

# CAD-Unit-Plan-1B-Curriculum-Hand Sketches-Multiview\_Drawings

Content Area: **CTE**  
Course(s): **CAD I**  
Time Period: **September**  
Length: **1**  
Status: **Published**

## Unit Overview

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### Multiview drawings and Orthographic Projection

Multiview drawings are also known as orthographic projection drawings. To draw different views of an object, it is very important to visualize the shape of the product. To facilitate visualizing the shapes, students must picture the object in 3D space with reference to the X, Y, and Z axes. These reference axes can then be used to project the image into different planes. This process of visualizing objects with reference to different axes is, to some extent, natural in human beings. Students might have noticed that sometimes, when looking at objects that are at an angle, people tilt their heads. This is a natural reaction, an effort to position the object with respect to an imaginary reference frame (X, Y, Z axes).

## Enduring Understandings

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The important ideas and core processes that are central to this lesson are:

- Understand the concepts of multiview drawings.
- Understand X, Y, and Z axes; XY, and YZ, XZ planes; and parallel planes.
- Understand and draw orthographic projections and position the views.
- Understand the First and Third Angle Projection

## Essential Questions

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The important ideas and core processes that are central to this lesson are:

- What are multiview drawings?
- What are XY, and YZ, XZ planes; and parallel planes?
- What are First and Third Angle Projection
- How would you define Orthographic projection?
- Can you identify the view necessary to make a Multiview Drawing?
- What are the advantages of Multiview drawings?

## Standards/Indicators/Student Learning Objectives (SLOs)

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ARCH.9-12.3	Maintenance and Operations
ARCH.9-12.9.4.12.B.(2).4	Identify project turnover procedures needed to successfully manage construction projects.
ARCH.9-12.9.4.12.B.(2).5	Plan building in accordance with contracts to meet budget and schedule.
ARCH.9-12.9.4.12.B.(2).6	Describe testing and inspection procedures used to ensure successful completion of construction projects.
ARCH.9-12.9.4.12.B.(2).7	Assess the purpose for scheduling as it relates to successful completion of construction projects.
ARCH.9-12.9.4.12.B.(2).8	Identify closeout procedures needed to effectively complete construction projects.
ARCH.9-12.9.4.12.B.(2).9	Demonstrate understanding of risk management principles and other strategies and tactics used to maintain, increase, or decrease risk.
ARCH.9-12.9.4.12.B.(2).10	Create a jobsite safety program to ensure safe practices and procedures.
ARCH.9-12.9.4.12.B.(2).12	Describe procedures for jobsite security to prevent liability.
ARCH.9-12.9.4.12.B.(2).15	Demonstrate knowledge of proper changeover procedures for successful completion of a construction project.
ARCH.9-12.9.4.12.B.(2).16	Examine building systems and components to evaluate their usefulness to construction projects.
ARCH.9-12.9.4.12.B.(2).17	Use craft skills to meet or exceed teacher and/or employer expectations.
ARCH.9-12.9.4.12.B.(3).1	Recognize and employ universal construction signs and symbols to function safely.
ARCH.9-12.9.4.12.B.(3).2	Use troubleshooting procedures when solving a maintenance problem to maintain project.
ARCH.9-12.9.4.12.B.(3).3	Apply construction skills when completing classroom projects and/or repairing, restoring, or renovating existing worksite structures to ensure long-term use of buildings and structures.
ARCH.9-12.9.4.12.B.(3).4	Evaluate and assess an existing structure to determine the repairs or renovations required to restore operation of the structure.
ARCH.9-12.9.4.12.B.(3).5	Plan and practice preventive maintenance activities to service existing structures.
ARCH.9-12.9.4.12.B.1	Demonstrate language arts knowledge and skills required to pursue the full range of postsecondary education and career opportunities.
ARCH.9-12.9.4.12.B.2	Demonstrate mathematics knowledge and skills required to pursue the full range of postsecondary education and career opportunities.
ARCH.9-12.9.4.12.B.3	Demonstrate science knowledge and skills required to pursue the full range of postsecondary education and career opportunities.
ARCH.9-12.9.4.12.B.4	Perform math operations, such as estimating and distributing materials and supplies, to complete classroom/workplace tasks.
ARCH.9-12.9.4.12.B.5	Apply principles of physics, as they relate to worksite/jobsite situations, to work with materials and load applications.
ARCH.9-12.9.4.12.B.7	Demonstrate use of the concepts, strategies, and systems for obtaining and conveying ideas and information to enhance communication.
ARCH.9-12.9.4.12.B.8	Locate, organize, and reference written information from various sources to communicate with others.
ARCH.9-12.9.4.12.B.9	Evaluate and use information resources to accomplish specific occupational tasks.  Roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment impact business operations. Key organizational systems impact organizational performance and the quality of products and services. Understanding the global context of 21st-century industries and careers impacts business

operations.

All clusters rely on effective oral and written communication strategies for creating, expressing, and interpreting information and ideas that incorporate technical terminology and information.

Academic concepts lay the foundation for the full range of career and post-secondary education opportunities within the career cluster.

## Lesson Titles

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- Multiview Drawing
- Orthographic Projection
- Angles of Projection
- The Glass Box

## Career Readiness, Life Literacies, & Key Skills

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TECH.9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
TECH.9.4.12.CI.2	Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8).
TECH.9.4.12.CI.3	Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1).
TECH.9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
TECH.9.4.12.CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
TECH.9.4.12.CT.3	Enlist input from a variety of stakeholders (e.g., community members, experts in the field) to design a service learning activity that addresses a local or global issue (e.g., environmental justice).

## Inter-Disciplinary Connections

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- Applied **Mathematics**
- **Arts** Related to Product "Form"
- **Historical** References & Perspectives
- Technical **Literacy**
- Applied **Sciences**

0x	Connections to Equations.
0x	During high school, students begin to formalize their geometry experiences from elementary and develop Euclidean and other geometries carefully from a small set of axioms.
0x	In real world problems, the answers are usually not numbers but quantities: numbers with unit commonly used attributes such as length, area, and volume. In high school, students encounter person-hours and heating degree days, social science rates such as per-capita income, and rate: which they themselves must conceive the attributes of interest. For example, to find a good me

- driver, or fatalities per vehicle-mile traveled. Such a conceptual process is sometimes called quantification, an important variable in evaporation. Quantification is also important for companies, which must
- 0x LA.9-10.RH.9-10.3 Analyze in detail a series of events described in a text; draw connections between the events, t
- 0x LA.9-10.RH.9-10.9 Compare and contrast treatments of the same topic, or of various perspectives, in several prim
- 0x LA.9-10.RST.9-10.5 Analyze the relationships among concepts in a text, including relationships among key terms (

## Anticipatory Set

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Possibilities of short activities that will focus the student's attention before the actual lesson begins:

1. **Vocabulary connections-** terms and definitions in a short game of "Trash-ketball"
  2. **Challenge-** Offer students sketching task and let them try to solve it as a group then present it to the class.
  3. **Challenge-** Offer a volunteer student a CAD task and let him/ her solve it on the board.
  4. **Use manipulatives or models**
    - **Description:** Teacher will use physical models to prepare students to learn a specific concept or better highlight the critical attributes of new concepts. Teacher will use a variety of models of two or three-dimensional shapes.
1. **Show & Tell:** Use a prop from an article students are about to read related to industry. Examples: Professional drawings - Architectural, Interior Design, Engineering.
  2. **Use a visual-** Teacher will use visual aides to encourage students to better connect to new concepts. Examples: Real drawings used in industry- Architectural, Interior Design, Engineering. The teacher will tell students that they have thirty seconds to remember everything they can about the drawing. After the thirty seconds, the teacher will remove the drawings and ask students to recall all they can about them. The teacher will solicit ideas and use this to introduce distinguishing between main idea and supporting details.

## Instructional Strategies, Learning Activities, and Levels of Blooms/DOK

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### Direct Instruction

- **Possibilities include**
  - Structured Overview
  - Lecture
  - Explicit Teaching
  - Drill & Practice
  - Compare & Contrast
  - Didactic Questions
  - Demonstrations
  - Guided & Shared - reading, listening, viewing, thinking

## **Interactive Instruction**

- **Possibilities include**

- Debates
- Role Playing
- Panels
- Brainstorming
- Peer Partner Learning
- Discussion
- Laboratory Groups
- Think, Pair, Share
- Cooperative Learning Groups
- Jigsaw
- Problem Solving
- Structured Controversy
- Tutorial Groups
- Interviewing
- Conferencing

## **Indirect Instruction**

- **Possibilities include**

- Problem Solving
- Case Studies
- Reading for Meaning
- Inquiry
- Reflective Discussion
- Writing to Inform
- Concept Formation
- Concept Mapping
- Concept Attainment
- Cloze Procedure

## **Independent Study**

- **Possibilities include**

- Essays
- Computer Assisted Instruction
- Journals
- Learning Logs
- Reports
- Learning Activity Packages
- Correspondence Lessons
- Learning Contracts
- Homework
- Research Projects
- Assigned Questions

- Learning Centers

## **Experiential Learning**

- **Possibilities include**
  - Field Trips
  - Narratives
  - Conducting Experiments
  - Simulations
  - Games
  - Storytelling
  - Focused Imaging
  - Field Observations
  - Role-playing
  - Model Building
  - Surveys

## **Instructional Skills**

- **Possibilities include**
  - Explaining
  - Demonstrating
  - Questioning
  - Questioning Technique
  - Wait Time
  - Levels of Questions

## **Modifications**

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Instructor implements the following teaching strategies with students who need special accommodations.

Instructor also implements specific requirements from the students' individual reports.

- Classroom:
  - Seat student near instruction, avoid distracting stimuli
  - Clarify that student understands directions
  - Cuing student to refocus (verbal/nonverbal)
  - Praise for positive behaviors.
  - Study guides provided, when available. Prior knowledge to upcoming quizzes/tests.
- Standardized Testing:
  - Extra Time
  - Repeating, clarifying, or rewording directions.
- Delsea One – Students benefit from increased opportunities for enrichment and tutoring during Delsea One Tutoring.

## **At Risk Modification**

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considered:

- Additional time for assignments .
- Adjusted assignment timelines .
- Agenda book and checklists .
- Answers to be dictated .
- Assistance in maintaining uncluttered space .
- Books on tape .
- Concrete examples .
- Extra visual and verbal cues and prompts .
- Follow a routine/schedule .
- Graphic organizers .
- Have students restate information .
- No penalty for spelling errors or sloppy handwriting .
- Peer or scribe note-taking .
- Personalized examples .
- Preferential seating .
- Provision of notes or outlines .
- Reduction of distractions .
- Review of directions .
- Review sessions .
- Space for movement or breaks .
- Support auditory presentations with visuals .
- Teach time management skills .
- Use of a study carrel .
- Use of mnemonics .
- Varied reinforcement procedures .
- Work in progress check .

## **ELL Modifications**

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- Choice of test format (multiple-choice, essay, true-false)
- Continue practicing vocabulary
- Provide study guides prior to tests
- Read directions to the student
- Read test passages aloud (for comprehension assessment)

- Vary test formats

**IEP & 504 Modifications**

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- Allow for redos/retakes .
- Assign fewer problems at one time (e.g., assign only odds or evens) .
- Differentiated center-based small group instruction .
- Extra time on assessments .
- Highlight key directions .
- If a manipulative is used during instruction, allow its use on a test .
- Opportunities for cooperative partner work .
- Provide reteach pages if necessary .
- Provide several ways to solve a problem if possible .
- Provide visual aids and anchor charts .
- Test in alternative site .
- Tiered lessons and assignments .
- Use of a graphic organizer .
- Use of concrete materials and objects (manipulatives) .
- Use of word processor .

**Alternative Assessments**

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Performance tasks

Project-based assignments

Problem-based assignments

Presentations

Reflective pieces

Concept maps

Case-based scenarios

Portfolios



## **Formative Assessment**

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- Observations during in-class activities; of students' non-verbal feedback during lecture.
- Homework exercises as review for exams and class discussions.
- Reflections journals that are reviewed periodically during the semester.
- Question and answer sessions, formal—planned and informal—spontaneous.
- Conferences between the instructor and student at various points in the semester.
- In-class activities where students informally present their results.
- Student feedback collected by periodically answering specific question about the instruction and their self-evaluation of performance and progress.

## **Benchmark Assessments**

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Skills-based assessment

Reading response

Writing prompt

Lab practical

## **Summative Assessment**

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- Quiz, Test, MP Assessments about the specified lesson: **Multiview drawings and Orthographic Projection**
- Final examination (a truly summative assessment) about the specified lesson.
- Projects (project phases submitted at various completion points could be formatively assessed) about the specified lesson.
- Portfolio that include all class assignments.
- Student evaluation of the lesson (teaching effectiveness).
- Instructor self-evaluation about the current lesson
- By Rubric shown below.

### **Computer Aided Design Evaluation Rubric**

Category	<b>1</b> <b>Does Not Meet Expectations</b> (0-25% of points)	<b>2</b> <b>Attempted to Meet Expectations</b> (25-50% of points)	<b>3</b> <b>Meets Expectations</b> (50-75% of points)
<b>Defining the Problem</b>	Offers an unclear statement of the problem. There is no support, documentation, or need for development. Little or no work is evident.	A short description and explanation is offered to the problem without any support and specifications for development pursuits.	A good statement and support/documentation is given to suggest the need to develop the product. Design specifications and constraints are also noted.
<b>Research, Brainstorming, and Developing Ideas</b>	Little research and brainstorming accomplished. Ideas generated are not original.	Research is evident as an outcome of brainstorming. Ideas generated are a result of the brainstorming process and not original.	Ideas generated are new and original as an outcome of brainstorming and research. Little suggestions are offered for the rest of the design process if any.
<b>Conceptual Design and Sketching</b>	Only one sketch is offered for a design review.	At least two sketches are offered for a review. The sketches offer no design specifications or annotation.	More than two sketches are offered for a review. The sketches include design specifications and annotation for developing the design.

Category	<b>1</b> <b>Does Not Meet Expectations</b> (0-25% of points)	<b>2</b> <b>Attempted to Meet Expectations</b> (25-50% of points)	<b>3</b> <b>Meets Expectations</b> (50-75% of points)
<b>Developing the Design</b>	A set of sketched working drawings without an assembly drawing. 3D representations of each part of the assembly on the working drawings are missing. Annotations, dimensioning and blocks are not accurate.	A set of production drawings with an assembly and working drawings. Each orthographic drawing includes a 3D representation. Annotations, notations, blocks, and dimensioning are inaccurate.	A set of production drawings with an assembly and workin drawings. Multiview drawings are added additiona to orthographic drawings. A 3D representation is included on all multiview drawings. Annotations, notations, blocks, and dimensioning are slightly inaccurate.
<b>Making a Model or</b>	Model is missing or does not	Model is proportional to	Model is accurate in

<b>Prototype</b>	look like concept sketches.	sketches, inaccurate in scale, and dimensioning does not follow industry standards.	proportion and dimensioning according to concept sketches and industry standards.
<b>Engineering Testing and Evaluating the Design</b>	Testing and evaluating designs/model are missing or not checked/approved.	Testing and verification attempted by checks and approvals without results.	Testing and verification are complete with checks/approvals and detailed results are not following industry standards.

Category	1 <b>Did Not Meet Expectations</b> (0-25% of points)	2 <b>Attempted to Meet Expectations</b> (25-50% of points)	3 <b>Meets Expectations</b> (50-75% of points)
<b>Revising the Design</b>	No attempt made to revise the design. Revision blocks not completed.	Designs revised without revision blocks completed.	Designs revised according to change requests and revision blocks filled out appropriately, but no approval or checking sought after the first revision.
<b>Creating a Final Model, Prototype, or Mockup</b>	Missing prototype model or mockup.	Mockup or prototype model is not accurate according to production drawings	Prototype model or mockup is accurate according to production drawing and created out of materials not specified.
<b>Presentation</b>	A presentation given without preparation and an outline.	A presentation given without a professional presence, good public speaking and a well thought out organized outline.	An organized outlined presentation with a professional presence, a written proposal, good public speaking and visual aids.

## **Resources & Materials**

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- Residential Housing and Interiors, 4th Edition by: Clois E. Kicklighter, Ed. D. and Joan C. Kicklighter
- Housing and Interior Design By: Evelyn L. Lewis, Ed.D., Carolyn Turner Smith, Ph.D
- Interior Design By : Stephanie Clemons
- Glencoe Mechanical Drawing: Board and CAD Techniques, Student Edition: 1st (First) Edition by Glencoe McGraw-Hill
- Basic Technical Drawing by Spencer, Dygon, Novak Glencoe McGraw-Hill
- Exploring Drafting, Instructor's Manual Instructor's Manual, 10th Edition by John R. Walker (Author), Bernard D. Mathis