

**Florida Department of Education
Curriculum Framework**

Program Title: Building Trades and Construction Design Technology
Program Type: Career Preparatory
Career Cluster: Architecture & Construction

Program Number	8722000
CIP Number	0646041505
Grade Level	9-12
Program Length	6 Credits
Teacher Certification	Refer to the Program Structure section.
CTSO	SkillsUSA
SOC Codes (all applicable)	49-9071 -- Maintenance and Repair Workers, General
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

The purpose of this program is to prepare students for employment or advanced training in the building construction industry.

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Architecture and Construction career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Architecture and Construction career cluster.

The content includes but is not limited to applying construction techniques; reading plans and specifications; and developing trade skills in carpentry, masonry, electricity, plumbing and air conditioning.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction totaling six credits.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the secondary program structure:

Course Number	Course Title		Length	SOC Code	Level	Graduation Requirement
8722010	Building Trades and Construction Design Technology 1	AC HEAT ME @7 7G BLDG CONST @7 7G BLDG MAINT @7 7G CARPENTRY @7 7G DRAFTING @7 7G ELECTRICAL @7 7G ENG 7G PLUMBIN @7 7G ROOFING 7G SHEETMETAL @7 7G TEC CONSTR @7 7G TEC DRAFT 7G TEC ED 1@2 ENG&TEC ED1@2 TROWEL TR 7G	1 Credit	49-9071	2	CT
8722020	Building Trades and Construction Design Technology 2		1 Credit		2	CT
8722030	Building Trades and Construction Design Technology 3		1 Credit		3	CT
8722040	Building Trades and Construction Design Technology 4		1 Credit		2	CT
8722050	Building Trades and Construction Design Technology 5		1 Credit		2	CT
8722060	Building Trades and Construction Design Technology 6		1 Credit		3	CT

(Graduation Requirement Codes: CT= Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA= Mathematics, PL= Personal Financial Literacy)

Common Career Technical Core – Career Ready Practices

Career Ready Practices describe the career-ready skills that educators should seek to develop in their students. These practices are not exclusive to a Career Pathway, program of study, discipline or level of education. Career Ready Practices should be taught and reinforced in all career exploration and preparation programs with increasingly higher levels of complexity and expectation as a student advances through a program of study.

1. Act as a responsible and contributing citizen and employee.
2. Apply appropriate academic and technical skills.
3. Attend to personal health and financial well-being.
4. Communicate clearly, effectively and with reason.
5. Consider the environmental, social and economic impacts of decisions.
6. Demonstrate creativity and innovation.
7. Employ valid and reliable research strategies.
8. Utilize critical thinking to make sense of problems and persevere in solving them.
9. Model integrity, ethical leadership and effective management.
10. Plan education and career path aligned to personal goals.
11. Use technology to enhance productivity.
12. Work productively in teams while using cultural/global competence.

Standards

After successfully completing this program, the student will be able to perform the following:

- 1.0 Demonstrate safety practices and follow disaster plans.
- 2.0 Identify and use basic hand tools.
- 3.0 Identify power tools and describe their proper operation.
- 4.0 Discuss, identify, classify and present construction components, materials, hardware and characteristics.
- 5.0 Demonstrate an understanding of the construction industry and related occupations.
- 6.0 Explain the importance of employability and entrepreneurship skills.
- 7.0 Demonstrate or discuss rough and finish carpentry skills.
- 8.0 Demonstrate or discuss masonry skills.
- 9.0 Demonstrate or discuss painting and decorating skills.
- 10.0 Demonstrate or discuss science knowledge and skills.
- 11.0 Demonstrate mathematics knowledge and skills.
- 12.0 Explain all that the built environment encompasses.
- 13.0 Demonstrate an understanding of the natural environment, built environment and green built environment.
- 14.0 Research laws applicable to the construction industry.
- 15.0 Develop a basic understanding of construction contracts, drawings, documents and specifications and how they apply to the construction process.
- 16.0 Demonstrate or discuss electrical rough in skills.
- 17.0 Demonstrate or discuss finish electrical skills.
- 18.0 Demonstrate or discuss plumbing rough in skills.
- 19.0 Demonstrate or discuss finish plumbing skills.
- 20.0 Demonstrate or discuss Heating, Ventilation and Air Conditioning (HVAC) rough in skills.
- 21.0 Demonstrate finish HVAC skills.
- 22.0 Design a capstone project using skills learned throughout the program.
- 23.0

**Florida Department of Education
Student Performance Standards**

Course Title: Building Trades and Construction Design Technology 1
Course Number: 8722010
Course Credit: 1

Course Description:

The purpose of this course is to provide students with competencies in safety practices; the use of hand and power tools; construction components, materials and hardware; construction industry occupations and employability skills.

CTE Standards and Benchmarks	
1.0	Demonstrate safety practices and follow disaster plans. The student will be able to:
1.1	Observe and comply with all applicable company and organizational safety policies and Occupational Safety and Health Administration (OSHA) rules and regulations.
1.2	Be able to demonstrate the purpose of Safety Data Sheets (SDS), formerly known as Material Safety Data Sheets (MSDS), and follow the procedures as necessary.
1.3	Identify health-related problems that may result from exposure to work-related chemicals and hazardous materials, and demonstrate knowledge of the proper precautions required for handling such materials. (Refer to Safety Data Sheets.)
1.4	Discuss, analyze and discuss the “Right-to-Know” law, such as with chemical or health hazards, as recorded in (29 CFR-1910.1200).
1.5	Identify and demonstrate the use of safety equipment such as fall arrest systems, fire extinguishers, scaffolds and ladders.
1.6	Identify, interpret and follow disaster plans.
1.7	Describe and demonstrate appropriate safety attitudes and behaviors in the shop and on the job in the construction industry.
1.8	Describe and demonstrate the appropriate safe use and maintenance of portable and stationary power equipment in the shop and on the job in construction industry.
1.9	Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
1.10	Explain and demonstrate emergency procedures to follow in response to workplace accidents.
1.11	Create a disaster and/or emergency response plan for a specific instance (earthquake, hurricane, tornado, etc.).
2.0	Identify and use basic hand tools. The student will be able to:
2.1	Select and utilize appropriate hand tools typically used in the construction industry for specific tasks in accordance with safety guidelines and standard practice.
3.0	Identify power tools and describe their proper operation. The student will be able to:
3.1	Select and utilize appropriate power tools and equipment for specific tasks in accordance with safety guidelines.
4.0	Discuss, identify, classify and present construction components, materials, hardware and characteristics. The student will be able to:
4.1	Discuss, identify and present the various components, materials and hardware used in residential construction applications.
4.2	Discuss, identify and present the various components, materials and hardware used in commercial construction applications.
4.3	Discuss, identify and present the various components, materials and hardware used in industrial construction applications.

4.4	Discuss and present preplanning and procedural steps to accomplish various projects large and small both in the lab and on the job site with attention to building codes, standard practice and acceptable techniques.
1.0	Demonstrate an understanding of the construction industry and related occupations. The student will be able to:
1.1	Identify and distinguish construction trade occupations and the roles and responsibilities of each craft.
1.2	Identify and distinguish construction project management occupations and the roles and responsibilities of each.
1.3	Identify and differentiate design and engineering occupations and the roles and responsibilities of each.
1.4	Assess and discuss the relationship between the Department of Labor and the construction industry, economy and opportunity for employment.
1.0	Explain the importance of employability and entrepreneurship skills. The students will be able to:
1.1	Identify and demonstrate positive work behaviors needed to be employable.
1.2	Develop personal career plan that includes goals, objectives and strategies.
1.3	Examine and explain licensing, certification and industry credentialing requirements.
1.4	Maintain a career portfolio to document knowledge, skills and experience.
1.5	Evaluate and compare employment opportunities that match career goals.
1.6	Identify and exhibit traits for retaining employment.
1.7	Identify opportunities and research requirements for career advancement.
1.8	Explain and practice the benefits and necessity of ongoing professional development.
1.9	Examine and describe entrepreneurship and leadership opportunities as a career planning option.
1.10	Conduct a job search and analyze the requirements of the job.
1.11	Understand the consequences of poor decision making.
1.12	Assess the importance of confidentiality in the workplace.
1.13	Determine healthy living habits in relation to work.

**Florida Department of Education
Student Performance Standards**

Course Title: Building Trades and Construction Design Technology 2
Course Number: 8722020
Course Credit: 1

Course Description:

The purpose of this course is to provide students with competencies in rough and finish carpentry, masonry and painting.

CTE Standards and Benchmarks	
2.0	Demonstrate or discuss rough and finish carpentry skills. The student will be able to:
1.1	Discuss the carpentry trade and explain the duties of a carpenter.
1.2	Identify and use building materials, fasteners and adhesives.
1.3	Use and maintain hand and power tools.
1.4	Read and interpret approved plans and specifications for residential and commercial drawings.
1.5	Apply linear and distance measurements, leveling, plumbing and squaring techniques.
1.6	Analyze a survey and develop site layout.
1.7	Construct and remove concrete forms, handle and place concrete, reinforcing materials and finish concrete.
1.8	Understand the potential hazards involved in handling concrete and proper protective measures and PPE.
1.9	Calculate, layout, construct and install floor, wall, ceiling and roof framing.
1.10	Calculate, layout, construct and install basic stair layout.
1.11	Understand building science of thermal and moisture protection and mitigating measures.
1.12	Calculate and install roofing applications.
1.13	Install windows and interior /exterior doors and door hardware.
1.14	Calculate, construct and install exterior finishing.
1.15	Install drywall and apply finishing techniques.
1.16	Install cabinets and built-in fabrications.
1.17	Calculate and install window, door, floor and ceiling trim.
1.18	Calculate, layout and construct metal stud framing.
1.19	Calculate, layout and install suspended ceilings.
3.0	Demonstrate or discuss masonry skills. The student will be able to:
1.1	Describe and discuss orientations to the masonry trade.
1.2	Identify and select basic masonry tools and equipment.
1.3	Use, maintain and store masonry hand tools, power tools and equipment safely and in proper working order.
1.4	Read and interpret measurements, drawings and specifications for masonry building projects.
1.5	Demonstrate safe and proper procedures for set up/tear down and maintaining masonry work sites and projects.

1.6	Utilize the tools and equipment used for mixing mortar.
1.7	Analyze the factors that affect the consistency of mortar.
1.8	Determine masonry ratios, their strengths and applications of mortar mixtures M, S, N, O and K.
1.9	Mix various types of mortar, considering application and Pounds per Square Inch (PSI) strength.
1.10	Lay out square corners using the 3-4-5 (or Pythagorean Theorem) and building instrument methods for masonry projects.
1.11	Lay out and install dry bonds for masonry block corner leads projects.
1.12	Lay out and build corner leads for masonry block projects.
1.13	Identify and describe various masonry units and installation techniques.
1.14	Implement the methods of putting up the line.
1.15	Utilize pointing tools to strike mortar joints.
1.16	Identify and use the various types of trowels.
1.17	Mix and apply stucco to a project.
4.0	Demonstrate or discuss painting and decorating skills. The student will be able to:
1.1	Identify, describe and use various painting tools and equipment.
1.2	Properly erect an extension ladder, step ladder and a scaffold.
1.3	Prepare surfaces for application of finishes.
1.4	Identify and describe various painting and application techniques.
1.5	Apply finishes to a project including primers, paints, stains varnishes, wall coverings and textures.
1.6	Use appropriate techniques and materials for clean-up and tool and material storage.

**Florida Department of Education
Student Performance Standards**

Course Title: Building Trades and Construction Design Technology 3

Course Number: 8722030

Course Credit: 1

Course Description:

The purpose of this course is to develop student competencies in construction related math and science, the built environment and the green environment.

CTE Standards and Benchmarks	
5.0	Demonstrate or discuss science knowledge and skills. The students will be able to:
1.1	Explore new technology as it applies to the construction industry in terms of materials, processes and the need for continuing education.
1.2	Investigate the use of communication technology and other resources to inspire design decisions.
6.0	Demonstrate mathematics knowledge and skills. The students will be able to:
1.1	Solve job-related problems by adding, subtracting, multiplying and dividing numbers using fractions, decimals and whole numbers.
1.2	Change fractions and decimals to percent.
1.3	Solve job-related problems using a calculator, tape measure, or on paper, for basic computations.
1.4	Read a ruler and a tape measure accurately.
1.5	Compute yards, feet, inches and fractions of inches.
1.6	Change hours and minutes to decimals, fractions and mixed numbers.
1.7	Construct charts/tables/graphs using functions and data.
1.8	Determine ratios and proportions.
1.9	Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares and cylinders.
1.10	Measure tolerance(s) on horizontal and vertical surfaces using metric (centimeters and millimeters) and english (feet, inches and fractions) units.
1.11	Analyze and apply data and measurements to solve problems and interpret documents.
1.12	Calculate man hours and labor costs for a specific job.
7.0	Explain all that the built environment encompasses. The student will be able to:
1.1	Discuss the development of construction technology, its impact on the built environment and the impact of growth on the construction industry.
1.2	Describe and give examples of the influences and benefits of the construction industry on health and safety, communication, transportation and the economy.
1.3	Examine and compare the relationship between the built environment and the natural environment.
1.4	Compare the relationship between architectural designs and/or models to understand aesthetic details.

1.5	Analyze changes in architectural styles and construction practices over time relative to various environments.
1.6	Discuss how technology has changed the design process throughout history.
8.0	Demonstrate an understanding of the natural environment, built environment and green built environment. The student will be able to:
1.1	Recognize and analyze the development of the built environment and its impacts on the natural environment such as pollution, deforestation, climate change, health and disease.
1.2	Describe and give examples of how a green built environment creates growth for the construction industry, and the economy such as health and safety, transportation and natural resources.
1.3	Examine and compare the relationship between a green built environment and the natural environment.
1.4	Explain the purpose of the United States Green Building Council (USGBC), the Green Building Certification Institute (GBCI) and Leadership for Energy and Environmental Design (LEED) are and how they create growth for the construction industry and the economy.
1.5	Discuss sustainable building design and its relationship between health, energy efficiency and money savings for government, businesses and individuals.
1.6	Discuss the effects of building science on construction and energy efficiency.
1.7	Discuss renewable fuels and energy.

**Florida Department of Education
Student Performance Standards**

Course Title: Building Trades and Construction Design Technology 4
Course Number: 8722040
Course Credit: 1

Course Description:

This course provides students with competencies in construction laws, contracts, documents specifications, building codes and regulations.

CTE Standards and Benchmarks	
9.0	Research laws applicable to the construction industry. The student will be able to:
1.1	Discuss and analyze the governmental law process at the federal, state and local level and its impact on the construction industry and construction education.
1.2	Identify and analyze the Codes of Federal Regulations (CFR) pertaining to the construction industry.
1.3	Analyze the Florida State Statutes pertaining to the construction industry.
1.4	Compare and contrast trade union and trade non-union workers in terms of their effect and influence on health and safety, communication, transportation and the economy.
1.5	Compare and contrast employment and training with union and non-union entities in the construction industry.
1.6	Examine the role of apprenticeship in the construction industry and its impact on education.
1.7	Discuss and assess the Florida Department of Business and Professional Regulation.
1.8	Discuss and assess the Construction Industry Licensing Board, its structure, policies and requirements.
1.9	Discuss various construction occupations and explain the requirements for becoming licensed.
1.10	Compare and contrast the roles and responsibilities of the engineers, architects/designers and the general contractor.
1.11	Compare and contrast the roles and responsibilities of the general contractor, subcontractors, specialty contractors and employees of contractors.
1.12	Identify and differentiate the roles and responsibilities of building construction firms and classifications of construction projects.
1.13	Understand the process of establishing a business in the construction industry.
1.14	Assess the relationship between the Department of Labor and new construction projects, new permits and new business start-ups.
1.15	Understand zoning and assess the need for and impact of zoning requirements on construction projects.
1.16	Examine and analyze the process of applying for building permits and variances.
10.0	Develop a basic understanding of construction contracts, drawings, documents and specifications and how they apply to the construction process. The student will be able to:
1.1	Explain the purpose and components of contracts, drawings, documents and specifications and explain their relation to building permits.
1.2	Analyze the importance of building codes and zoning regulations on the development of drawings and specifications.

1.3	Identify and interpret the analogy of a full set of drawings including architectural (site plans, foundation plans, floor plans, interior/exterior elevations, sections, details, schedules, etc.), structural, plumbing, mechanical and electrical drawings.
1.4	Utilize building symbols, drawing lines, abbreviations and scale in the development of blueprints.
1.5	Prepare lists of materials and specifications.
1.6	Use architectural and engineering scales.
1.7	Demonstrate or discuss the basic use of computer-aided design software.
1.8	Demonstrate or discuss the use of Computer-Aided Drafting (CAD) software to prepare project drawings.
1.9	Write specifications for a project.
1.10	Prepare construction documents for a project.

**Florida Department of Education
Student Performance Standards**

Course Title: Building Trades and Construction Design Technology 5
Course Number: 8722050
Course Credit: 1

Course Description:

This course provides students with competencies in electrical, plumbing and air conditioning.

CTE Standards and Benchmarks	
11.0	Demonstrate or discuss electrical rough in skills. The student will be able to:
1.1	Identify and apply electrical safety practices and procedures when working with electrical systems. (Refer to NFPA70E standards.)
1.2	Explain grounding, its purpose and relation to electrical safety.
1.3	Explain and describe various phases of electrical generation and the transportation and distribution of electricity to sub stations for industrial, business and residential uses (under 480 volts).
1.4	Design and calculate electrical loads using ohms law to determine power, American wire gauge (AWG) and electrical equipment sizes.
1.5	Apply basic electrical theory to wiring a project.
1.6	Wire an air-conditioning system, heat exchanger, heat pump or electric water heater into an electrical supply and properly size wire and overcurrent protection.
1.7	Design and install a branch circuit system in a project.
1.8	Discuss and/or install Ground Fault Circuit Interrupter (GFCI) circuitry.
1.9	Troubleshoot electrical systems, using testing and metering devices.
1.10	Install a meter, distribution panel and breaker panel for a project.
1.11	Identify types of wiring raceways (EMT/ IMC/ PVC/ MC Cable/ Romex/ SE Cable/ UF Cable).
1.12	Install conduit, pipe, shielded electrical cable and electrical boxes in a project.
12.0	Demonstrate or discuss finish electrical skills. The student will be able to:
1.1	Install electrical components relating to residential and commercial applications.
1.2	Troubleshoot and inspect electrical systems.
13.0	Demonstrate or discuss plumbing rough in skills. The student will be able to:
1.1	Identify, select and install various pipes, tubing, fittings and connectors used in the plumbing trade for a specific project.
1.2	Lay out and install a water distribution (supply) system for a project.
1.3	Lay out and install a Drain, Waste and Vent (DWV) system for a project.
1.4	Test and inspect plumbing systems.
1.5	Discuss the design and layout of a domestic solar hot water system.
14.0	Demonstrate or discuss finish plumbing skills. The student will be able to:

1.1	Install bathroom fixtures and hardware such as lavatories, water closets, urinals, showers, bathtubs and traps.
1.2	Install kitchen fixtures and hardware such as sinks, garbage disposals, faucets, dishwasher, icemaker and hot water heater tanks.
15.0	Demonstrate or discuss Heating, Ventilation and Air Conditioning (HVAC) rough in skills. The student will be able to:
1.1	Explain heating and cooling principles and code requirements.
1.2	Perform basic calculations for heating and cooling loads.
1.3	Develop an understanding of building envelope, insulation and ventilation.
1.4	Select and discuss or install the components of an air conditioning system for a project including ductwork, coolant lines, compressor packages and coil packages.
1.5	Identify and select refrigerants according to their properties.
16.0	Demonstrate finish HVAC skills. The student will be able to:
1.1	Determine a refrigerant level.
1.2	Install a control system for a project.
1.3	Install registers for a project.
1.4	Examine computer-monitoring systems associated with HVAC control systems and air-quality management.

**Florida Department of Education
Student Performance Standards**

Course Title: Building Trades and Construction Design Technology 6
Course Number: 8722060
Course Credit: 1

Course Description:

The purpose of this course is to allow students to apply skills learned throughout the program through a capstone project.

CTE Standards and Benchmarks	
17.0	Design a capstone project using skills learned throughout the program. The student will be able to:
22.1	Solve design and construction problems to gain new perspectives.
22.2	Apply critical-thinking and problem solving skills used in design to develop solutions for real-life issues.
22.3	Use and maintain tools and equipment used in the construction process.
22.4	Work in a project team to develop cohesiveness, team building, respectful compromise and time-management skills.
22.5	Apply carpentry skills.
22.6	Apply masonry skills.
22.7	Apply Mechanical, Electrical and Plumbing (MEP) skills.
22.8	Apply construction industry safety.
22.9	Apply sustainable construction practices.
22.10	Apply learned and acquired skills to address construction industry standards, methods and techniques.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular career and technical student organization for providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular course or a modified course. If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.