

Construction Alignments

This document contains information about three Career-Technical Articulation Numbers (CTANs) for the Construction Design Career-Technical Assurance Guide (CTAG). The CTANs are:

1. Plan Reading (CTCON001)
2. Construction Safety (CTCON002)
3. Construction Methods and Materials (CTCON003 / OAN OET016)

1. Plan Reading: CTAN alignment with the Career-Technical Prep Construction Design Pathway in the Career Field Technical Content Standards of the Ohio Department of Education [ODE Course Plan Reading and Estimating (178019)].

Semester Credit Hours: 3

Course Description: This course provides the context and skills required for students to interpret, visualize, and apply technical information contained within a set of construction drawings and sets the foundation for further study in design and construction. Upon completion of this course, the student will be able to interpret working drawings including scales, dimensions, notes, symbols, sections, schedules, and how the various drawing views relate to each other. Students will learn how specifications and other contract documents relate to the construction drawings.

All Learning Outcomes signified with an asterisk (*) are considered essential, and must be taught.

Alignment:

| Learning Outcomes The student will be able to: | Outcomes and/or Competencies in ODE's Revised Career Field Technical Content Standards |
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| 1. Interpret Views and Scales, Lines and Symbols, Plan Views, Elevation Views, and Sections and Details as they pertain to construction drawings.* | 6.1.1. Calculate surface area and volume for three-dimensional objects, accurate to a specified level of precision. 6.1.2. Apply measurement scales to layout length, width, and angle measurements. 6.1.3. Apply algebraic procedures and geometric concepts to reading construction documents. |

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| | <p>6.1.4. Use proportional reasoning and apply indirect measurement techniques (e.g., right triangle trigonometry, properties of similar triangles).</p> <p>6.1.6. Perform calculations and conversions with fractions, decimals, and percents.</p> <p>6.1.7. Perform unit conversions.</p> <p>6.2.1. Collect and analyze project information to determine resources and tasks required to complete a project.</p> <p>6.2.2. Read and interpret a site plan.</p> <p>6.2.3. Use architect's and engineer's scales to read and interpret construction drawings for material calculations and installation at the jobsite.</p> <p>6.2.4. Read, interpret, and organize construction drawings, models, specifications and other contractual documents.</p> |
| <p>2. Read and interpret plans within a construction drawing set including topographical, grading and drainage, architectural, structural, plumbing, mechanical, and electrical drawings.*</p> | <p>3.2.2. Interpret features of a site plan.</p> <p>6.1.2. Apply measurement scales to layout length, width, and angle measurements.</p> <p>6.1.3. Apply algebraic procedures and geometric concepts to reading construction documents.</p> <p>6.1.4. Use proportional reasoning and apply indirect measurement techniques (e.g., right triangle trigonometry, properties of similar triangles).</p> <p>6.2.2. Read and interpret a site plan.</p> <p>6.2.3. Use architect's and engineer's scales to read and interpret construction drawings for material calculations and installation at the jobsite.</p> |

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| | <p>6.2.5. Describe various building sections, wall sections and other architectural details of residential, commercial, utility, and highway construction.</p> <p>6.2.6. Identify and interpret aspects of sustainable design and construction techniques in construction drawings and specifications.</p> <p>6.2.7. Identify and interpret aspects of the Americans with Disabilities Act (ADA) in construction drawings and specifications.</p> <p>6.2.8. Read and interpret various 3-D and other CAD generated views in construction drawings.</p> <p>6.2.9 Read and interpret various BIM generated views in construction drawings.</p> |
| <p>3. Explain how specifications and other contract documents relate to construction drawings. *</p> | <p>6.2.4. Read, interpret and organize construction drawings, specifications and other contractual documents.</p> |
| <p>4. Use construction drawings to visualize a proposed project and transfer data relating to the project design.*</p> | <p>6.2.1. Collect and analyze project information to determine resources and tasks required to complete a project.</p> <p>7.3.6. Identify the role of CAD and BIM in Construction drafting.</p> |

2. Construction Safety: CTAN alignment with the Tech Prep Construction Management Pathway in the Career Field Technical Content Standards of the Ohio Department of Education [ODE Course Construction Safety (178018)].

Semester Credit Hours: 3

Course Description: This course introduces occupational safety hazards associated with the construction industry. Emphasis placed on recognition, evaluation and control of safety hazards particularly as they relate to the Occupational Safety and Health Act (OSHA) standards and requirements as they apply to the construction industry. Topics include safety and health hazards workers may face on construction work sites, safe practices and construction safety management. Emphasis is placed on hazard identification, avoidance, control and prevention. Upon successful completion, this course provides students with a 30 hour OSHA card.

Advising Notes: Student must have valid OSHA 30 hour card in general construction.

All Learning Outcomes signified with an asterisk (*) are considered essential, and must be taught.

Alignment:

| <p style="text-align: center;">Learning Outcomes</p> <p>The student will be able to:</p> | <p style="text-align: center;">Outcomes and/or Competencies in ODE’s Revised Career Field Technical Content Standards</p> |
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| <p>1. Identify safe practices on different construction activities (e.g. materials handling, welding, excavations, fall protection, electrical work, fire protection, etc.) and proper use of personal protective equipment, hand and power tools, cranes, scaffolds and ladders.*</p> | <p>1.3.2. Follow protocols and practices necessary to maintain a clean and healthy work environment.</p> <p>2.1.3. Identify and apply load factors for constructing scaffolding, railings, ladders, and temporary structures.</p> <p>2.1.8. Identify the location of emergency flush showers, eyewash fountains, Safety Data Sheets (SDSs), fire alarms, and exits.</p> <p>2.1.9. Select and operate fire extinguishers based on the class of fire.</p> <p>2.2.2. Describe how working under the influence of (e.g., drugs, alcohol and stimulants/caffeine) increases the risk of accident, lowers productivity, raises insurance costs, and reduces profits.</p> <p>2.2.3. Select, use, store, maintain, and dispose of personal protective equipment (PPE) appropriate to job tasks, conditions, and materials.</p> |

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| | <p>2.2.4. Identify workplace risk factors associated with lifting, operating, and moving heavy objects and establish an ergonomics process.</p> <p>2.2.5. Identify, inspect, and use safety equipment appropriate for task.</p> <p>2.2.6. Demonstrate first aid and cardiopulmonary resuscitation (CPR).</p> <p>2.2.7. Identify and describe hazards associated with using electronic devices on the job site.</p> <p>2.2.8. Identify and describe hazards associated with improper clothing and poor hygiene.</p> <p>2.2.9. Describe trenching and excavation hazards (e.g. soil types, cave in, utilities, underground obstacles)</p> <p>2.2.10. Describe the process for identifying and locating existing site utilities.</p> <p>2.3.1. Select the equipment and attachments needed to complete the task.</p> <p>2.3.2. Follow the manufactures' recommendations for safety, maintenance, limitations, and use.</p> <p>2.3.3. Perform pre- and post-operation inspections and adjustments and report malfunctions.</p> <p>2.3.4. Operate levers, pedals, or valves to activate power equipment.</p> <p>2.4.2. Ensure the presence and functionality of safety systems and hardware.</p> <p>2.4.10. Document and log equipment maintenance records.</p> <p>4.3.3. Utilize National Fire Protection Association (NFPA) procedures for NFPA 70E-arc flash boundaries, current-limiting fuses, live work power permits, electrically safe work</p> |
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| | <p>conditions, emergency worker safety programs, scheduling, energized circuits, and training.</p> <p>6.6.6. Develop and implement a custodial care plan (i.e., custodial duties and frequency; routine, renovation, supervisory, management activities) that provides a safe and healthy environment for a facility and analyzes efficiency based on hours and square footage.</p> <p>6.6.12. Schedule preventative maintenance, repair, and renovation to maintain a safe and healthy environment using computer-aided facilities management programs as appropriate.</p> |
| <p>2. Identify common safety hazards on a construction site (e.g., Focus 4: falls, electrocution, caught in or between, and struck by) and recommend proper preventive and corrective measures.*</p> | <p>The secondary career-technical program must teach the content using the OSHA 30 guidelines. In addition, the secondary career-technical program must also show alignment to the following content:</p> <p>1.3.2. Follow protocols and practices necessary to maintain a clean and healthy work environment.</p> <p>2.1.2. Identify and rectify or mitigate construction hazards (e.g., thresholds, slippery surfaces, and lighting, and workplace clutter).</p> <p>2.1.6. Identify source of electrical hazards and use shutdown and established lock-out/tag-out procedures.</p> <p>3.3.1. Describe excavation, trenching, and shoring designs.</p> |
| <p>3. Identify and describe the primary health and environmental hazards on a construction site and be able to recommend proper preventive and/or control measures.*</p> | <p>The secondary career-technical program must teach the content using the OSHA 30 guidelines. In addition, the secondary career-technical program must also show alignment to the following content:</p> <p>1.3.2. Follow protocols and practices necessary to maintain a clean and healthy work environment.</p> <p>2.1.2. Identify and rectify or mitigate construction hazards associated with (e.g., thresholds, slippery surfaces, and lighting, and workplace clutter).</p> |

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| | <p>2.1.7. Identify procedures for handling, storage, and disposal of hazardous materials.</p> <p>2.1.10. Create a hazardous materials safety plan (e.g., liquid and airborne materials).</p> <p>2.1.11. Describe the interactions of incompatible substances when measuring and mixing chemicals.</p> <p>3.3.3. Collect samples and explain the environmental impact of contaminated soil and water on the worksite.</p> <p>3.3.4. Explain disposal procedures for contaminated soil, water, and waste.</p> <p>3.3.5. Describe procedures to control water runoff and drainage.</p> <p>5.8.1. Compare and contrast sources of contamination in water supplies and methods of disinfecting water.</p> <p>5.9.2. Describe the physical properties and potential hazards associated with different fuel types.</p> |
| <p>4. Communicate safe practices to team members.*</p> | <p>The secondary career-technical program must teach the content using the OSHA 30 guidelines. In addition, the secondary career-technical program must also show alignment to the following content:</p> <p>1.1.2. Identify the scope of career opportunities and the requirements for education, training, certification, licensure and experience.</p> <p>1.1.4. Describe the role and function of professional organizations, industry associations and organized labor and use networking techniques to develop and maintain professional relationships.</p> <p>1.11.2. Identify the difference between monetary and nonmonetary incentives and explain how changes in incentives cause changes in behavior.</p> <p>1.2.1. Extract relevant, valid information from materials and cite sources of information.</p> |

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| | <p>1.2.2. Deliver formal and informal presentations.</p> <p>1.2.3. Identify and use verbal, nonverbal and active listening skills to communicate effectively.</p> <p>1.2.4. Use negotiation and conflict-resolution skills to reach solutions.</p> <p>1.2.5. Communicate information (e.g., directions, ideas, vision, workplace expectations) for an intended audience and purpose.</p> <p>1.2.12. Use technical writing skills to complete forms and create reports.</p> <p>1.4.1. Use office equipment to communicate (e.g., phone, radio equipment, fax machine, scanner, public address systems).</p> <p>1.4.2. Select and use software applications to locate, record, analyze and present information (e.g., word processing, e-mail, spreadsheet, databases, presentation, Internet search engines).</p> <p>1.4.3. Verify compliance with security rules, regulations and codes (e.g., property, privacy, access, accuracy issues, client and patient record confidentiality) pertaining to technology specific to the industry pathway.</p> <p>2.1.5. Demonstrate proper use of American National Standards Institute (ANSI) hand signals.</p> <p>2.2.1. Interpret personal safety rights according to the employee Right to Know plan.</p> <p>2.2.2. Describe how working under the influence of drugs and alcohol increases the risk of accident, lowers productivity, raises insurance costs, and reduces profits.</p> |
| <p>5. Recognize the various aspects of OSHA safety regulations for the construction industry including terms used, mandatory procedures, record keeping, emergency</p> | <p>The secondary career-technical program must teach the content using the OSHA 30 guidelines. In addition, the secondary career-technical program must also show alignment to the following content:</p> |

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| <p>response, compliance, inspection and penalties.*</p> | <p>1.3.5. Access and implement safety compliance measures (e.g., quality assurance information, safety data sheets [SDSs], product safety data sheets [PSDSs], United States Environmental Protection Agency [EPA], United States Occupational Safety and Health Administration [OSHA]) that contribute to the continuous improvement of the organization.</p> <p>1.4.3. Verify compliance with security rules, regulations and codes (e.g., property, privacy, access, accuracy issues, client and patient record confidentiality) pertaining to technology specific to the industry pathway.</p> <p>2.1.1. Use Occupational Safety and Health Administration (OSHA)-defined procedures for identifying employer and employee responsibilities, working in confined spaces, managing worker safety programs, using ground fault circuit interrupters (GFCIs), maintaining clearance and boundaries, and labeling.</p> |
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3. Construction Methods and Materials: CTAN alignment with the Tech Prep Construction Pathway in the Career Field Technical Content Standards of the Ohio Department of Education [ODE Course Carpentry and Masonry Technical Skills (178001)]. This CTAN is already an approved OAN in the Civil/Construction Engineering Technology (CCET) TAG. The number and title are OET016-Construction Methods and Materials.

Semester Credit Hours: 3-4

Course Description: This course provides an overview of various common construction methods and building details and the various materials used in construction. After receiving an introduction into fundamental principles of structural, physical, and long-term performance, students learn about material and product manufacturing techniques and properties of the various materials. Topics include analyzing architectural drawings, construction terminology, sectors of the construction industry, that is, residential, commercial, industrial, institutional, and highway, and the various individuals involve in the industry.

All Learning Outcomes signified with an asterisk (*) are considered essential, and must be taught.

Alignment:

| Learning Outcomes | Outcomes and/or Competencies in ODE’s Revised Career Field Technical Content Standards |
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| The student will be able to: | |
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| <p>1. Demonstrate basic understanding of architectural blueprints.*</p> | <p>3.2.1. Identify topographical and existing features of areas (i.e., property lines, utilities, streets, setbacks) on survey maps (parcel map, survey plat).</p> <p>6.2.2. Read and interpret a site plan.</p> <p>6.2.3. Use architect's and engineer's scales to read and interpret construction drawings for material calculations and installation at the jobsite.</p> <p>6.2.4. Read, interpret and organize construction drawings, specifications and other contractual documents.</p> |
| <p>2. Understand the terminology related to the building construction.*</p> | <p>1.4.3. Verify compliance with security rules, regulations, and codes (e.g., property, privacy, access, accuracy issues, client and patient record confidentiality) pertaining to technology specific to industry pathway.</p> <p>3.1.10. Demonstrate knowledge of specialty finishes to concrete.</p> <p>3.1.12. Compare types of foundation materials (e.g., brick, block, poured).</p> <p>3.2.4. Identify and apply relevant building codes.</p> <p>3.3.9. Explain the types of grade (e.g., subgrade, finished grade).</p> <p>3.3.11. Describe fill materials, their appropriateness, and their functions.</p> <p>3.6.1. Identify platform and balloon framing.</p> <p>3.10.1. Describe the different types and characteristics of drywall and finishing materials.</p> <p>4.6.1. Compare renewable energy systems.</p> <p>5.2.7. Identify the components of a geothermal system.</p> <p>5.6.1. Identify the components of a duct system.</p> <p>5.7.2. Identify the components of a drainage system.</p> |

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| | <p>6.2.4. Read, interpret and organize construction drawings, specifications and other contractual documents.</p> <p>6.2.5. Describe various building sections, wall sections, and other architectural details of the residential, commercial, and highway construction.</p> <p>6.5.2. Identify the various material testing techniques (e.g., hardness, tensile strength, bearing capacity, wear resistance).</p> <p>6.5.6. Identify the roles and goals of construction professionals within a given delivery system (e.g., owners, architects and engineers, suppliers, general contractors and trade contractors, consultants, regulators).</p> <p>7.1.1. Differentiate between residential, commercial, industrial, and institutional construction segments.</p> |
| <p>3. Identify the people involved in the construction industry.*</p> | <p>1.1.2. Identify the scope of career opportunities and the requirements for education, training, certification, licensure and experience.</p> <p>1.1.4. Describe the role and function of professional organizations, industry associations, and organized labor and use networking techniques to develop professional relationships.</p> <p>7.1.1. Differentiate between residential, commercial, industrial, and institutional construction segments.</p> <p>6.5.6. Identify the roles and goals of construction professionals within a given delivery system (e.g., owners, architects and engineers, suppliers, general contractors and trade contractors, consultants, regulators).</p> |
| <p>4. Know the origin, development and use of common building materials.*</p> | <p>1.2.1. Extract relevant, valid information from materials and cite sources of information.</p> <p>3.1.12. Compare types of foundation materials (e.g., brick, block, poured).</p> <p>3.3.2. Compare and contrast how soil properties, profiles, and types affect construction and describe fill placement processes (e.g., lifts, geomat fabrics, compaction, density, moisture content).</p> |

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| | <p>3.5.1. Identify, describe, and assemble materials for floor framing.</p> <p>3.6.3. Compare and contrast metal and wood framing.</p> <p>3.6.5. Describe wall framing techniques used in masonry construction.</p> <p>3.7.1. Compare and contrast roof types and materials.</p> <p>3.7.2. Identify, describe, and assemble materials for roof framing.</p> <p>3.8.1. Compare and contrast types and characteristics of doors and windows.</p> <p>3.8.2. Identify, describe, and assemble materials for exterior finishing.</p> <p>3.10.1. Describe the different types and characteristics of drywall and finishing materials.</p> <p>3.10.3. Describe the effects insulation, vapor barriers, and ventilation can have on controlling moisture.</p> <p>3.11.5. Match materials selected to the original structure.</p> <p>6.5.2. Identify the various material testing techniques (e.g., hardness, tensile strength, bearing capacity, wear resistance).</p> |
| <p>5. Compare methods of construction used in buildings.*</p> | <p>1.3.2. Follow protocols and practices necessary to maintain a clean, safe, and healthy work environment.</p> <p>2.3.1. Select the equipment and attachments needed to complete the task.</p> <p>2.4.2. Ensure the presence and functionality of safety systems, and hardware.</p> <p>3.3.1. Describe excavation, trenching, and shoring designs.</p> <p>3.3.4. Explain disposal procedures for contaminated soil, water, and waste.</p> <p>3.3.5. Describe procedures to control water runoff and drainage.</p> |

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| | <p>3.7.1. Compare and contrast roof types and materials.</p> <p>3.9.1. Describe stairway types and their components.</p> <p>3.9.2. Calculate rise and run and design stairway risers, treads, stringers, and clearances.</p> <p>3.10.1. Describe the different types and characteristics of drywall and finishing materials.</p> <p>3.10.3. Describe the effects insulation, vapor barriers, and ventilation can have on controlling moisture.</p> <p>6.2.5. Describe various building sections, wall sections, and other architectural details of the residential, commercial, and highway construction.</p> <p>6.4.2. Prescribe material and equipment storage needs and location on different types of job sites (e.g., access, delivery, protection from the elements, security).</p> |
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