii. Provides a limited amount of cabinets
 - ii. L-shape
 - i. Not intended for large kitchens
 - ii. More attractive than a straight line
 - iii. Corridor
 - i. Small to medium size kitchens
 - ii. Efficient arrangement for long, narrow spaces
 - iii. Should not be used where heavy traffic flows through the kitchen
 - iv. Need at least 4' between cabinets for movement
 - iv. U-shape
 - i. High efficiency
 - ii. Medium size kitchens
 - iii. Approximately 6' between legs of "U"
 - v. Island
 - i. Has stand-alone cabinets, which may be used for any of the kitchen centers or a snack bar

- ii. Allow 42" on all sides
- 6) Kitchen eating areas (Family kitchen)
 - i. Open/Informal plan
 - ii. May include table/chairs or an eating counter
- b. Laundry
 - 1) Size and location varies with function.
 - i. Washing, drying, ironing, mending clothes
 - ii. May be placed close to kitchen and other work areas or near bedrooms
 - 2) Efficient design has arrangement of appliances/fixtures following the order of operation.
 - i. Receiving and preparing requires hamper/bins.
 - ii. Washing requires sink, washer, and detergents.
 - iii. Drying requires dryer and/or drying line.
 - iv. Folding and ironing requires board, countertop, and racks.
- c. Garage or Carport
 - 1) Size depends upon the number of cars to be housed and other purposes it will serve.
 - i. Single car space is recommended to be from 11'x 19' to 16'x 25' depending on car and access space.
 - ii. Double car space is recommended to be from 20'x 20' to 25' x 25'.
 - iii. Space may be increased if garage is to be used for storage or a workshop.
 - 2) May be a separate structure or attached to the house
 - i. Style should match the house
 - ii. May be connected by a breezeway
 - 3) A carport is like a garage except one or more walls are removed and no door(s) provided.
 - i. Less expensive than a garage

- ii. Does not provide as much protection as a garage
 - iii. Better suited to mild climates
- 4) Garage doors vary in style, construction, and size.
- 5) Garage floors are most often constructed with concrete.
 - i. Slope toward doors or built-in drain
 - ii. 4" thick with vapor barrier and reinforcement
 - iii. Apron connects floor to paved driveways.
- 6) Driveways
 - i. May include a turnaround to avoid having to back onto a street
 - ii. Desirable widths are 10' for a single car or 18' for a double car garage.
 - iii. Turning radii of 15' should be provided where the driveway connects to the street.
 - iv. Driveway layout may vary due to size and position of the house pertaining to the lot
- 4. Outside living areas (porches, patios, decks)
 - a. Patios are located at ground level and are generally constructed of concrete
 - b. Porches and decks are structurally connected to the house and are raised above grade.
 - 1) Porches are built of various materials.
 - 2) Decks are constructed of wood.

UNIT C: Floor Plans

Competency: 203.00

Draw Floor Plans

Objective: 203.03

Determine door and window types.

R1, pgs. 118, 243-249, 256

A. Doors

1. General classifications

a. Flush doors

- 1) Smooth on both sides (usually mahogany or birch plywood)
- 2) May be hollow core or solid core

b. Panel doors

- 1) Heavy frame around perimeter
- 2) Parts
 - i. Stiles – vertical members
 - ii. Rails – horizontal members
 - iii. Panels – thin material enclosed by stiles and rails
 - iv. Louvered doors are panel doors.

2. Exterior doors

a. Typical door sizes

- 1) 6'-8" tall by 1-3/4" thick
- 2) One opening must be a minimum of 3'-0"
- 3) Insulated

b. Sloping sills at the bottom sheds water away from opening

c. Swinging doors

- 1) Hinged
- 2) Swing into the house

d. Sliding doors

- 1) Made with wood or metal frames and tempered glass for safety
- 2) Provide glass areas and are excellent for access to a patio or deck

- 3) Common sizes are 6'-0" and 8'-0"
- e. French doors
 - 1) Purchased with mullions and muntins between glass panes or one large glass pane
 - 2) May be used individually, in pairs, or in groups of three or four
- f. Garage doors
 - 1) Generally are overhead doors
 - 2) May be one piece or sectional
 - 3) Widths may be for a single or double opening
 - i. Singles are usually 8', 9', or 10'
 - ii. Doubles are usually 15', 16', or 18'
 - 4) 7'-0" is the most commonly used height
- 3. Interior doors
 - a. Standard height = 6'-8"
 - b. Thickness = 1-3/8"
 - c. Widths vary based on a 2' module
 - 1) Bedroom doors = 2'-6"
 - 2) Rooms other than sleeping areas = 2'-6"
 - 3) Bathroom doors = 2'-0" or 2'-4"
 - 4) Closet doors should be as large as possible
 - d. Bi-fold doors
 - 1) Set of two doors making up one door unit
 - 2) Hung on a track
 - 3) Popular for closet doors
 - e. Sliding doors/Bypass doors
 - 1) Hung on a track and slide left to right
 - 2) Often used in wide openings, like closets
 - f. Pocket doors
 - 1) Hung on a track and slides into a wall cavity
 - 2) Frees floor space when open
 - 3) Come packaged with a framed pocket which is built into the wall

g. Double-action doors

- 1) Spring hinge mounted on the door allows it to swing back and forth
- 2) May be one door or two doors

B. Windows

1. Purpose

- a. Admits light from outside
- b. May provide fresh air and ventilation
- c. Adds detail, balance, and interest to the exterior
- d. Visually enlarges interior space

2. Types

a. Double hung windows

- 1) Have two sashes that slide up and down
- 2) Most common type of window

b. Horizontal sliding/gliding windows

- 1) Have two or more sashes that slide horizontally
- 2) Operates on a track

c. Casement windows

- 1) Sashes are hinged on the side which swing outward.
- 2) On the exterior elevation, hinged side is represented by dotted lines forming a triangle.

d. Awning windows

- 1) Sash is hinged on the top and swings out.
- 2) Allows the unit to be open in light rain
- 3) On the exterior elevation, the hinged top is represented by dotted lines forming a triangle.

e. Hopper windows

- 1) Sash is hinged on the bottom, typically swinging inward.
- 2) Inward swing can interfere with the use of space near windows.
- 3) Can be constructed into unusual shapes

f. Fixed windows

- 1) Do not open to the outside, thus provide no ventilation
 - 2) Often combined with other windows to provide interesting designs
 - 3) Common fixed windows include Picture and Palladium windows
- g. Bay and Bow windows
- 1) May be fixed or casement
 - 2) Project from the structure
 - 3) Bay windows offer a traditional style.
 - i. Usually the sides are drawn at 45° or 30°.
 - ii. Depth of the bay is often between 18" and 24".
 - iii. Center window is typically either a fixed panel, double-hung, or casement window.
 - iv. Commonly extend from floor to ceiling
 - v. Often has its own roof structure
 - 4) Bow windows are arranged in a circular plan.
- h. Skylights
- 1) Built into the roof to admit light
 - 2) May or may not open for ventilation

C. Door and Window Schedules

1. Marks are placed on the floor plan to identify all doors and windows
 - a. Marks are numbers or letters placed inside circles or polygons to identify the door or window.
 - b. Marks are placed close to the door or window.
 - c. Doors/windows with exactly the same size and characteristics have the same mark.
2. Arranges all the information about a door or window in a chart
 - a. Repeats the mark found on the floor plan
 - b. Lists the number of doors/windows needed for this structure
 - c. List the size of individual and multiple units
 - d. Identifies the type of door or window
 - e. Includes any material notes and/or special remarks about the unit

- f. May include elevation drawings of the door or window near the chart to help define its appearance

UNIT C: Floor Plans

Competency: 203.00

Draw Floor Plans

Objective: 203.04

Identify floor plan symbols.

R1, pgs 236-270

See also Handouts and Activities

A. Doors and openings

1. Hinged (swinging)
 - a. Exterior
 - b. Interior
2. Bifold
3. Sliding
4. Pocket
5. Double-action
6. Arch or cased opening
7. Garage

B. Windows

1. Double-hung
2. Horizontal sliding
3. Swinging
 - a. Casement
 - b. Awning
 - c. Hopper
4. Fixed
5. Combination
 - a. Bay
 - b. Bow
6. Skylight

C. Bathroom fixtures

1. Tub
2. Water closet

3. Bidet
 4. Lavatory (sink)
 - a. Built into a cabinet
 - b. Wall hung
 - c. Pedestal
 5. Shower
 - a. Head
 - b. Drain
 - c. Sloping floor
 - d. Faucet
- D. Kitchen fixtures and appliances
1. Sink
 - a. Double bowl
 - b. Single bowl
 - c. Triple bowl
 2. Refrigerator
 3. Dishwasher
 4. Range/stove
 - a. Built-in oven
 - b. Cook top
 5. Base cabinets
 6. Wall hung cabinets
- E. Utility symbols
1. Washer
 2. Dryer
 3. Laundry tub (sink)
 4. Water heater
 5. AC/return air
- F. Wall material symbols (section symbols)
1. Wood frame walls
 2. Wood frame with brick veneer

3. Stone
4. Concrete
5. Concrete block

UNIT C: Floor Plans

Competency: 203.00

Draw Floor Plans

R1, pgs 340 & R2, pgs 483- 490

Objective: 203.05

See also Handouts and Activities

Identify terms and symbols used to indicate electrical fixtures.

A. Switches

1. Single pole
2. 3 way
3. 4 way
4. Weather proof
5. Dimmer
6. Special
7. Branch circuits/Switch leg connectors

B. Convenience outlets

1. Duplex receptacle
2. Split wired
3. Special purpose
4. 220 volt
5. Weather proof
6. Ground Fault Interrupt (GFI)

C. Lighting

1. Incandescent
2. Fluorescent
3. Special
4. Recessed

D. Miscellaneous

1. Exhaust fan
2. Room air circulating fan
3. Telephone
4. TV Antenna Outlet

5. Chimes
6. Smoke detector
7. Thermostat

UNIT C: Floor Plans

Competency: 203.00

Draw Floor Plans

Objective: 203.06

R1, pgs. 334-351

Explain the rules and standards for electrical fixture placement.

A. Verify placement and completeness of required fixtures

1. Outlets
2. Lights
3. Switches and switch leg connectors
4. Miscellaneous fixtures
 - a. Exhaust fan
 - b. Ceiling fan
 - c. TV
 - d. Telephone
 - e. Smoke detector
 - f. Push button and chimes/bells/buzzer

B. Placement of switches

1. Place on the latch side of the door/entrance
2. Closet switches are placed on the outside of the closet.
3. Lights for hallways, stairs, and garages are controlled from both ends
4. Large rooms with two or more exits have multiple switches
5. Each room must have at least one light controlled by a switch

C. Placement of outlets

1. Consider furniture and appliance placement
2. For rooms other than kitchens, outlets should average one per every 6' of wall.
3. Kitchen appliance outlets should average one per every 4' of wall.
4. Hall outlets should be placed every 15'
5. An outlet should be placed no further than 6' from each room corner.
6. Each appliance should have an outlet.

7. Each bathroom should have at least two outlets with at least one above the sink or counter.
8. Include weatherproof outlets on each side of the exterior.
9. Position outside outlets for decorative lights.
10. Must include at least one outlet in attic and crawl space
11. Ground fault outlets must be located where the danger of grounding exists near water sources.

D. Placement of lights

1. Provide enough foot-candles of illumination for the required activity.
2. Plan for light over the dining room table.
3. Include lights on the exterior for general illumination and decoration.
 - a. Connected to motion detectors for security
 - b. Need to be waterproof
4. Include lighting for stairs and halls.

E. Electrical Fixture Plan

1. Shows *approximate* placement of fixtures
 - a. Does not include circuit design
 - b. Does not consider electrical loads
2. Electrical fixtures can be shown on the working floor plan, however information should not be crowded and difficult to read.
 - a. Draw electrical symbols on an abbreviated floor plan to prevent crowding the information.
 - b. On CAD floor plans, layers created for various details can be turned off, providing just the basic wall outline layer.

F. Electrical Symbols

1. Drawn in approximate locations
2. Placement
 - a. Standard placement
 - 1) 48" high for switches
 - 2) 12" high for outlets

- b. Where switches and outlets vary from their normal vertical placement, note the dimensional change along with the symbol.
3. Connect switches to the devices that they control by drawing a curved, dashed line.
4. A symbol legend should be provided on the drawing.
5. Except in special situations, dimensions are not provided.

UNIT C: Floor Plans

Competency: 203.00

Draw Floor Plans

Objective: 203.07

R1, pgs. 277-289

Evaluate the steps in drawing, dimensioning, and annotating a single-level floor plan.

A. The floor plan

1. The purpose of the floor plan is to show precise locations and dimensions of walls, windows, doors, appliances, fixtures, cabinets, and other fixed features.
2. Usually started first and may be finished last
3. All other drawings refer to or project from the floor plan
4. Is a sectional drawing with the cutting plane at approximately 4' above the floor

B. Drawing a floor plan

1. Determine the scale that will allow you to fit the drawing onto the assigned sheet size.
 - a. $\frac{1}{4}" = 1'-0"$ is most often used for residential floor plans.
 - b. Scale varies with paper size, details, and scope of project.
2. Procedure for drawing
 - a. Using an appropriate scale, block in the overall size of the structure
 - 1) Allow space for adding dimensions and annotation
 - 2) Allow space for exterior features
 - b. Layout exterior and interior walls
 - c. Locate and draw/insert door and window symbols
 - d. Layout and draw kitchen cabinets/fixtures and bathroom fixtures
 - e. Add dimensions, annotation, and room names
 - f. Add miscellaneous symbols
 - g. Locate and draw walks, patio, porch, and/or deck
 - h. Add material symbols and annotation
 - i. Draw/insert title block and indicate scale, date, drafter, revisions, etc.
 - j. Check throughout for drawing accuracy and content

C. Dimensioning and Annotation

1. Exact methods vary with different designers.
2. All features must be located and sized completely and accurately.
 - a. Builder becomes the designer if measurements are left off
 - b. Errors are costly both in time and money.
3. General procedures
 - a. Dimension lines are generally unbroken with $\frac{1}{8}$ " tall numbers placed above the line
 - b. Dimension lines should be $\frac{3}{4}$ " or more off of the object and at least $\frac{1}{4}$ " apart
 - c. Foot and inch marks are used with a dash between the foot and inch numerals
 - d. Measurements over 1' are written in feet and inches, less than 1' are expressed in inches only, if no inches are present, the foot must be followed by a zero inches (example: 5'-0")
 - e. Use the aligned system (read from the bottom and right)
 - f. Dimension lines, extension lines, center lines, and leaders are thin
 - g. Curved leaders are sometimes used to avoid confusion with straight lines of the building
 - h. Avoid crowding dimensions
4. Placement of dimensions
 - a. Interior frame walls are dimensioned to either the side, center, or both sides of the stud
 - b. Exterior frame walls are commonly dimensioned to the face of the stud or sheathing excluding the exterior finish
 - c. Masonry structures are typically dimensioned to face of the masonry material for exterior and interior walls
 - d. Masonry veneer walls are typically dimensioned to the outside of the stud or sheathing; An additional dimension is used to size the cavity and masonry material thickness

- e. Windows and doors are located by centerlines in frame and veneer construction
 - f. Windows and doors are located by the edges of their openings in masonry walls
5. Modular dimensions
- a. Structures produced using modular components waste fewer materials and therefore cost less
 - b. Typical modular considerations
 - 1) Exterior walls should be modular lengths of 4' or at least 2'
 - 2) Plan rooms with an eye on standard sizes; building materials are sold in increments of 2'
 - 3) Concrete blocks use an 8" module and brick works on a 4" module
 - 4) Plan structure with material sizes in mind
 - i. Lumber lengths
 - ii. Plywood/OSB is 4'x 8'
6. Dimensions must be checked for accuracy
- a. Total offset strings and compare to stated overall dimensions
 - b. Check stated dimensions against scaled distances
7. Annotation
- a. Room names should be given with $\frac{3}{16}$ " lettering and centered as much as possible
 - b. A label should identify all fixtures such as washer, dryer, dishwasher, sink, range, etc. using proportionately sized text
 - c. Title and scale are placed near the bottom of each individual drawing and detail
 - d. Title block includes sheet number, name of drawing, scale, date, drafter, client and other important information
 - e. Door and window sizes may be given on the floor plan or symbols may be applied for reference to a schedule
 - f. Label unusual or special features

UNIT C: Floor Plans

Competency: 203.00

Draw floor plans.

Objective: 203.08

Draw a single-level residential floor plan.

Requirements: Each student is required to produce drawings for a 1200sf-1500sf. single-level residential floor plan that includes three bedrooms, two baths, living, dining/breakfast area, kitchen, utility room, and garage.

1. Use accepted drafting standards.
2. Include title block.
3. Time Limit = 180 minutes
4. An effort should be made to create a balanced appearance within drawing space.
5. Your work should reflect an understanding of space planning, door and window types, floor plan symbols, floor plan dimensions.

Assessment: The problem will be evaluated based on the following criteria:

Design Concepts	30 points
Doors & Windows	10 points
Floor Plan Symbols	20 points
Architectural Dimensioning	20 points
Drawing Technique	20 points

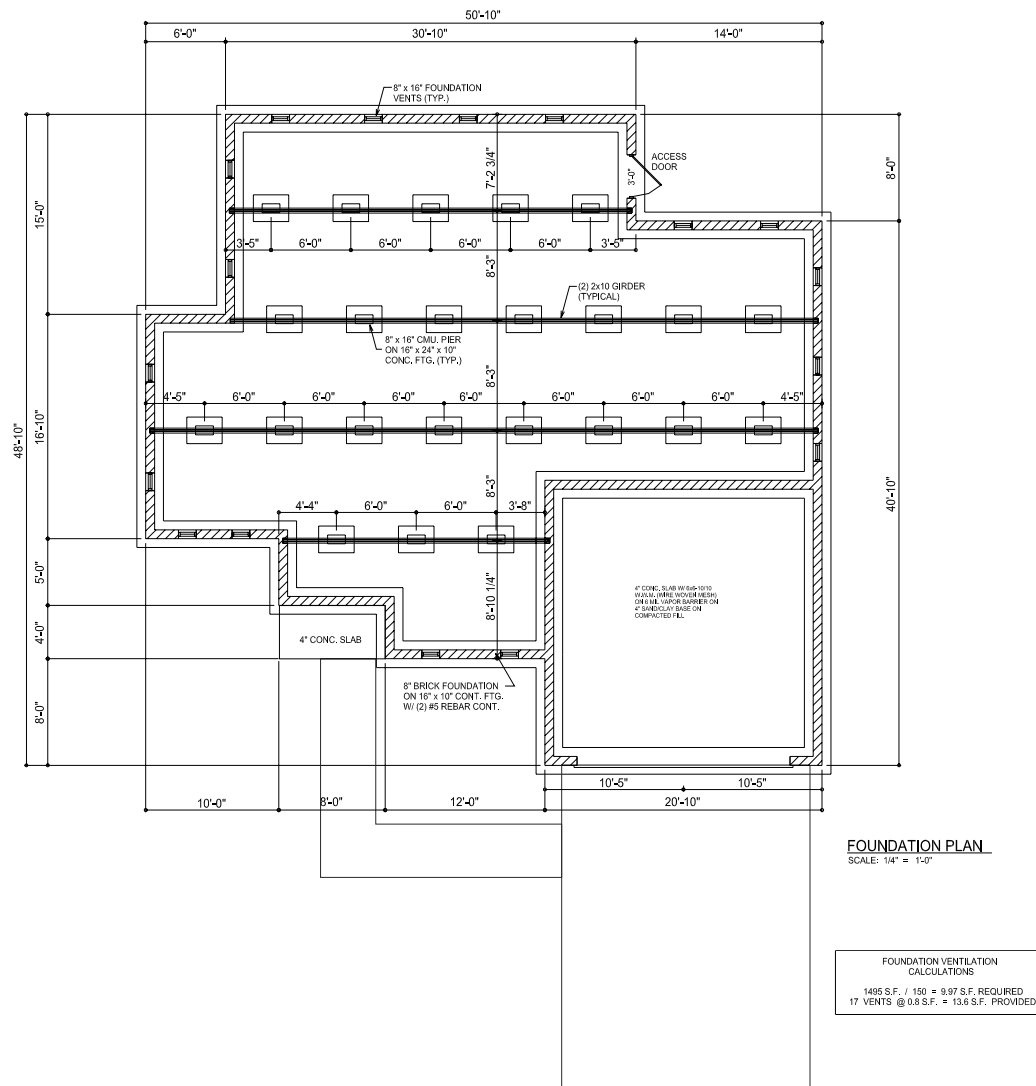
203.08**Draw a single-level residential floor plan.**

This rubric is designed with the assumption that the *Floor Plan* drawing will be a single-story; residential structure with no fireplace, basement, or stairs, made using CAD software and plotted to an appropriate scale.

Criterion Statements	Point Value	Rating
<i>Design Concepts</i>	30	
• Design demonstrates consideration of traffic patterns • Entrances and exits demonstrate efficient planning • Rooms are grouped appropriately • Room sizes are appropriate • Fixture/appliance arrangement demonstrates efficient planning • Kitchen Work Triangle demonstrates efficiency • Electrical plans are accurate and complete		
<i>Doors and Windows</i>	10	
• Placement demonstrates thoughtful planning • Symbols are correctly sized and located • Symbols are correctly annotated • Schedule contains all required information		
<i>Floor Plan Symbols</i>	20	
• Industry accepted standard symbols are used • Symbol correctly sized and located • Symbols exist on a dedicated layer • Correctly oriented and positioned		
<i>Architectural Dimensioning</i>	20	
• Dimensional styles are appropriate • Annotations are appropriate style and size • Hard copy is appropriately scaled • All required dimensions are stated		
<i>CAD Drawing Technique</i>	20	
• Setup file for units, limits, grid, snap and layers • File correctly saved • Layers correctly managed • Linetypes correctly coded • Drawings neatly laid out to balance space on the page • Line connections connect when closely zoomed • Lines are not over-drawn/ are continuous lines		
Total	100	

UNIT D

Foundation Plans



UNIT D: Foundation Plans

Competency: 204.00

Draw Foundation Plans

Objective: 204.01

R1, pgs. 625-693

Identify terminology related to foundation plans.

1. Footing - Lowest member of foundation system used to spread the loads of structure across supporting soil
2. Live Load - Load from all movable objects within a structure including loads from furniture and people. External loads from snow and wind are also considered live loaded.
3. Dead Load - Weight of building materials or other immovable objects in a structure
4. Stem Wall - A concrete block or brick foundation wall constructed on top of the footer
5. Rebar - Reinforcing steel used to strengthen concrete
6. Settlement - Sinking foundations, cracked or buckled walls and uneven floors caused by unstable soil and extreme moisture with lack of proper drainage
7. Monolithic - Concrete construction created in one pour
8. Structural Reinforcement – Rebar, steel forms, keyways or any other material used to strengthen foundation systems
9. Piers - Concrete or masonry foundation pillar support used to support the floor system
10. Columns/Posts - Vertical structural support, usually round and made of steel
11. Girders - Horizontal support member at the foundation level
12. Frost Line - Depth to which soil will freeze
13. Foundation Wall – The vertical wall that extends from the top of the footing up to the first-floor level of the structure. Helps spread the load being supported
14. CMU – (Concrete Masonry Unit) Concrete Blocks used in foundation walls and piers
15. Aggregates - Stone, gravel, cinder, or slag used as one of the components of concrete
16. Modular Brick – Brick that is identified by a nominal size that includes an allowance for the thickness of a standard mortar joint
17. Stretchers - A course of masonry laid horizontally with the end of the unit exposed

- 18. Lintels - A horizontal steel member used to provide support for masonry over an opening
- 19. Pilaster - A reinforcing column built into or against a masonry wall
- 20. Jamb Blocks - A concrete block that is shaped to go around the jamb
- 21. Drain Tile - A buried drainage system used to run-off storm or sewer away from the foundation. Typically made of black, plastic tubing with holes
- 22. Parging - A thin coat of plaster used to smooth a masonry surface
- 23. Polyethelene – Vapor barrier sheeting, generally 6 mil, used to block moisture
- 24. Forms – Wood or plastic molds used to create footings from poured concrete
- 25. Bearing Capacity – A design value specifying the amount of weight a square foot of soil can support
- 26. Unexcavated – Undisturbed earth that has not been dug out or filled

UNIT D: Foundation Plans

Competency: 204.00

Draw Foundation Plans

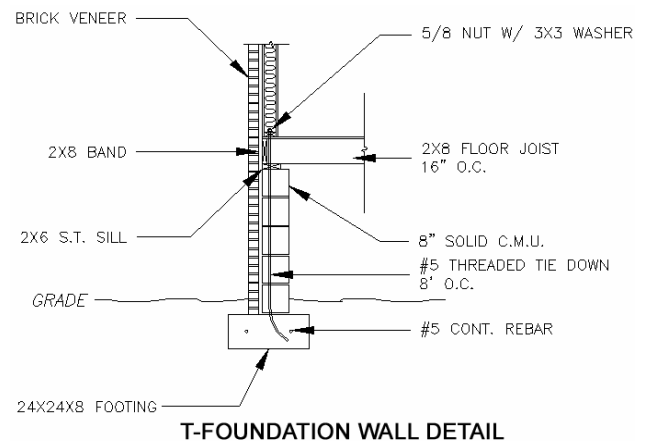
Objective: 204.02

Identify common foundation systems.

R1, pgs 625-693

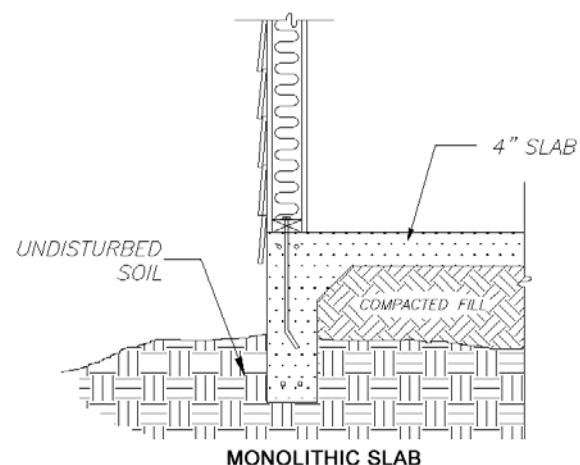
A. T-Foundations

1. The name is derived from the shape of the foundation wall and footing, which consists of a poured concrete footing and a foundation wall that resembles an inverted "T."
2. The foundation wall and footing may be separate or cast "monolithically" as a single unit.
3. The foundation wall is typically centered on footing.



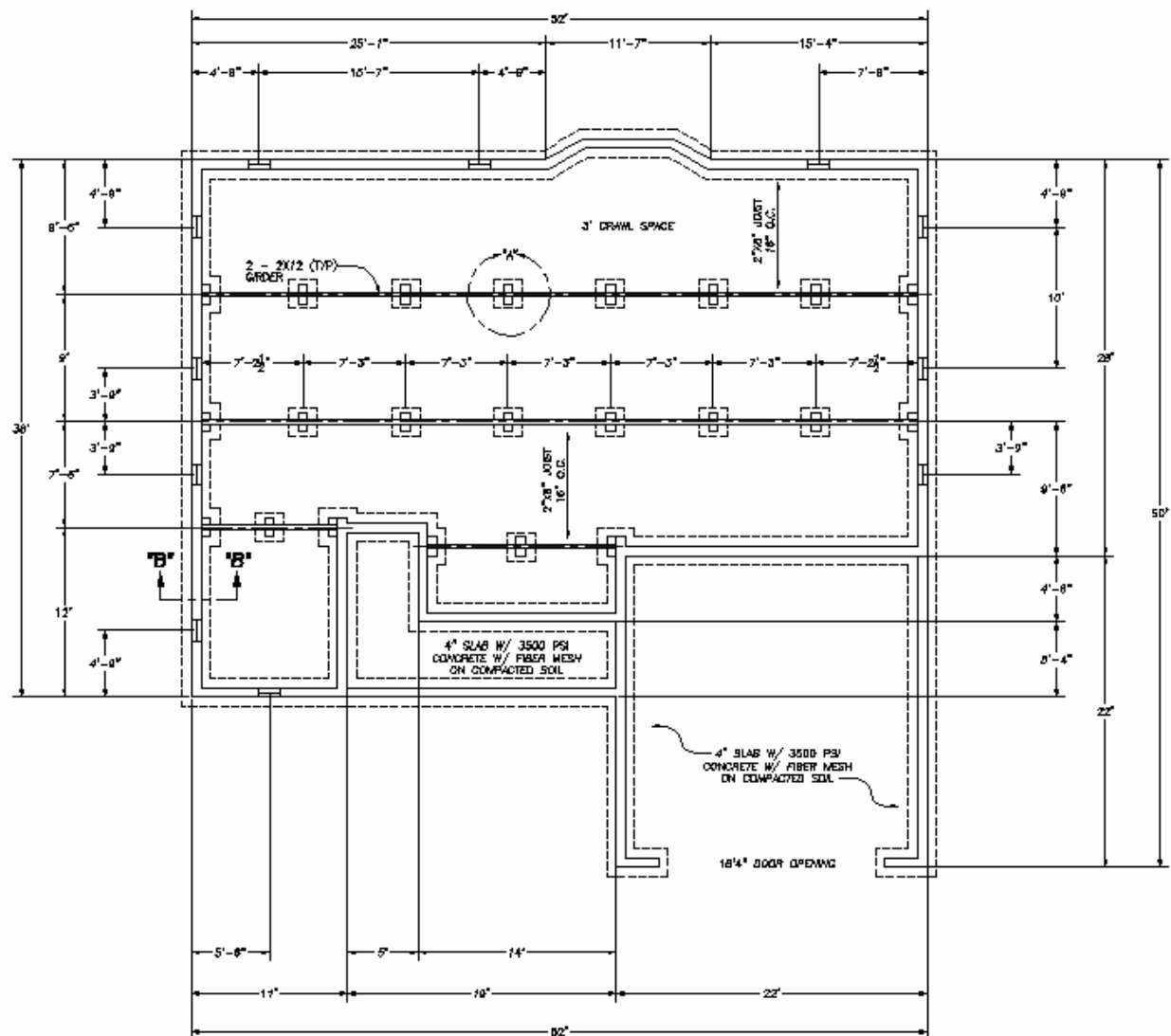
B. Slab Foundations

1. Concrete floor typically poured monolithically or separate from the footing
2. Rebar or fiber mesh is recommended to prevent cracking due to settling
3. Requires less time and labor than the T-Foundation
4. The base of the footing should extend below the frost line



C. Pier and Post Foundations (Crawlspace and Basement)

1. Piers and columns are vertical members used to support floor systems.
2. Piers are shorter than columns/posts and are generally used in a crawl space.
3. Posts/columns are commonly used in basement walls.
4. Footings must be provided under piers and columns for support.
5. Beams (girders) are used in place of bearing walls between the piers and columns.



UNIT D: Foundation Plans

Competency: 204.00

Draw Foundation Plans

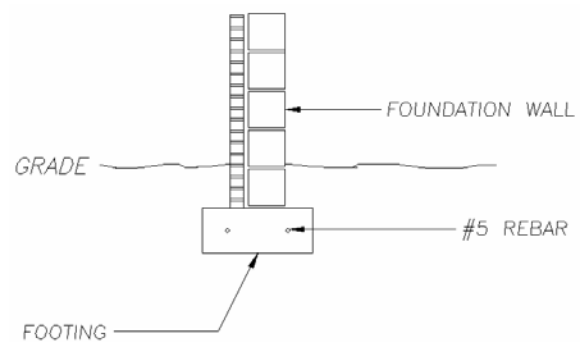
Objective: 204.03

Explain footing and foundation wall construction.

R1, pgs 625-693

A. Footings

1. The footing is wider than the foundation wall; its purpose is to spread the entire load of the structure over a wider area in order to prevent uneven settlement



- a. Different types of soils are capable of supporting varying loads. The type of soil must be considered when determining the size of a footing
- b. Determine footing sizes based on live loads and dead loads
 - 1) Live loads include movable items such as people, wind, snow, and furniture.
 - 2) Dead loads include all of the materials used in the construction of the building.
2. Footings are generally made of poured concrete in residential construction.
 - a. In stable soils, a trench is dug to which shapes the footing
 - b. With unstable soils, sand for example, forms must be constructed to shape the footing.
 - c. Concrete can withstand heavy loads.
 - d. Steel rebar can be added to the concrete to provide additional support
3. Proper footing design and construction are important because uneven settlement can cause damage to the structure.

- a. Larger footings aid in prevention of uneven settlement.
- b. Two or more different soils under a structure can cause uneven settlement.
- c. Different loading conditions on walls can cause uneven settlement.
- d. Effects of uneven settlement
 - 1) Doors and windows stick.
 - 2) Cracks appear in finish materials.
 - 3) Plumbing can move, causing leaks.
 - 4) Structural elements can fail.

4. Frost line

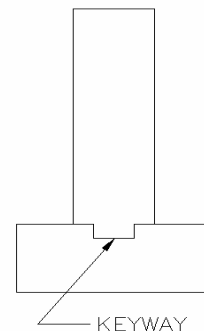
- a. The frost line is the depth to which the ground will freeze.
 - 1) Depth varies with geographic location.
 - 2) Local codes specify the minimum footing depth.
- b. The footing must be placed below the frost line.
 - 1) When the ground freezes and thaws, it expands and contracts.
 - 2) If footing is placed above the frost line, it will be pushed upward causing cracks in the foundation.

B. Foundation walls

- 1. The foundation wall extends from the footing upward to the first floor.

- a. Poured concrete

- 1) Composed of cement (clay and limestone), water, stone or other aggregate
 - 2) Poured concrete walls use a *key* to tie them to the poured concrete footing



- b. Concrete block is commonly used in construction

- 1) May be purchased in a variety of sizes and shapes
 - i. The most common (*nominal*) size for a concrete block is 8"high x 8"thick x 16"long.

- ii. The *actual* size is $7\frac{5}{8}" \times 7\frac{5}{8}" \times 15\frac{5}{8}"$ with a $\frac{3}{8}"$ mortar joint allowance.
 - iii. Common thickness includes 4", 8", 10" and 12".
 - iv. Common styles include 2 and 3 core stretchers, solids, lintels, corner, pilaster, and jamb blocks.
 - v. *CMU* is the standard abbreviation for *Concrete Masonry Unit*.
- c. Brick
- d. Stone
- 2. The thickness of a foundation wall depends upon several factors and must be designed according to local codes and conditions.
- 3. The shape of the foundation wall must be designed to handle horizontal earth movement. Lateral earth shifting caused by seismic activity can easily damage foundation walls.
- 4. Foundation walls require damp proofing on the outside of the wall
 - a. Heavy coats of tar or 2 coats of cement based paint
 - b. Thin ($\frac{1}{4}"$) coats of parging (cement-mortar materials)
 - c. Drain tile
 - 1) Perforated pipe that surrounds the structure at the bottom of the wall
 - 2) Washed gravel is set from the wall and covered with washed gravel above holding back the soil but allowing water to enter the pipe.
 - 3) Water collected in the drain tile is directed away from the foundation.
 - d. Polyethylene sheeting
 - 1) Thickness of material is measured in millimeters (*mils*).
 - 2) 6 mil is a commonly used thickness.

UNIT D: Foundation Plans

Competency: 204.00

Draw Foundation Plans

Objective: 204.04

R1, pgs 625-693

Explain the purpose of a foundation plan and describe its features.

- A. The foundation plan is a section drawing much like the floor plan, except that the cutting plane passes through the structure at the level of the foundation wall.
1. Drawn after the floor plan
 2. Features typically include the following:
 - a. Footings for walls, piers, columns (dashed lines)
 - b. Foundation walls
 - c. Piers and Columns
 - d. Pilasters
 - e. Openings in the foundation wall (access door, vents)
 - f. Beams (girders)
 - g. Direction, size, and spacing of floor joists
 - h. Annotation to describe sizes and materials used
 - i. Horizontal dimensions are used to locate features
 3. Material symbols used on floor plan drawings would be the same for a foundation plan drawing.
- B. The foundation plan is closely related to the floor plan, section, and elevations.
1. Dimensions stated on the floor plan, elevations, and section must agree with the foundation plan.
 - a. Double joists occur under walls that were previously located on the floor plan.
 - b. Foundation vents are often located under windows previously located on the floor plan.
 - c. Girders may be placed under bearing walls located by the floor plan

2. Overall dimensions stated on the floor plan should agree with overall dimensions on the foundation plan.
3. Dimensions on a foundation plan are typically given for masonry construction and should be stated appropriately.

Example: 24"x24"x12" CONC PIER FOOT

C. Steps for drawing a slab foundation plan

1. Using dimensions on floor plan, layout exterior of slab. Edge of slab should match outside edge of exterior walls on floor plan
2. Draw interior side of the stem wall around the slab
3. Block out doors in the stem walls. Allow 4" for trim unless otherwise specified
4. Layout support ledge if brick veneer is used
5. Layout exterior footing width
6. Layout interior footings
7. Layout any exterior piers required for decks or porches
8. Draw changes in floor levels
9. Draw floor drains
10. Use proper Architectural Drafting techniques to dimension the following features:
 - a. Locate any exterior pier/columns for porches or decks
 - b. Locate and specify the overall size of all building offsets
 - c. Provide overall dimensions for the entire structure
 - d. Locate the center line of all double joists and girders (beams)
 - e. Locate all piers/columns and/or piles
11. Use proper Architectural Drafting techniques to make the following annotations:
 - a. Note the placement direction, size, material, material grade, and spacing of joists
 - b. Note the size, material, and material grade of girders (beams)

- c. State the size (including depth) and material used for pier and column footings
- d. Specify the thickness and material(s) used to construct the foundation wall
- e. Note any special construction details such as areaways for below-grade windows, ground coverings, bridging, etc.
- f. Title drawing and indicate scale

UNIT D: Foundation Plans

Competency: 204.00

Draw foundation plans.

Objective: 204.05

Draw a foundation plan.

Requirements: Each student is required to produce a slab or crawlspace foundation drawing in cooperation with the floor plan created in objective 203.08.

1. Use accepted drafting standards
2. Include the title block.
3. Time Limit = 180 minutes
4. An effort should be made to draw a structurally sound foundation system.
5. Your work should reflect an understanding of footing, foundation wall, rebar, concrete, live load, dead load, drain tile, vapor barrier.

Assessment: The problem will be evaluated based on the following criteria:

Design Concepts	30 points
Foundation Symbols	30 points
Architectural Dimensioning	20 points
Drawing Technique	20 points

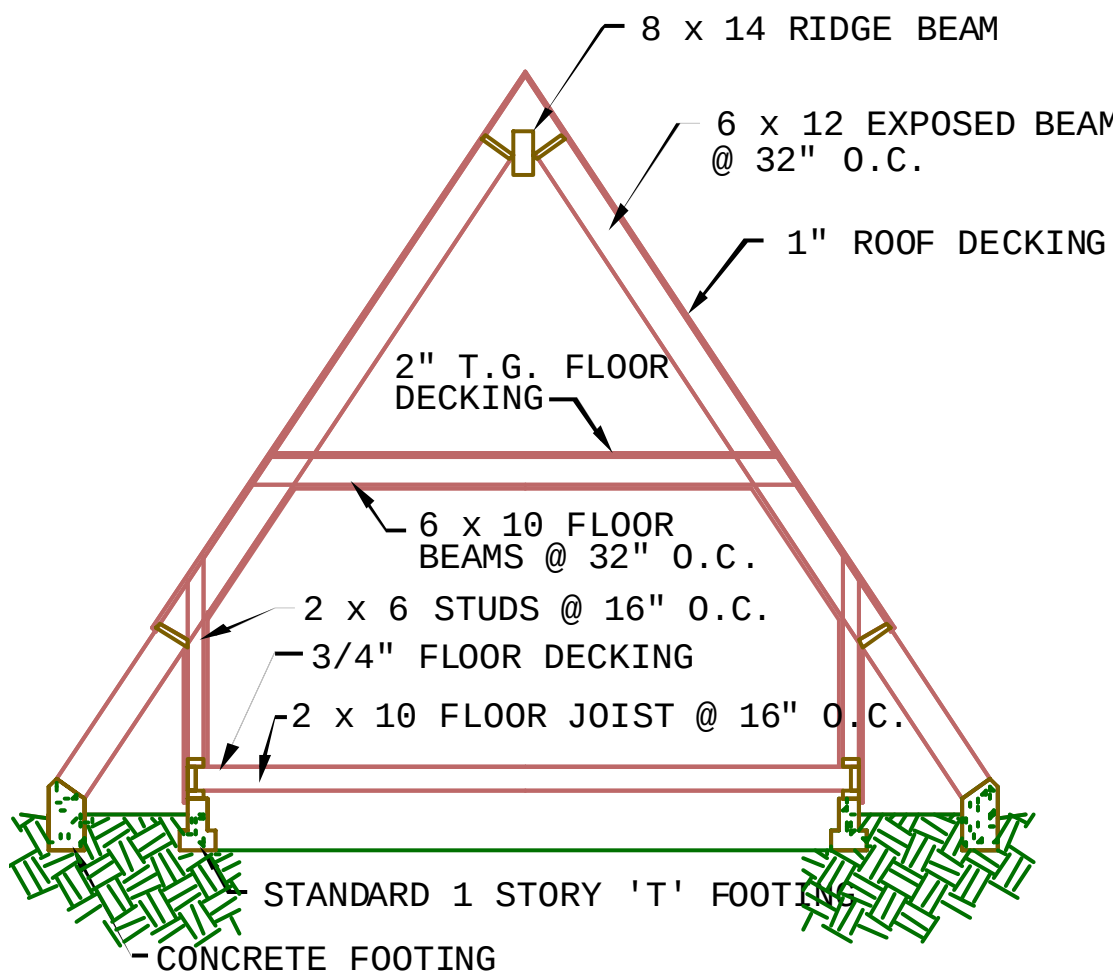
204.05**Draw a foundation plan.**

Each student is required to produce drawings of a foundation plan for the floor plan drawn and designed earlier. This rubric is designed with the assumption the Foundation Plan drawing will be a single-story; residential structure with no fireplace, basement, or stairs, plotted to an appropriate scale.

Criterion Statements	Point Value	Rating
<i>Design Concepts</i>	30	
- Demonstrate placement of the following and noted correctly. - Walls - Footings - Pilasters - Piers - Columns - Vents - Correct thickness of material. - Access doors if necessary. - Exterior edges match floor plan. - Correctly oriented and positioned.		
<i>Architectural Notes and Dimensioning</i>	30	
- Overall dimensions correct. - All required dimensions are clear visible - Follows appropriate dimension standards. - Symbols are correctly sized and located - Symbols are correctly annotated - Annotation of the following correctly located. - Girders - Joists - Beams - Note indicating surface - Title block		
<i>Accuracy, Line Weight, Neatness</i>	20	
- Line weight is neat, clean, and meets acceptable drafting standards for thickness and darkness. - Industry accepted standard symbols are used		
<i>CAD or Drawing Technique</i>	20	
- Setup file for units, limits, grid, snap and layers - File correctly saved - Layers correctly managed - Line types correctly coded - Drawings neatly laid out to balance space on the page - Line connections connect when closely zoomed - Lines are not over-drawn/ are continuous lines		
Total	100	

UNIT E

Basic Roof Design



UNIT E: Basic Roof Design

Competency: 205.00

Draw roof plans.

Objective: 205.01

R1, pgs. 410 - 435

Identify terms and definitions related to roof plans.

Terms and Definitions

1. Flat roof – common in areas with little rain or snow
2. Shed roof – offers the same simplicity and economical construction methods as a flat roof but does not have the drainage problems associated with a flat roof
3. Gable roof – one of the most common roof types in residential construction; constructed with two sloping sides that meet to form a ridge
4. Hip roof – has many similarities to a gable roof but with four surfaces instead of two; the intersecting surfaces are called hips
5. Gambrel roof – a traditional shape that dates back to the colonial period; the lower level is covered with a steep roof surface, which connects into the upper roof system with a slighter pitch
6. Mansard roof – similar to a gambrel roof with the angled lower roof on all four sides rather than just two
7. Dutch hip roof – a combination between a hip roof and a gable roof
8. Roof plan – a drawing in plan view of the roof area showing the features and items on the roof
9. Roof pitch/slope – a description of the angle of the roof that compares the horizontal run and the vertical rise
10. Rafter – the inclined structural member of a roof system designed to support loads
11. Roof truss – a prefabricated member formed of triangular shapes used to construct a roof
12. Ridge – the top of a roof where two sloping edges meet
13. Valley – the internal corner formed between two intersecting roof surfaces
14. Hip – the exterior edge formed by two sloping roof surfaces

15. Gable end wall – the triangular wall that is formed at each end of a gable roof between the top plate of the wall and the rafter
16. Cornice/Eave – the part of the roof that extends out from the wall
17. Flashing – metal used to prevent water leaking through surface intersections
18. Ridge board – the top horizontal member that rafters are aligned against to resist their downward force
19. Collar ties/beams – horizontal ties between rafters near the ridge to help resist the tendency of the rafters to separate
20. Ceiling joist – the horizontal member of the roof which is used to resist the outward spread of the rafters and to provide a surface on which to mount the finished ceiling
21. Live load – fixed or moving weights that are not a structural part of the building; examples: furniture, occupants, snow on the roof, wind, etc.
22. Dead load – Static or fixed weights of the structure itself; examples: weight of roofing materials, foundation walls, siding, joists, etc.
23. Knee wall – a wall of less than full height
24. Soffit – usually the underside of an overhanging cornice
25. Lookout – a beam used to support eave loads
26. Fascia – covers the rafter end enclosing the overhang

UNIT E: Basic Roof Design

Competency: 205.00

Draw roof plans.

Objective: 205.02

Explain concepts of roof construction

R1, pgs 410 - 435

A. Traditional framed roof (stick built)

1. Rafter size depends upon
 - a. The distance to be spanned
 - b. The spacing of the rafters (typically 24" O.C.)
 - c. The loads exerted on the roof from dead loads and live loads
2. Common rafters rest on the double top plate and extend to the ridge
3. Hip, valley, and jack rafters
 - a. Hip rafters extend from the ridge to a wall corner in a hip roof
 - b. Valley rafters occur where two sloping roofs intersect forming a valley
 - c. Jack rafters extend from the double top plate to either a hip or valley rafter
 - 1) Lengths vary as they occur higher on the roof
 - 2) Shorter than common rafters
4. Collar beams
 - a. Typically placed every 2nd or 3rd set of rafters
 - b. May serve as a ceiling joist for finished attics
5. Knee walls
 - a. Vertical studs that extend from the ceiling joists to the rafters
 - b. Reduces rafter span
 - c. Adds rigidity
 - d. May form wall in finished attics

B. Roof slope

1. Rise is the vertical distance measured from the top of the wall plate to the underside of the rafter.
2. Run is the horizontal distance equal to $\frac{1}{2}$ of the clear (building) span.

3. Span (building span) is the horizontal distance between the load bearing walls.
4. Roof pitch is the ratio of the actual rise to the actual span often indicated by rise to run ratio where the run is always expressed as 12.

C. Cornice/Eave

1. The cornice is composed of all the materials used to join the roof and exterior sidewalls
2. Roof overhang
 - a. Protects the walls and openings (windows, doors, etc.) from weather
 - b. Controls the amount of natural light that enters the building
3. Types of cornice
 - a. Open cornice
 - 1) Used with exposed beam construction
 - 2) Rafter ends (tails) are exposed and sometimes tapered or curved for appearance
 - b. Box cornice
 - 1) Fascia
 - i. Forms the eave line
 - ii. Projects below the soffit to form a drip edge
 - iii. May be nailed to the lookout
 - 2) Soffit is the material that covers the bottom side of the rafter tail.
 - i. May be attached directly to the bottom side of the overhanging rafter or to members that are perpendicular to the wall
 - ii. The bottom side of the rafter tail may be cut perpendicular to the soffit if nailed directly to it.
 - iii. A nailing strip (nailer) may be attached to the sidewall to serve as a continuous nailing surface.
 - iv. Wide overhangs require a lookout to be placed perpendicular to the wall to serve as an addition nailing surface.

4. Gable end (Rake)

- a. The rake or gable end is formed by the extension of the gable roof beyond the end walls of a house with a gable style roof.
- b. The gable end overhangs can be constructed in a manner similar to the other walls.
 - 1) Lookouts attached to the last rafters (with overhang) is less than 12"
 - 2) Fascia attached to the lookout

D. Roof trusses

1. Roof Truss

- a. Prefabricated unit that includes all of the members needed to perform the function of the rafters, ceiling joists, collar ties, and knee walls
- b. Often less expensive than conventional framing
- c. Able to span long distances without interior load bearing walls or beams
 - 1) Allows for more open plans
 - 2) Can install roof before interior wall construction begins

2. Truss assembly

- a. Top chord, bottom chord, and web members
- b. Joined together with plywood or sheet metal gussets for light construction
- c. Available in many styles such as the Fink (W), Howe (King post) and scissor truss
- d. Horizontal members, known as purlins, are placed perpendicular to the trusses to provide additional stability and nailing surface

E. Roof ventilation

1. Purpose

- a. Helps cool the attic area of the house in summer
- b. Removes moisture that forms in the attic area
 - 1) Moisture comes from the inside of the house (bathing, cooking, cleaning)

- 2) In cold weather, moisture will condensate on the cold attic members
- c. Helps prevent ice dams in winter conditions
 - 1) Melting snow refreezes at the colder edges of the roof, forming an ice dam where the water backs up.
 - 2) Water behind the ice dam can get under shingles.
 - 3) Ventilation helps keep the entire attic the same temperature.
2. Methods of ventilation
 - a. Gable end vents
 - 1) Louvered to let air (not rain) enter
 - 2) Various shapes such as triangular, semi-circular, rectangular, and octagonal
 - b. Cupola
 - 1) A small structure built above the main roof level to provide light and ventilation
 - 2) Louvered sides allow for air movement.
 - c. Ridge vents
 - 1) Projecting devices that exhaust air from the attic
 - 2) Some have moving parts such as the turbine vents.
 - 3) Some are flat and non-mechanical.
 - 4) Sometimes connected to thermostats
 - d. Soffit vents
 - 1) Allow air to enter the attic
 - 2) May be continuous strips or individual units
 - 3) Covered with wire to prevent insects and pests from entering attic area

UNIT E: Basic Roof Plans

Competency: 205.00

Draw roof plans.

Objective: 205.03

Draw a roof plan.

Requirements:

Each student is required to produce drawings of a roof plan for the floor plan drawn in Objective 203.08. This rubric is designed with the assumption that the Roof Design should include a gable or hip over the single-story, residential structure previously designed and drawn using board techniques or CAD software and plotted to an appropriate scale.

1. Use accepted drafting standards
2. Include the title block.
3. Time Limit = 180 minutes.
4. An effort should be made to create a balanced appearance within drawing space.
5. Your work should reflect an understanding the construction of a typical frame roof and understand the notes roof that has a typical roof slope.

Assessment: The problem will be evaluated based on the following criteria:

Design Concepts	30 points
Architectural Notes and dimensioning	30 points
Accuracy, Line Weight, Neatness	20 points
CAD Drawing Technique	20 points

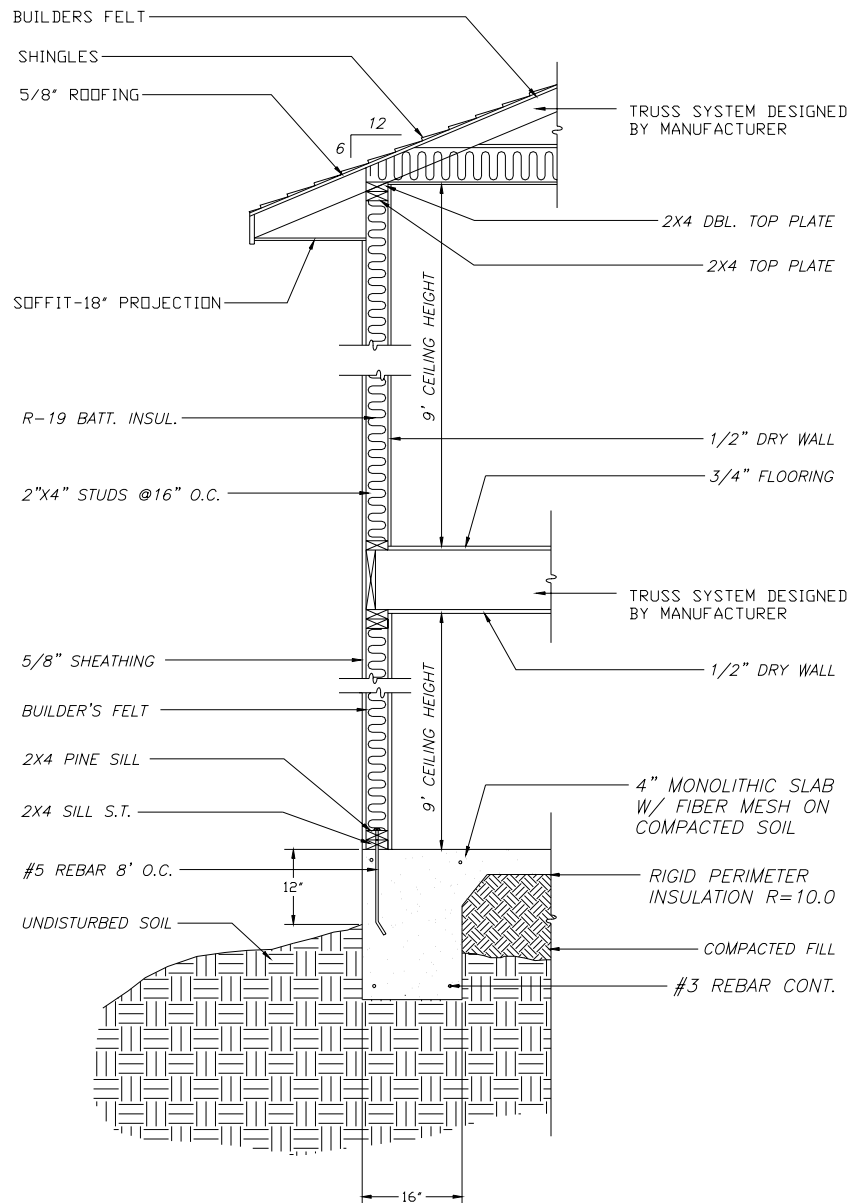
205.03**Draw a roof plan.**

Each student is required to produce drawings of a roof plan for the floor plan drawn and designed earlier. This rubric is designed with the assumption that the Roof Design should include a gable or hip over the single-story, residential structure previously designed and drawn using board techniques or CAD software and plotted to an appropriate scale.

Criterion Statements	Point Value	Rating
<i>Design Concepts</i>	30	
• Perimeter of walls • Supports required for covered porches • Limits of overhangs • Ridge or ridges • Locate and draw hips and valleys required by design. • Location of downspouts		
<i>Architectural Notes and Dimensioning</i>	30	
• Dimensions should be placed by using leader and extension lines or in a note. • Overhangs should be noted • Roof Pitch • Sheathing information • Dimensions should match floor plan including overhang. • General Notes • Title and Scale		
<i>Line Weight, Neatness</i>	20	
• Line weight is neat, clean, and meets acceptable drafting standards for thickness and darkness. • Industry accepted standard symbols are used		
<i>CAD Drawing Technique</i>	20	
• Setup file for units, limits, grid, snap and layers • File correctly saved • Layers correctly managed • Line types correctly coded • Drawings neatly laid out to balance space on the page • Line connections connect when closely zoomed • Lines are not over-drawn/ are continuous lines		
Total	100	

UNIT F

Sections and Details



UNIT F: Sections and Details

Competency: 206.00

Draw wall sections and details.

Objective: 206.01

R1, pgs 700-738 & 927-938

Identify terms and definitions related to sections and details.

Terms and Definitions

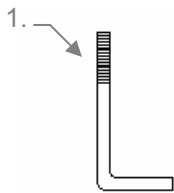
1. Anchor bolts - A threaded rod inserted in masonry construction to anchor the sill plate to the foundation
2. Beam – A structural member that supports the joists and effectively reduces the span
3. Blocking – Framing members, typically wood, placed between joists, rafters, or studs to provide support. This will allow for additional construction items
4. Bridging – Small wood or metal members that are inserted in a diagonal position between the floor joists at mid-span to act both as tension and compression members for the purpose of bracing the joists and spreading the action of loads.
5. Ceiling Joist - Used to span and support the roof loads from the ridge to the top plate
6. Chords – The outside framing members of a truss, often referred to as top or bottom chord
7. Corner Bracing - Used at the corner of the structure to stiffen, strengthen, and insure that the wall unit is squar
8. Cripple Stud (Jack studs)- Studs not full height used to frame around an opening in a wall
9. Crawl space – The shallow space below the floor of a house built above the ground; generally surrounded with the foundation wall
10. Cutting plane – The location on the floor plan where a cross section is taken is identified with symbols known as cutting plane lines
11. Double Joist – A built up beam located under walls running parallel to the joist direction

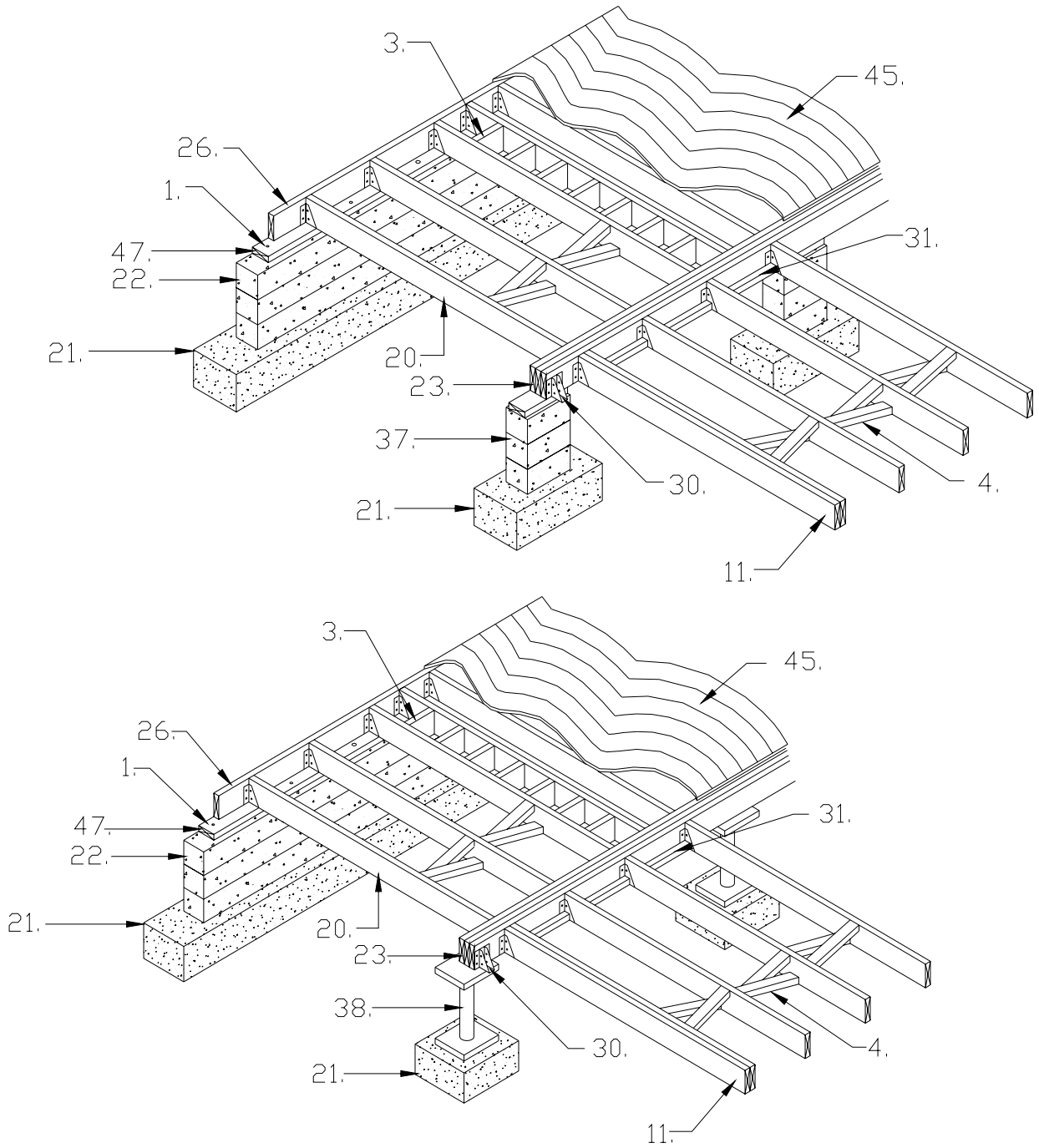
12. Double Top Plate – Located on top of the studs and used to hold the walls together
13. Drain Tile – A pipe that allows moisture to escape from a masonry structure
14. Face grain – A symbol representing material from a particular view
15. Fascia – A vertical board nailed onto the ends of the rafters
16. Finished Floor - The top layer of flooring placed on top of floor decking or concrete
17. Flange – The top and lower portion of an 'I' beam
18. Flashing – Sheet metal or other material used in roof and wall construction to shed water away from areas of potential leakage
19. Flitch beams – A built-up beam that consists of steel plates bolted between wood members
20. Floor Joist – Used to support the floor decking
21. Footing – A masonry section, usually concrete, in a rectangular form; used to increase the supporting capacity
22. Foundation Wall – The supporting portion of the structure below the first-floor construction, or below grade, including the footings
23. Girder – A large or principle beam of wood or steel used to support concentrated loads at isolated points along its length
24. Glulam Beams – Glue-laminated members that consist of 1x or 2x lumber glued in stacks to the desired shape and size
25. Hatching/Section lining – Used to show the feature has been sectioned or cut
26. Header – Wood horizontal member used above the door or window to provide support for the top plate
27. Header (Rim Joist, Butt Joist) – A beam placed perpendicular to joists and to which joists are nailed
28. Insulation – Prevents or reduces the transfer of heat or sound from one location to another
29. Joist – Provides support for the floor or ceiling
30. Joist Hanger – A metal strap used to support piping or the ends of joists

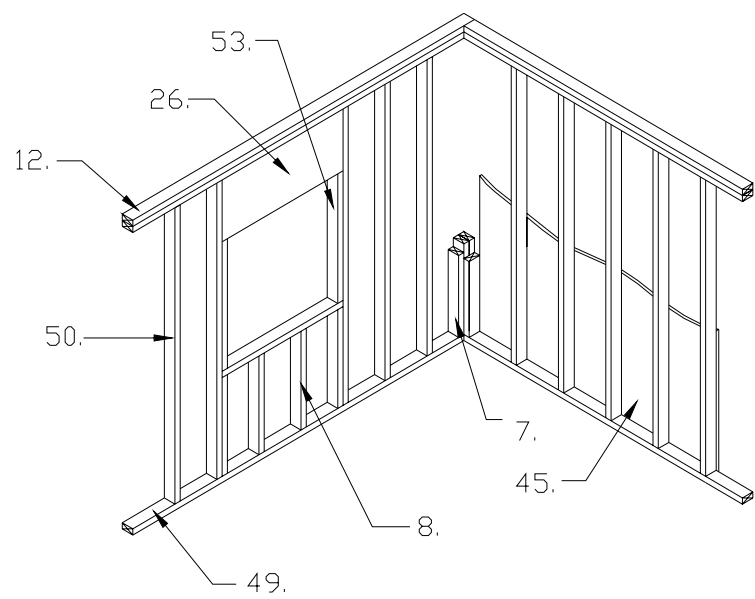
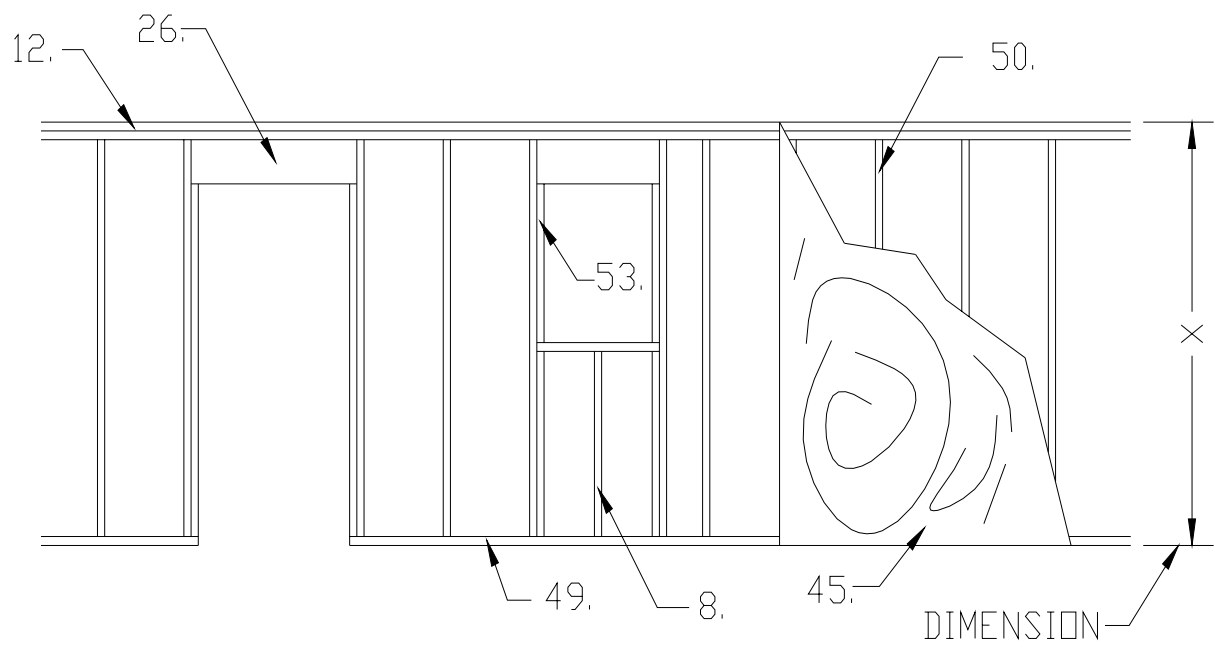
- 31. Ledger Strip – A strip of lumber nailed along the bottom of the side of a girder on which joists rest
- 32. Longitudinal section – A method of post and beam construction where the beams are placed at right angles to the roof slope and the roof decking is laid from the ridgepole to the eaves line
- 33. LVL (Laminated Veneer Lumber) – An engineered wood product in which veneers of wood are stacked in parallel and glued under pressure
- 34. O.C. – On-Center- The measurement of spacing for studs, rafters, joists, and other framing members from the center of one member to the center of the next
- 35. OSB – Oriented Strand Board – An engineered wood product in which long strands of wood are mixed with resin, placed, in layers, and pressed and cured
- 36. Particleboard – A composition board made of wood chips or particles bonded together with an adhesive under high pressure
- 37. Pier – A masonry pillar usually below a building to support the floor framing
- 38. Post – A metal structure used below a building to support the floor framing
- 39. Pressure Treated – The wood has been treated to resist rot and termites
- 40. PSL – Parallel Strand Lumber – An engineered wood product in which thin strands of wood are glued together under pressure
- 41. Rafter – The most basic member of roof framing; designed to support roof loads
- 42. Ridge Board – The board placed on edge at the ridge of the roof into which the upper ends of the rafters are fasted
- 43. R-Value – A measure of resistance to heat flow
- 44. Section line – Defines surfaces touched by the cutting plane
- 45. Sheathing – The structural covering, usually wood boards or plywood, used over studs, joists, or rafters of a structure
- 46. Shingles (asphalt) – Composition roof shingles made from asphalt-impregnated felt covered with mineral granules
- 47. Sill (mud sill) – The lowest member of the frame of a structure, it rests on the foundation and supports the floor joists or the uprights (studs) of the wall.
- 48. Soffit – Underside of the overhanging cornice
- 49. Sole plate – The bottom horizontal member of the wall on which studs rest

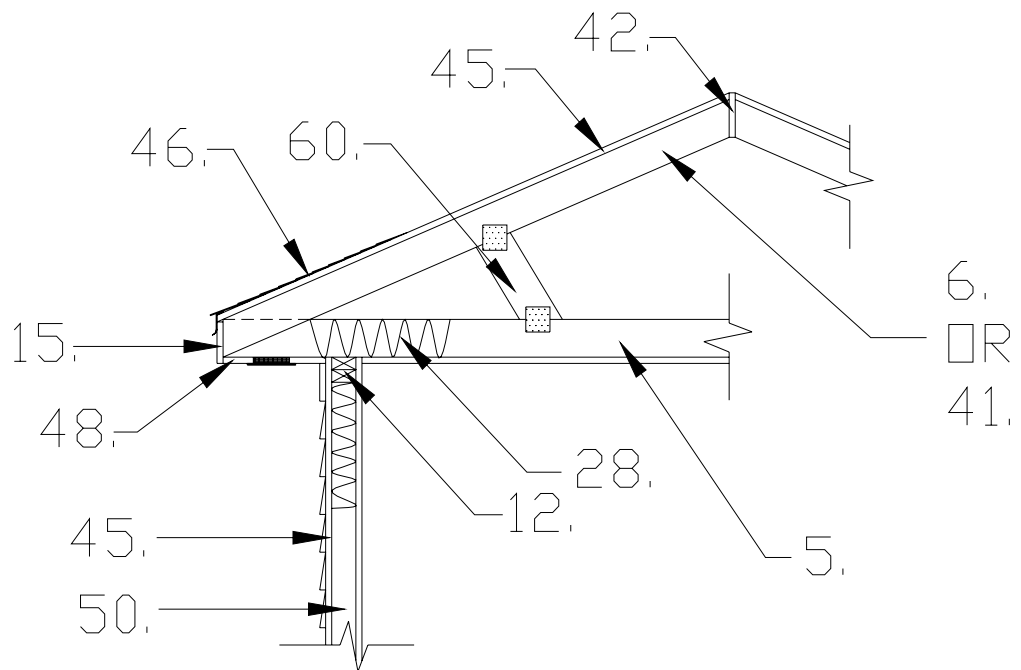
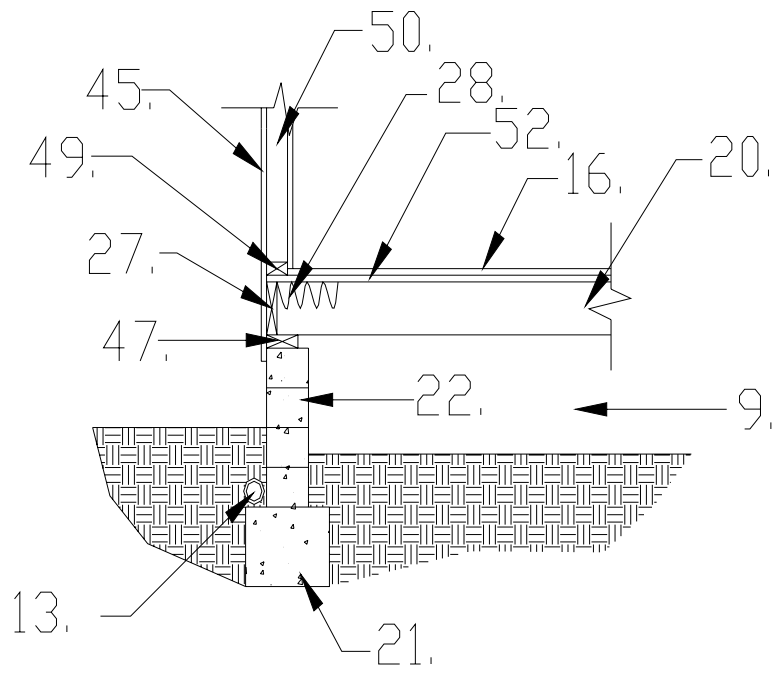
- 50. Stud – A vertical framing part of a stud wall
- 51. Stud Wall – A vertical wall framing member
- 52. Sub-floor – Affixed to the floor joists; provides the surface on which the underlayment for the final floor will rest
- 53. Trimmer Stud – Used to support the header of an opening in a wall
- 54. Truss – Structural members arranged and fastened in triangular units to form a rigid framework for support of loads over a long span
- 55. Underlayment – A material placed under finish coverings, such as floor or shingles, to provide a smooth, even surface for applying the finish
- 56. Vapor barrier – Prevents moisture transfer
- 57. Veneer Construction – Type of wall construction in which frame or masonry walls are faced with other exterior surfacing materials
- 58. Wall studs – Vertical framing member of a wall
- 59. Wall ties – Nailed to sheathing prior to constructing masonry veneer walls for the purpose of tying the masonry units to the wood frame wall
- 60. Web – The framework between the chords of a truss
- 61. Weep hole – An opening at the bottom of a wall that allows the drainage of water

Graphic reference for terms and definitions









UNIT F: Sections and Details

Competency: 206.00

Draw wall sections and details.

Objective: 206.02

R1, pgs 497-591 & R2, pgs 273-317

Explain concepts of wood sill and floor construction.

A. Commonly used lumber is determined based on code and drawing specifications

1. Nominal sizes

- a. 2x4
- b. 2x6
- c. 2x8
- d. 2x10
- e. 2x12

2. Actual sizes

- a. $1\frac{1}{2} \times 3\frac{1}{2}$
- b. $1\frac{1}{2} \times 5\frac{1}{2}$
- c. $1\frac{1}{2} \times 7\frac{1}{2}$
- d. $1\frac{1}{2} \times 9\frac{1}{4}$
- e. $1\frac{1}{2} \times 11\frac{1}{4}$

3. Common lengths

- a. 8'
- b. 10'
- c. 12'
- d. 14'
- e. 16'

4. Structurally graded according to knots (size, tightness, placement), wane, and straightness

B. Sill

- 1. Rests on top of the foundation wall
- 2. Supports the floor joists

3. Prevents air infiltration, fiberglass insulation is frequently used as a sill sealer between the sill and the foundation wall
4. Must be pressure-treated lumber
5. Used as a transition between masonry and standard lumber
 - a. Anchor bolts embedded into masonry are commonly used to tie the sill to the foundation
 - b. Nails can be shot into concrete with a low-caliber nail gun

C. Joists

1. Provide support for the floor
2. May be wood or steel
3. Size of wood joists depends upon
 - a. Species of lumber
 - b. Wood grade
 - c. Spacing
 - 1) 12", 16", or 24" O.C. spacing is most common
 - 2) Works with the 48" module common to plywood and OSB
 - d. Recommended live load (40psf)
 - e. Distance between supports (clear span)
 - f. Joists manufacturer's charts
4. Double joists must be provided under walls running parallel to the joist direction
 - a. May be solid or built up of two joists
 - b. May have solid blocking between doubled joists to allow for plumbing that passes through the floor
5. Bridging
 - a. May be used between joists
 - b. Transfers the floor loads to adjacent joists
 - c. Stiffens joists
 - d. Aligns joists vertically
 - e. May be diagonal wood members, metal or 1x3 wood cross bridging
 - f. May be solid blocking placed perpendicular between joists

D. Wood floor trusses

1. May be used in place of solid lumber joists to provide support for the floor
2. Able to span longer distances than solid lumber joists
 - a. Reduce or eliminate the need for girders, piers, and columns
 - b. Allow for designing open spaces
 - c. Formed with top and bottom horizontal chords and diagonal webs constructed of standard size lumbers
3. Typically placed 24" O.C.
4. Open web construction
 - a. Reduces sound transmission through floors
 - b. Aids in ease of plumbing, electrical, and heating systems installation
5. Sizes are determined from manufacturers' charts

E. Wooden I-Joists

1. Similar to wood floor trusses
2. May be used in place of solid lumber joists to provide support for the floor
3. I-joists are able to span longer distances than solid lumber joists
 - a. Speed construction
 - b. Very straight
 - c. May come with circular knock-outs
4. Formed with horizontal wooden (solid lumber or micro lam) top and bottom flanges, grooved to receive a solid plywood or OSB vertical web

F. Joist header (Rim joist, or Butt joist)

1. Used as rim joists with I-joist construction
2. Can be used with truss construction
3. Should be strapped to the sill in high wind areas
4. Double under exterior walls parallel to joist direction

G. Girders (Beams)

1. Built-up
 - a. Formed with solid lumber nailed together
 - b. Built on the job
2. Glue laminated lumber (glulam)

- a. Solid, 1x__ lumber, glued together under pressure
 - b. Graded according to appearance
 - c. Very strong
 - d. Able to span long distances
 - e. Disadvantages
 - 1. Weight
 - 2. Expense
3. LVL (Laminated Veneer Lumber)
- a. Glued veneers, similar to plywood
 - b. Advantage
 - 1) High strength
 - 2) Long spans
 - c. Disadvantage
 - d. Cost
 - e. Low moisture resistance causes delamination in high humidity
4. PSL (Parallel Strand Lumber)
- a. Composed of veneers cut into strands
 - b. Very strong
 - c. Allows long spans
5. Steel
- a. Beam Types
 - 1) S – standard
 - 2) W – wide flange
 - 3) S- beam
 - 4) W - beam
 - b. I-beams come in two standards
 - 1) Wide flange
 - 2) Standard wide flange
 - c. Beam supports greater weight
 - d. More stable than standard S-beam
 - e. “W 18 x 62” means “Wide flange beam, 18” tall, weighing 62 lbs/ft”

- f. Advantages
 - 1) Strength
 - 2) Ability to span long distances
- g. Disadvantages
 - 1) Weight
 - 2) Difficulty in cutting on the job

6. Girder size

- a. Determined by
 - 1) Type of material used
 - 2) Loads imposed
 - 3) Clear span of the girder
- b. Where loads exceed material limits, the girder span must be reduced by using piers, piles, columns, or posts

H. Types of girders

- 1. Drop girder
- 2. Flush girder
- 3. A ledger strip attached to the girder may support joists
- 4. Metal connectors may support joists or hangers attached to the girder
- 5. Where joists must tie to a steel girder, a wooden plate must first be bolted to the steel

I. Subflooring

- 1. Provides a base for the underlayment and/or finish flooring material
 - a. Underlayment is the material placed under finish floor coverings (i.e. as carpet, to provide a smooth, clean surface).
 - b. Underlayment can be combined with the subfloor into a single thickness.
 - c. Single thickness underlayment/subfloor is generally constructed of $\frac{3}{4}$ " tongue and groove plywood.
- 2. Materials
 - a. 1 x ____ board lumber, applied diagonally
 - b. Plywood or OSB in 4'x 8' sheets speed installation.

- c. Structural particle board and composite board

J. Crawl space considerations

- 1. Access door is required
 - a. Recommended size 24" wide x 18" high
 - b. Large enough to allow for repair and/or replacement of under-house mechanical systems
- 2. Ventilation provided
 - a. Remove moisture from crawl space
 - b. 8"x 16" vents are common

UNIT F: Sections and Details

Competency: 206.00

Draw wall sections and details.

Objective: 206.03

R1, pgs 497-591

Explain concepts of wood frame wall construction.

R2, pgs 273-317

A. Wood frame wall construction

1. Materials

a. Wood studs should

- 1) Be straight
- 2) Have good stiffness
- 3) #2 grade or better
- 4) Moisture content of 15-19%

b. 2x4 and 2x6 lumber are most popular sizes for wall construction

- 1) 2x6 materials can be used for exterior walls for additional insulation thickness
- 2) 2x4 materials used for most interior walls
- 3) 2x6 and 2x8 materials used to allow plumbing to pass through wall

2. Sole Plate/Bottom Plate

- a. Holds studs together in a wall unit
- b. Anchors wall to subfloor

3. Wall studs

- a. Spaced 16" or 24" O.C.
- b. Length based on ceiling height

4. Top plate

- a. Ties intersecting walls together
- b. Provides additional strength between studs where ceiling joists/rafters do not bear directly above the stud

5. Headers

- a. Size depends on its span and loading
 - b. Carries load of the roof where studs have been removed from the wall to create an opening
 - c. Solid headers
 - 1) Fill the space above the opening
 - 2) Header formed by turning two units of framing lumber on edge with a $\frac{1}{2}$ " spacer between the members
 - 3) For 2x4 stud wall a 3- $\frac{1}{2}$ " thick unit
 - d. Cripple studs incorporate *cripples*.
 - 1) Studs are not full length.
 - 2) Fill the space above the header
 - e. Headers are supported by *trimmers* or *jack studs*.
6. Corner bracing
- a. Plywood, OSB, or similar material may be used in place of the let-in brace.
 - b. Diagonal metal straps may be used.
- B. Exterior finishing
- 1. Wall sheathing
 - a. Typically $\frac{1}{2}$ " thick
 - b. May be a structural material and/or an insulating material
 - c. Often applied to frame wall prior to wall being raised from the subfloor
 - d. Covered with a *housewrap paper* to reduce heat loss/gain
 - 2. Wall ties
 - a. Masonry wall is not a load bearing wall
 - b. Frame wall carries the load of the structure
 - c. Ties are bent to fit between mortar joints
 - d. Corrugated metal ties
 - 1) Placed 16" O.C. vertically
 - 2) Placed 32" O.C. horizontally

UNIT F: Sections and Details

Competency: 206.00

Draw wall sections and details.

Objective: 206.04

R1, pgs 172-185

R2, pgs 515-536, 579-595

Identify insulation and vapor barrier materials and construction.

A. Insulation

1. Slows the transfer of heat
2. Placed in walls, floors, and ceilings that face unheated areas
3. Types
 - a. Flexible batt and blanket
 - b. Loose-fill
 - c. Rigid board
 - d. Spray-on
 - e. Reflective foils

B. R-values

1. The higher the R number the greater the resistance to heat flow.
2. All materials have an R-value.
3. Requirements vary with geographic location.

C. Vapor barriers

1. Placed on the heated side of insulation
2. Types
 - a. Papers attached to flexible batt and blanket insulation
 - b. 6mil polyethylene sheets
 - c. Rubberized asphalt membrane
 - d. Foil-backed gypsum board

UNIT F: Sections and Details

Competency: 206.00

Draw wall sections and details.

Objective: 206.05

R1, pgs 701-738

Describe the purpose and features of a wall section.

R2, pgs 431-438

A. Sectional drawings

1. Used to reveal the internal construction
2. Provide information concerning materials and assembly
3. Detail sections show specific parts of construction

B. Sectional basics

1. Cutting plane
 - a. Edge of cutting plane is drawn as a line on the floor plan
 - 1) Heavy, dark line
 - 2) Coding includes two dashes
 - 3) Arrows indicate direction of sight
 - 4) Most often attached to a circle that identifies the section and its location within the drawing set
 - 5) Sometimes only the ends are shown to prevent interference with other information
 - i. Assumed to be a straight line between ends
 - ii. If offset, the bend (offset) is shown
 - b. A cutting plane extending fully across the short dimension of the structure defines a transverse section
 - c. A cutting plane extending fully across the long dimension of a structure defines a longitudinal section
2. Section lining (hatching)
 - a. Features behind the cutting plane are not section, but are shown in proper position and scale
 - b. Materials are defined by symbols (section lines)

c. Commonly used symbols

- 1) Brick
- 2) Steel
- 3) Insulation
- 4) Earth
- 5) Sand
- 6) Gravel
- 7) Concrete
- 8) Concrete block
- 9) Framing lumber
- 10) Finish lumber

d. Hatching (section lining) is thinner than visible lines

3. Drawing scale

a. Sections showing the entire building are drawn at small scales

- 1) $\frac{1}{4}" = 1'-0"$ are most common
- 2) Small scales do not allow drawing much detail

b. Break lines are used to reduce distances by removing repetitive information

- 1) Used where construction does not change over a long distance
- 2) Allows drawing large areas at readable scales (more detail)
- 3) Long break lines have a center zigzag or looped connection

c. Scale selected for a Typical Wall Section should allow the details to be clearly shown while still fitting the available space

- 1) $\frac{3}{4}" = 1'-0"$
- 2) $1" = 1'-0"$
- 3) $1\frac{1}{2}" = 1'-0"$

4. Dimensions

a. Show specific elevation numbers, distances, and sizes of building materials

b. Important dimensions are often included

- 1) Floor to ceiling heights

- 2) Crawl space vertical height
- 3) Footing sizes
- 4) Foundation wall thickness
- 5) Roof overhang
- 6) Roof slope

c. The order of notes is to give number, size, and material description of various building elements

- 1) Ex: 2-2 x 4 DOUBLE TOP PLATE
- 2) Leaders lead from the note to where the note applies

C. Construction elements usually shown in a *Typical Wall Section*

1. Footing
2. Foundation
3. Drain tile and waterproofing as needed
4. Sill and sill anchoring system
5. Joists and Rim Joists
6. Subfloor
7. Underlayment
8. Sole plate
9. Wall stud
10. Double top plate
11. Wall sheathing material
12. Ceiling joist or truss
13. Rafter or truss
14. Fascia (if included)
15. Soffit (if included)
16. Lookouts and other soffits nailers
17. Drip edge
18. Building paper
19. Roof covering material
20. Insulation for walls, floors, ceilings
21. Interior and exterior wall finish materials and trim

22. Metal straps (hurricane ties)

23. If the wall includes masonry veneer, the following additional elements are included

- a. Masonry wall ties
- b. Air space (cavity)
- c. Flashing
- d. Weep holes
- e. Drain Tile

UNIT F: Section and Details

Competency: 206.00

Draw wall sections and details.

Objective: 206.06

Draw a typical wall section.

Requirements:

Each student is required to produce drawings of a Typical Wall Section and Details for the floor plan drawn in Objective 203.08. This rubric is designed with the assumption that the Wall Section drawing will be a single-story, residential structure previously designed and drawn using board techniques or CAD software and plotted to an appropriate scale.

1. Use accepted drafting standards
2. Include the title block.
3. Time Limit = 180 minutes.
4. An effort should be made to create a balanced appearance within drawing space.
5. Your work should reflect an understanding of vertical relationships of structural materials called for on the floor, framing, roof, and foundation plans.

Assessment: The problem will be evaluated based on the following criteria:

Design Concepts	30 points
Architectural Notes and dimensioning	30 points
Accuracy, Line Weight, Neatness	20 points
CAD Drawing Technique	20 points

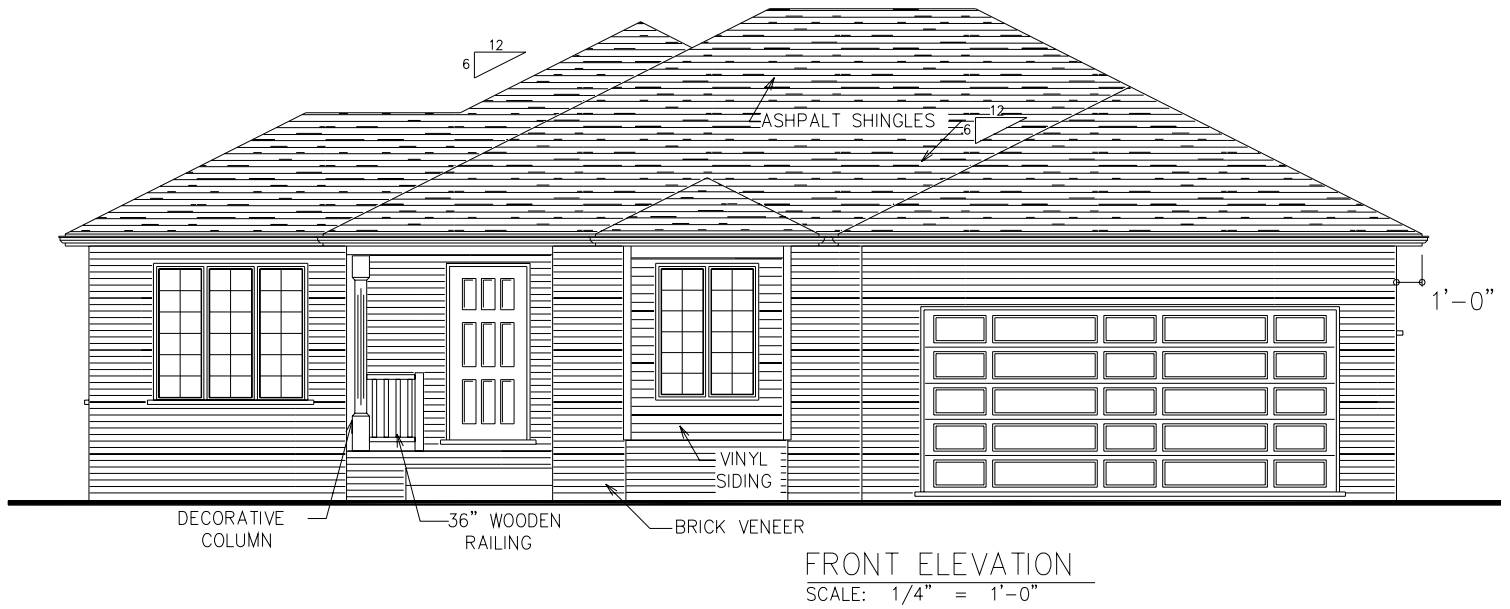
206.06**Draw a typical wall section.**

Each student is required to produce drawings of a Typical Wall Section and Details for the floor plan drawn and designed earlier. This rubric is designed with the assumption that the Wall Section drawing will be a single-story, residential structure previously designed and drawn using board techniques or CAD software and plotted to an appropriate scale.

Criterion Statements	Point Value	Rating
<i>Design Concepts</i>	30	
• Footing thickness • Finish Grade • Slab thickness or Foundation wall • Sill plate • Floor joists or concrete slab • Plywood sub floor (if needed) • Headers • Sole plate and anchor bolt • Stud Wall • Insulation in appropriate walls • Exterior sheathing (roof and exterior walls) • Double top plates and ceiling heights • Ceiling Joist and Chords • Overhang • Ridge Board and Vent • Fascias • Soffits and vents • Shingles • Exterior wall material (brick or siding) • Interior wall material		
<i>Architectural Notes and Dimensioning</i>	30	
• All materials labeled • Correct size of materials • Ceiling height • Overhang dimension • Thickness and height of footing • Foundation wall or slab dimensions • Crawl space height • Roof Pitch • Dimensions should not be crowded. • Follows appropriate dimension standards. • Title and scale		
<i>Line Weight, Neatness</i>	20	
• Line weight is neat, clean, and meets acceptable drafting standards for thickness and darkness. • Industry accepted standard symbols are used		
<i>CAD Drawing Technique</i>	20	
• Setup file for units, limits, grid, snap and layers • File correctly saved • Layers correctly managed • Line types correctly coded • Drawings neatly laid out to balance space on the page • Line connections connect when closely zoomed • Lines are not over-drawn and are continuous lines		
Total	100	

UNIT G

Exterior Elevations



UNIT G: Exterior Elevations

Competency: 207.00

Draw exterior elevations.

Objective: 207.01

R1, pgs 400-469, 927-937

Identify terms and definitions related to exterior elevations.

Terms and definitions

1. Elevation – the exterior views of a structure
2. Grade line – the spot where the soil surface strikes the building; reference point for most elevations
3. Stucco – a type of plaster made from Portland cement, sand, water, and a coloring agent that is applied to exterior walls
4. Flashing – metal used to prevent water leaking through surface intersections
5. Topography – physical description of land surface showing its variation in elevation and location of features such as rivers, lakes, or towns
6. Eave – the lower part of the roof that projects from the wall, sometimes referred to as the cornice
7. Cornice – the part of the roof that extends out from the wall, sometimes referred to as the eave
8. Roof ridge – the uppermost area of two intersecting roof planes
9. Projection – Horizontal or vertical guidelines used for transferring measurements orthographically from one view to another
10. Surface materials – the materials used to protect the building from the weather
11. Skylight – an opening in the roof to allow light and ventilation that is usually covered with glass or plastic
12. Siding – exterior wall covering used to protect walls from the weather
13. Stucco – a weather resistant, colored plaster finish used for an exterior wall covering

14. Rail – decorative barriers and supports typically used to enclose porches and decks

UNIT G: Exterior Elevations

Competency: 207.00

Draw exterior elevations.

Objective: 207.02

R1, pgs 400-469

Describe the purpose and features of an exterior elevation.

A. Exterior Elevations

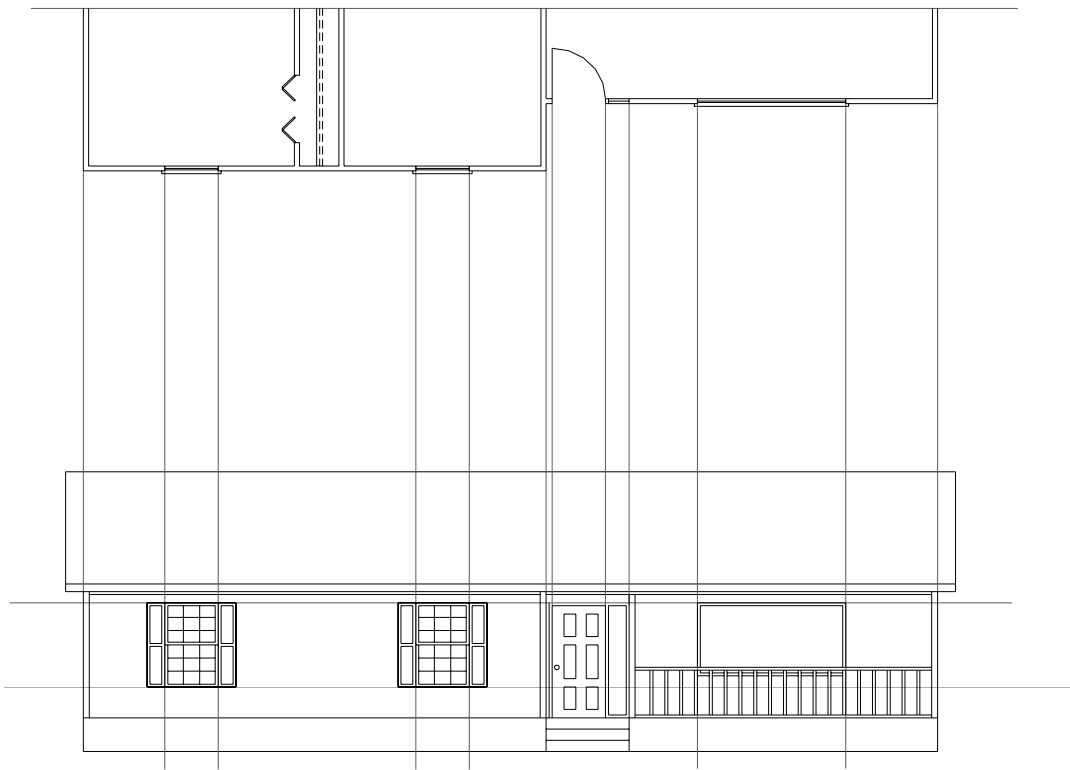
1. Two-dimensional, flat, orthographic representations of the building's exterior
2. Each elevation shows the final appearance of one side of the building
3. A set of working drawings
 - a. Four exterior elevations are shown.
 - b. Elevations are drawn at the same scale as the floor plan.
 - c. Labeled as Front, Rear, Right, and Left Side Elevations
 - d. Compass directions are often used to label elevations (North, South, East, West Elevations).

B. Features typically include

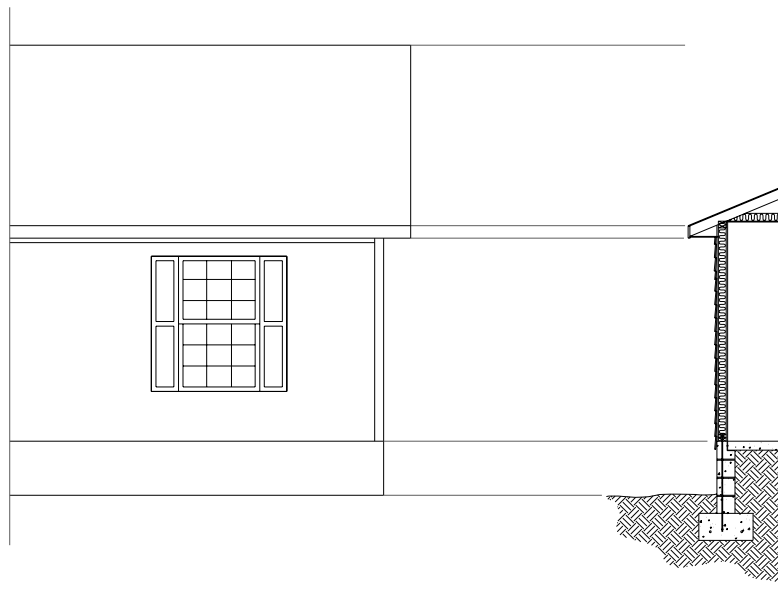
1. Doors and windows
2. Roof slope and material
3. Surface and trim materials
4. Vertical distances and material notes

C. Construction elements

1. Project horizontal measurements from floor plan downward onto the developing elevation drawing



2. Vertical distances are projected from a scaled section drawing



3. Elevations for working drawings do not include landscaping features.
4. Elevation symbols include
 - a. Windows
 - b. Doors
 - c. Grade line
 - d. Wall finish materials are shown in simple symbols in scattered locations to prevent crowding.
 - e. Roof features
 - f. Materials notes
 - g. Common surface materials
 - 1) Brick
 - 2) Horizontal siding
 - 3) Vertical siding
 - 4) Stucco
 - 5) Stone
 - 6) Concrete
 - 7) Flashing
 - 8) Glass
 - 9) Roofing
5. Below-grade elements (footings, foundation wall, etc.) are drawn using hidden lines.
6. Dimensioning most often includes
 - a. Vertical distance from floor to ceiling (varies according to client needs)
 - b. Vertical distance from floor to tops of windows and doors is usually 6'-8"
 - c. Vertical distances to footings (from grade or floors)
 - d. Elevations that relate to the site topography
 - e. Horizontal distances for roof overhangs
 - f. Notes that specify wall and roof finish materials

- g. Roof slope symbols showing rise and run

D. Steps for drawing an Exterior Elevation

1. Use the same scale as floor plan
 2. Use the Wall Section Drawing for vertical dimensions
 3. Place the floor plan directly above the space where the elevation is to be constructed so that measurements may be projected
 - a. The exterior walls to be represented should be facing down
 - b. Project horizontal measurements downward
 - 1) Walls/offsets of building
 - 2) Doors and windows
 - 3) Porches/Patios
 - 4) Stairs
 4. Project vertical measurements from the section across
 - a. Footings
 - b. Grade
 - c. Floor levels
 - d. Ceilings
 - e. Eaves
 - f. Cornice trim
 - g. Roof ridges
 5. Add details such as windows, window trim, doors, door trim, vents, etc.
 6. Add dimensions, notes, and material symbols
 7. Check the work
 8. Add a label to identify the elevation
- E. Repeat steps 1-8 for each exterior elevation to be drawn

UNIT G: Exterior Elevations

Competency: 207.00

Draw wall sections and details.

Objective: 207.03

Draw exterior elevations.

Requirements:

Each student is required to produce drawings of Exterior Elevations for the floor plan drawn in Objective 203.08. This rubric is designed with the assumption that the Exterior Elevation drawing will be a single-story; residential structure previously designed and drawn using board techniques or CAD software and plotted to an appropriate scale.

1. Use accepted drafting standards
2. Include the title block.
3. Time Limit = 180 minutes.
4. An effort should be made to create a balanced appearance within drawing space.
5. Your work should reflect an understanding that the elevations are the exterior view of the house showing the front, back, right, and left views.

Assessment: The problem will be evaluated based on the following criteria:

Design Concepts	30 points
Architectural Notes and Dimensioning	30 points
Accuracy, Line Weight, Neatness	20 points
CAD Drawing Technique	20 points

207.03**Draw exterior elevations.**

Each student is required to produce drawings of Exterior Elevations for the floor plan drawn and designed earlier. This rubric is designed with the assumption that the Exterior Elevation drawing will be a single-story; residential structure previously designed and drawn using board techniques or CAD software and plotted to an appropriate scale.

Criterion Statements	Point Value	Rating
<i>Design Concepts</i>	40	
• Outline of house matches the overall dimensions • Finish floor line • Finish ceiling line • Correct symbols for materials • Finish Grade • Roof height • Correct symbols for windows and doors • Below Grade elements correctly illustrated • Correctly oriented and positioned views		
<i>Architectural Notes and Dimensioning</i>	20	
• Dimensions between floor level and ceiling height • Dimensions between ceiling height and roof line • Window and Door height • Correct Pitch • Dimensions for each view should match • Title and scale		
<i>Line Weight, Neatness</i>	20	
• Line weight is neat, clean, and meets acceptable drafting standards for thickness and darkness. • Industry accepted standard symbols are used		
<i>CAD Drawing Technique</i>	20	
• Setup file for units, limits, grid, snap and layers • File correctly saved • Layers correctly managed • Line types correctly coded • Drawings neatly laid out to balance space on the page • Line connections connect when closely zoomed • Lines are not over-drawn/ are continuous lines		
Total	100	

APPENDIX A

Bibliography / References

Textbooks

- R1** Jefferis, Alan & David A. Madsen. (2004). *Architectural Drafting and Design*. Albany, NY: Delmar Thomson Learning.
- R2** Kicklighter, Clois E. & Joan C. Kicklighter. (2004). *Architecture Residential Drafting and Design*. Tinley Park, IL: The Goodheart-Wilcox Company, Inc..

CAD Software Websites

AutoCADLT, AutoCAD– www.autodesk.com

Softplan - <http://www.softplan.com>

Student Version Pricing for CAD Software – www.journeyed.com

APPENDIX B

Vendor's – Texts – Software – Literature

Vendor's – Texts

Amazon.com, Inc. (Book resource)
www.amazon.com

Glencoe/McGraw-Hill
Pam Angotti
6510 Jimmy Carter Boulevard
Norcross, GA 30071
Phone: 919-469-4517
Fax: 770-613-5065
Pam_angotti@mcgraw-hill.com

Goodheart-Willcox Publishing
Liz Myhre
18604 West Creek Drive
Tinley Park, IL 60477
Phone: 800-365-3907
Fax: 919-468-3792
lmyhre@goodheartwillcox.com

Delmar Thomson Learning
Patrick Delaney
7813 Waterford Ridge Dr. #702
Charlotte, NC 28212
Phone: 877-430-0483
Patrick.delany@thomsonlearning.com

NC-DPI

Tom Shown
Department of Public Instruction
Instruction Technology & Human Services
6360 Mail Service Center
Raleigh, NC 27699-6360
Phone: 919-807-3880
Fax: 919-807-3899
Tshown@dpi.state.nc.us

NC SkillsUSA VICA

Glen Barefoot
Department of Public Instruction
Instruction Technology & Human Services
6360 Mail Service Center
Raleigh, NC 27699-6360
Phone: 919-807-3887
Fax: 919-807-3899
Gbarefoot@dpi.state.nc.us

National SkillsUSA VICA
P.O. Box 3000
Leesburg, VA 20177-0300
Phone: 703-777-8810
Fax: 703-777-8999
www.vica.org

Software

Autodesk Products (ie AutoCAD 2006)
Kris Dell
ADADemic/Applied Software
3200 Northline Ave, Suite 130
Greensboro, NC 27403
Phone: 704-491-2285
Fax: 704-573-9981
kris@asti.com

APPENDIX C

Trade and Industrial Education - Drafting Facility Equipment List

Courses taught within the facility:

Drafting I	DFT	Code: 7921
Drafting-Engineering II	ENG	Code: 7972
Drafting-Engineering III		Code: 7973
Drafting-Architecture II	ARC	Code: 7962
Drafting-Architecture III		Code: 7963

Equipment	DFT	ENG	ARC
2D CAD Software (AutoCAD, AutoCAD LT)	1S	1S	1S
3D CAD Software (Rhino 3D, Solidworks)	1S	1S	1S
C or D size plotter/printer	1F	1F	1F
Drafting stool	1S	1S	1S
Drafting table/computer table	1S	1S	1S
Instructor chair	1F	1F	1F
Instructor desk	1F	1F	1F
PC to TV converter or LCD panel screen for projector	1F	1F	1F
Pentium III (or better) computer w/ 10 GB hard drive or higher, 450 MHz (or better) suggested clock speed, 128 MB RAM, 52X CD-ROM, 3.5 floppy drive, 17" (or larger) monitor, Open GL graphics card w/ 32 MB or better VRAM & input/output, multimedia capability, NIC	1S	1S	1S
Printer	1F	1F	1F
TV/VCR	1F	1F	1F

Tools and Other Items Under \$100

Equipment	DFT	ENG	ARC
Ames Lettering Guide	1S	1S	1S
Brush, dusting	1S	1S	1S
Calculator	1F		
Compass	1S	1S	1S
Compass Lead, tube (gross)	1F		
Cover, drawing board	1S	1S	1S
Erasing Shield	1S	1S	1S
French Curve	1S	1S	1S
Gauge, screw pitch		1:4S	
Gauge, small hole		2F	
Gauge, vernier height 10"		2F	
Lead Holder		2F	
Lead refills, 2H & 6H	1S	1S	1S
Paper cutter	1F	1F	1F
Parallel bar	1S	1S	1S
Printer table	1F	1F	1F
Protractor, plastic	1S	1S	1S
Scale, triangular, architect's 12"	1S	1S	1S
Scale, triangular, engineer's 12"	1S	1S	1S
Scale, triangular, mechanical 12"	1S	1S	1S
Scale, triangular, metric 12"	1S	1S	1S
Template, bolts & nuts		10F	
Template, circles, fraction	1S	1S	1S
Template, circles, metric	1S	1S	1S
Template, electrical			10F
Template, ellipses	1S	1S	1S
Template, house plan & plumbing	1S	1S	1S
Template, large isometric		10F	
Template, machine & cap screws		10F	
Template, screw threads		10F	
Template, small isometric	1S	1S	1S
Triangle, adjustable	1:4S	1:4S	1:4S
Triangle, 30° x 60° 10"	1S	1S	1S
Triangle, 45° 10"	1S	1S	1S

Quantities are listed per: F=Facility C=Center S=Student

APPENDIX D

Facility Design Specification

Program Area: Trade & Industrial Education

Course Title: Drafting - Architectural II

Course Description:

Purpose:

This course is focused on the principles, concepts, and use of complex graphic tools used in the field of architecture, structural systems, and construction trades. Emphasis is placed on the use of CAD tools in the creation of floor plans, foundation plans, basic roof plans, wall sections, and elevation drawings.

Types of Instruction:

Lecture; demonstration; individual inquiry; small-group cooperative learning; individual and small-group viewing of video programs

Typical Activities:

Individual production of architectural drawings using computer-aided drawing equipment; sketching; individual and small-group design projects; maintenance of tables and equipment

Maximum Recommended Class Size: 20

Typical Length of Class Period: 90 minutes (block schedule); 55 minutes (traditional)

Typical Duration of Course: Semester (block); Year (traditional)

Rationale for Program Selection:

Success in all areas of business and industry is predicated on the ability to communicate effectively. Complex graphic tools are used in all facets of the economy, including the sciences, for analyzing and sharing information. This program prepares the student to effectively use these communication tools.

Program Locations and Relationships:

May be the center for the school's most sophisticated computer activities and appropriately located contiguous to other computer-oriented programs; May be a part of an integrated approach to math and science and located accordingly; need not be located near other trade and industrial education programs.

Shared Space Options:

1. Other Workforce Development:

Fundamentals of Technology

Computer Applications (depending upon the number of computers)

Graphic Communications

Scientific and Technical Visualization

2. Other Elective:

Art

3. Academic:

Mathematics

Science

Space Requirements:

1. Square Footage Range: 1800 – 2200
2. Peculiar Needs:
 - A. 100 foot-candles of artificial lighting required for drawing
3. Special Conditions: N/A
4. Flexibility Needs: N/A

Furnishings and Equipment:

1. Typical Furniture:
 - A. Flat tracing files (ten drawers minimum)
 - B. Teacher drawing table and desk and file cabinets
 - D. Lockable storage cabinets with shelves for drawing equipment and software
2. Typical Casework;
 - A. Bookshelves for reference books, magazines, and manuals
 - B. Storage shelves for drawing and reproduction media up to size “D” sheets
 - C. Storage shelves for student models and projects
 - D. Storage for Diazo machine filters and ammonia
 - E. Counters to accommodate twenty computers and four printers
 - F. Counter space for a size “A” – “D” plotter or printer, a Diazo reproduction machine, and a paper cutter
3. Typical Equipment:
 - A. Size “D” plotter or printer
 - B. Computers for CAD
 - C. Printers
 - D. TV monitors for display of computer software techniques
 - E. Computer-to-TV display equipment or computer projection device
 - F. Small hand tools for project construction
 - G. CAD/CAM

Special Notes:

1. Perimeter electrical outlets above counter height
2. Accessible to local school network and Internet
3. Light dimmers near teacher station for use of projectors and TV monitors

APPENDIX E

7962 DRAFTING ARCHITECTURE II EVALUATION FORM

Your suggestions and insights are needed to improve our curriculum products including the curriculum guide, recommended activities, performance assessments, blueprint, test-item bank, and reference media. Please review all the Drafting – Architectural II curriculum materials carefully. After teaching one full course cycle, please take the time to fill out and return this evaluation form. Note that the more specific and clear your suggestions are, the more useful and influential they will be. You may wish to have an industry representative evaluate the products. Thank you for helping us serve you and your students better.

Rate the following statements from 1-5, with 1 being poor and 5 being excellent. When responding to specific curriculum content found within the curriculum guide or blueprint, please give competency and objective numbers.

Teacher's Name: _____

School Name: _____

		<u>Don't Know</u>	<u>Poor</u>	<u>Fair</u>	<u>Good</u>	<u>Very Good</u>	<u>Excellent</u>
1)	Blueprint is well structured and focuses on essential concepts and skills. It does not contain superfluous content. Comments:	Unsure	1	2	3	4	5
2)	Curriculum guide clearly specifies the content needed to achieve program mastery. It is easy to use and is technically correct. Comments:	Unsure	1	2	3	4	5
3)	Curriculum incorporates appropriate math, science, technical concepts, and processes. Content is not too complex or too simple for students. It is technically correct. Comments:	Unsure	1	2	3	4	5
4)	Curriculum reflects the use of state-of-the-art technology. Equipment list reflects state-of-the art technology and meets minimum standards. Comments:	Unsure	1	2	3	4	5
5)	Program completers are well prepared for entry level position in industry and/or post-secondary studies. Comments:	Unsure	1	2	3	4	5

Return To: Tom Shown
Instructional Technology & Human Services
6360 Mail Service Center
Raleigh, N.C. 27699-6360

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Fax: 919-807-3899
tshown@dpi.state.nc.us