

**Standards and Sequence**

**for**

**BUILDING TRADES**



**Portage Lakes Career Center**

**We equip and empower tomorrow's leaders to discover their passion and design their future.  
Extraordinary Experiences. Every Student. Every Day.**

**CTPD 200098**

**Portage Lakes Joint Vocational School District  
Uniontown, Ohio**

**Updated February 2024**

Sincere appreciation is extended to the following individuals for their assistance in preparing this course of study:

- Kim Redmond, Superintendent
- Lisa Tripney, Assistant Superintendent
- Gregg Clark, Principal
- Adam Irwin, Program Instructor
- Members of the Advisory Committee

## **RECOMMENDATION BY THE PROGRAM ADVISORY COMMITTEE**

PORTAGE LAKES JOINT VOCATIONAL SCHOOL DISTRICT

### Building Trades

The advisory committee for the Building Trades Program at Portage Lakes Career Center has reviewed this course of study and recommends it for use as the foundation for instruction in classroom and laboratory experiences. The developers of the course of study have considered local labor market needs and the school district's ability to offer specialized programs.

The competencies found in the scope and sequence for this program have been reviewed and modified as congruent with Ohio Department of Education and Workforce competencies, the district's philosophy and student assessment measures. Additional competencies related to the field may have been incorporated.

We believe that this course of study adequately and correctly focuses on the development of the knowledge, skills, attitudes, and values critical to successful employment in the multiple career fields available to students.

The Building Trades program advisory committee recommended this for approval in November 2024.

# OUR MISSION

We equip and empower tomorrow's leaders to discover their passion and design their future.

## WE BELIEVE

An innovative culture positions our students to navigate an evolving global economy.

Success demands a safe environment, where individuals are respected and valued.

Experiences beyond the classroom walls enrich learning and maximize student growth.

Learning, teaching, designing, and leading is a shared responsibility.



## OUR VISION

EXTRAORDINARY EXPERIENCES.  
*Every Student. Every Day.*

## **DISTRICT PHILOSOPHY**

### **PORTAGE LAKES JOINT VOCATIONAL SCHOOL DISTRICT**

The Board of Education of the Portage Lakes Joint Vocational School District believes in maintaining a stimulating educational environment that is conducive to providing the highest quality career-technical skill training and meeting the intellectual pursuits of each individual student. The objective of the district's educational philosophy is to prepare each person to be a responsible and productive member of our democratic society.

In the application of this philosophy, the Board of Education believes the instructional program should be designed to provide the student every available opportunity to further develop the skills, interests, abilities, and attitudes acquired by that person in earlier school years. It is the opinion of the Board of Education that constant attention must be given to appropriately expanding career-technical programs and academic courses, updating classroom equipment, and ensuring the instructor's knowledge in academic and career-technical trends.

The Board of Education adheres to the principle that what is considered valuable and appropriate learning be determined within the scope of state law and the prerogative of the citizens of the community working in conjunction with members of the Board.

Instructional techniques will be employed which prepare a student to be gainfully employed in a program field and/or enrolled in an institution of higher education. The student will be taught to have respect for the discipline of work and to practice appropriate personal safety measures.

The Board of Education believes that by following the district philosophy, students will take pride in personal achievement and proper conduct and will believe that education is an ongoing process that continues throughout one's lifetime.

## **DISTRICT GOALS**

### **CURRICULUM AND INSTRUCTION**

To ensure that curriculum and instruction meet student needs, the district will:

- continually update courses of study to reflect state of the art competencies
- provide for the use of current technology to aide instructional delivery
- utilize state and national best practices in the curriculum and instruction process

### **PROFESSIONAL GROWTH/STAFF MORALE/ADMINISTRATIVE SUPERVISION**

To promote staff and administrative involvement in the educational process, the district will:

- assist staff in developing individual professional goals
- provide opportunities to improve staff morale
- provide opportunities for professional development through in-service activities

### **PUBLIC RELATIONS AND COMMUNICATIONS**

To promote a positive image of the career center and the value of career-technical training, the district will:

- strengthen communication with advisory committees
- expand and improve communication with home school districts and other contiguous districts
- review and expand recruitment activities
- be sensitive to enrollment issues and program expansion

### **FINANCE**

To develop long-range fiscal planning, the district will:

- maximize state and local funding resources
- research alternate funding sources, including grants
- continue to improve operational methods to allow for increased efficiency

### **FACILITIES AND GROUNDS**

To maintain a sound physical plant, the district will:

- review and evaluate preventative maintenance
- develop a long-range maintenance replacement plan
- update program equipment to meet program and labor market needs

## **PROGRAM PHILOSOPHY**

### Building Trades

The program believes that students participating in a building maintenance and construction program will have the skills to meet the new demands and challenges in our nation's economy. The Building Trades program will focus on multiple skills that meet industry and post-secondary educational standards. Skills will include competencies developed at both a state and national level.

The Building Trades program is aligned with Ohio Department of Education and Workforce program competencies and guidelines. This arrangement provides a seamless pathway for secondary, post-secondary, and occupational experiences. Students experience a core of mathematics, science, communication, and technology competencies. These experiences can lead to opportunities for post-secondary education enrollment with multiple apprenticeship/internship programs and options.

Students in the Building Trades program will receive training in today's newest technologies and receive the academic foundation they need to meet post-secondary educational and future workforce needs.

## **PROGRAM GOALS**

### Building Trades

The goals of the Building Trades program are the following:

- develop competencies in academic skill areas of mathematics, science, communications, career planning, and technology
- develop competencies in materials identification and use, estimating, inter-relational systems, blueprints and drawings, schematics, safety regulations, emergency response, governmental regulations, carpentry skills, masonry skills, heavy equipment operation, plumbing skills, electrical skills, roofing, flooring, interior and exterior finish skills, and environmental sounds control
- develop employability and entrepreneurial competencies
- develop teamwork, problem solving, leadership, and citizenship skills
- develop acceptable attitudes, behaviors, and work habits for success in a global economy

## **PROGRAM STANDARDS**

Portage Lakes Career Center's Building Trades program follows the Ohio Department of Education and Workforces (ODEW) approved Construction Technologies Career Field Technical Content Standards located via the link below and referred to in the forthcoming Scope and Sequence for the courses specifically chosen in the Building Trades program.

ODEW updated the Construction Technologies Career Field Technical Course Content Standards in 2019.

[Construction Technologies Career Field Technical Course Content Standards](#)



**SCOPE AND SEQUENCE**  
**Construction Technologies Career Field**  
**Construction Technology – Core and Sustainable Construction**  
 Subject Code: 178000  
 Outcome & Competency Descriptions

**Course Description:**

Students will learn principles in basic safety (10-hr OSHA), construction math, hand and power tool area and operation, blueprint reading, material handling, communication and employability skills. An emphasis will be placed on safe and green construction practices.

**Strand 1. Business Operations/21st Century Skills**

Learners apply principles of economics, business management, marketing and employability in an entrepreneur, manager and employee role to the leadership, planning, developing and analyzing of business enterprises related to the career field.

**Outcome 1.1. Employability Skills**

Develop career awareness and employability skills (e.g., face-to-face, online) needed for gaining and maintaining employment in diverse business settings.

**Competencies**

- 1.1.1. Identify the knowledge, skills and abilities necessary to succeed in careers.
- 1.1.2. Identify the scope of career opportunities and the requirements for education, training, certification, licensure and experience.
- 1.1.3. Develop a career plan that reflects career interests, pathways and secondary and postsecondary options.
- 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.
- 1.1.5. Develop strategies for self-promotion in the hiring process (e.g., filling out job applications, résumé writing, interviewing skills, portfolio development).
- 1.1.6. Explain the importance of work ethic, accountability and responsibility and demonstrate associated behaviors in fulfilling personal, community and workplace roles.
- 1.1.7. Apply problem-solving and critical-thinking skills to work-related issues when making decisions and formulating solutions.
- 1.1.8. Identify the correlation between emotions, behavior and appearance and manage those to establish and maintain professionalism.
- 1.1.9. Give and receive constructive feedback to improve work habits.
- 1.1.10. Adapt personal coping skills to adjust to taxing workplace demands.
- 1.1.11. Recognize different cultural beliefs and practices in the workplace and demonstrate respect for them.
- 1.1.12. Identify healthy lifestyles that reduce the risk of chronic disease, unsafe habits and abusive behavior.

*An "X" indicates that the pathway applies to the outcome.*

Pathways	X	Design	X	Mechanical, Electrical, Plumbing	X	Structural
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## Outcome 1.2. Leadership and Communications

Process, maintain, evaluate and disseminate information in a business. Develop leadership and team building to promote collaboration.

### Competencies

- 1.2.1. Extract relevant, valid information from materials and cite sources of information.
- 1.2.2. Deliver formal and informal presentations.
- 1.2.3. Identify and use verbal, nonverbal and active listening skills to communicate effectively.
- 1.2.4. Use negotiation and conflict-resolution skills to reach solutions.
- 1.2.5. Communicate information (e.g., directions, ideas, vision, workplace expectations) for an intended audience and purpose.
- 1.2.6. Use proper grammar and expression in all aspects of communication.
- 1.2.7. Use problem-solving and consensus-building techniques to draw conclusions and determine next steps.
- 1.2.8. Identify the strengths, weaknesses and characteristics of leadership styles that influence internal and external workplace relationships.
- 1.2.9. Identify advantages and disadvantages involving digital and/or electronic communications (e.g., common content for large audiences, control of tone, speed, cost, lack of non-verbal cues, potential for forwarding information, longevity).
- 1.2.10. Use interpersonal skills to provide group leadership, promote collaboration and work in a team.
- 1.2.11. Write professional correspondence, documents, job applications and resumés.
- 1.2.12. Use technical writing skills to complete forms and create reports.
- 1.2.13. Identify stakeholders and solicit their opinions.
- 1.2.14. Use motivational strategies to accomplish goals.

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Pathways	X	Design	X	Mechanical, Electrical, Plumbing	X	Structural
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## Outcome 1.3. Business Ethics and Law

Analyze how professional, ethical and legal behavior contributes to continuous improvement in organizational performance and regulatory compliance.

### Competencies

- 1.3.1. Analyze how regulatory compliance affects business operations and organizational performance.
- 1.3.2. Follow protocols and practices necessary to maintain a clean, safe and healthy work environment.
- 1.3.3. Use ethical character traits consistent with workplace standards (e.g., honesty, personal integrity, compassion, justice).
- 1.3.4. Identify how federal and state consumer protection laws affect products and services.
- 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.

- 1.3.6. Identify deceptive practices (e.g., bait and switch, identity theft, unlawful door-to-door sales, deceptive service estimates, fraudulent misrepresentations) and their overall impact on organizational performance.
- 1.3.7. Identify the labor laws that affect employment and the consequences of noncompliance for both employee and employer (e.g., harassment, labor, employment, employment interview, testing, minor labor laws, Americans with Disabilities Act, Fair Labor Standards Acts, Equal Employment Opportunity Commission [EEOC]).
- 1.3.8. Verify compliance with computer and intellectual property laws and regulations.
- 1.3.9. Identify potential conflicts of interest (e.g., personal gain, project bidding) between personal, organizational and professional ethical standards.

*An "X" indicates that the pathway applies to the outcome.*

Pathways	X	Design	X	Mechanical, Electrical, Plumbing	X	Structural
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**Outcome 1.4. Knowledge Management and Information Technology**

Demonstrate current and emerging strategies and technologies used to collect, analyze, record and share information in business operations.

**Competencies**

- 1.4.1. Use office equipment to communicate (e.g., phone, radio equipment, fax machine, scanner, public address systems).
- 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).
- 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.
- 1.4.4. Use system hardware to support software applications.
- 1.4.5. Use information technology tools to maintain, secure and monitor business records.
- 1.4.6. Use an electronic database to access and create business and technical information.
- 1.4.7. Use personal information management and productivity applications to optimize assigned tasks (e.g., lists, calendars, address books).
- 1.4.8. Use electronic media to communicate and follow network etiquette guidelines.

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Pathways	X	Design	X	Mechanical, Electrical, Plumbing	X	Structural
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**Outcome 1.5. Global Environment**

Evaluate how beliefs, values, attitudes and behaviors influence organizational strategies and goals.

**Competencies**

- 1.5.1. Describe how cultural understanding, cultural intelligence skills and continual awareness are interdependent.
- 1.5.2. Describe how cultural intelligence skills influence the overall success and survival of an organization.

- 1.5.3. Use cultural intelligence to interact with individuals from diverse cultural settings.
- 1.5.4. Recognize barriers in cross-cultural relationships and implement behavioral adjustments.
- 1.5.5. Recognize the ways in which bias and discrimination may influence productivity and profitability.
- 1.5.6. Analyze work tasks for understanding and interpretation from a different cultural perspective.
- 1.5.7. Use intercultural communication skills to exchange ideas and create meaning.
- 1.5.8. Identify how multicultural teaming and globalization can foster development of new and improved products and services and recognition of new opportunities.

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### **Outcome 1.6. Business Literacy**

Develop foundational skills and knowledge in entrepreneurship, financial literacy and business operations.

#### **Competencies**

- 1.6.1. Identify business opportunities.
- 1.6.2. Assess the reality of becoming an entrepreneur, including advantages and disadvantages (e.g., risk versus reward, reasons for success and failure).
- 1.6.3. Explain the importance of planning your business.
- 1.6.4. Identify types of businesses, ownership and entities (i.e., individual proprietorships, partnerships, corporations, cooperatives, public, private, profit, not-for-profit).
- 1.6.5. Describe organizational structure, chain of command, the roles and responsibilities of the organizational departments and interdepartmental interactions.
- 1.6.6. Identify the target market served by the organization, the niche that the organization fills and an outlook of the industry.
- 1.6.7. Identify the effect of supply and demand on products and services.
- 1.6.8. Identify the features and benefits that make an organization's product or service competitive.
- 1.6.9. Explain how the performance of an employee, a department and an organization is assessed.
- 1.6.10. Describe the impact of globalization on an enterprise or organization.
- 1.6.11. Describe how all business activities of an organization work within the parameters of a budget.
- 1.6.12. Describe classifications of employee benefits, rights, deductions and compensations.

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### **Outcome 1.9. Financial Management**

Use financial tools, strategies and systems to develop, monitor and control the use of financial resources to ensure personal and business financial well-being.

#### **Competencies**

- 1.9.1. Create, analyze and interpret financial documents (e.g., budgets, income statements).

- 1.9.2. Identify tax obligations.
- 1.9.3. Review and summarize savings, investment strategies and purchasing options (e.g., cash, lease, finance, stocks, bonds).
- 1.9.4. Identify credit types and their uses in order to establish credit.
- 1.9.5. Identify ways to avoid or correct debt problems.
- 1.9.6. Explain how credit ratings and the criteria lenders use to evaluate repayment capacity affect access to loans.
- 1.9.7. Review and summarize categories (types) of insurance and identify how insurances can reduce financial risk.
- 1.9.8. Identify income sources and expenditures.
- 1.9.9. Compare and contrast different banking services available through financial institutions.
- 1.9.10. Identify the role of depreciation in tax planning and liability.

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## Strand 2. Safety, Tools, and Equipment

Learners apply principles of protection, prevention and mitigation to create and maintain safe working conditions at construction sites. Knowledge and skills may be applied in all aspects of personal and site safety, including handling materials, using tools and equipment, working with and around electricity, using personal protective equipment and operating heavy equipment.

### Outcome 2.1. Site Safety

Handle materials, prevent accidents and mitigate hazards.

#### Competencies

- 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.
- 2.1.2. Identify and rectify or mitigate construction hazards associated with thresholds, slippery surfaces and lighting.
- 2.1.3. Calculate an example of load factors for constructing scaffolding, railings, ladders and temporary structures.
- 2.1.4. Apply inspection, rejection criteria, hitch configurations and load-handling practices to slings and rigging hardware.
- 2.1.5. Demonstrate the proper use of American National Standards Institute (ANSI) hand signals.
- 2.1.6. Identify the source of electrical hazards and use shutdown and established lock-out/tag-out procedures.
- 2.1.7. Identify and eliminate worksite clutter in accordance with standards for cleanliness and safety.
- 2.1.8. Identify procedures for the handling, storage and disposal of hazardous materials.
- 2.1.9. Identify the location of emergency flush showers, eyewash fountains, Safety Data Sheets (SDSs), fire alarms and exits.
- 2.1.10. Select and operate fire extinguishers based on the class of fire.
- 2.1.11. Identify the components of a hazardous materials safety plan.
- 2.1.12. Create a hazardous materials safety plan.
- 2.1.13. Set up for ergonomic workflow.

2.1.14. Describe the interactions of incompatible substances when measuring and mixing chemicals.

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Pathways	X	Design	X	Mechanical, Electrical, Plumbing	X	Structural
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### Outcome 2.2. Personal Safety

Practice personal safety in construction.

#### Competencies

- 2.2.1. Interpret personal safety rights according to the employee Right-to-Know plan.
- 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.
- 2.2.3. Select, use, store, maintain and dispose of personal protective equipment (PPE) appropriate to job tasks, conditions and materials.
- 2.2.4. Identify workplace risk factors associated with lifting, operating and moving heavy objects and establish an ergonomics process.
- 2.2.5. Identify, inspect and use safety equipment appropriate for the task.
- 2.2.6. Demonstrate first aid and cardiopulmonary resuscitation (CPR).

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Pathways	X	Design	X	Mechanical, Electrical, Plumbing	X	Structural
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### Strand 6. Planning and Design

Learners apply principles of architectural and civil engineering, drawing and construction with current technology to develop, present and use construction proposals, plans and schematics. Knowledge and skill may be applied throughout the project from preconstruction design through all stages of building in residential, commercial and industrial applications.

#### Outcome 6.4. Construction Drawings

Read and interpret plans and diagrams within a construction drawing set (i.e., topographical, grading and drainage, architectural, structural, plumbing, mechanical, electrical) to organize a project work sequence.

#### Competencies

- 6.4.2. Read and interpret a site plan.
- 6.4.3. Use architect's and engineer's scales to read and interpret construction drawings for material calculations and installation at the jobsite.
- 6.4.4. Read, interpret, and organize construction drawings, specifications and other contractual documents.

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### Outcome 6.5. Construction Math

Calculate materials needed to complete construction projects.

#### Competencies

- 6.5.1. Find surface area and volume for three-dimensional objects, accurate to a specified level of precision.
- 6.5.2. Apply measurement scales to layout length, width, and angle measurements.
- 6.5.3. Apply algebraic procedures and geometric concepts to reading construction documents.
- 6.5.4. Use proportional reasoning and apply indirect measurement techniques (e.g., right triangle trigonometry, properties of similar triangles).

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### Strand 7. Construction and Facility Management

Learners apply principles of business, facility and site operations and project management to build and operate residential, commercial and industrial facilities. Knowledge and skill may be applied in managing and supervising site operations; developing work sequences for tasks and units of work; coordinating material and equipment delivery; planning building stages and the build environment; and providing facility management, maintenance and custodial services.

### Outcome 7.1. Construction Scheduling

Organize material and equipment delivery to maximize productivity.

#### Competencies

- 7.1.1. Describe the delivery schedule of materials and equipment and its effect on employer cash flow and construction economics.
- 7.1.2. Prescribe material and equipment storage needs and location on different types of job sites (e.g., access, delivery, protection from the elements, security).
- 7.1.3. Describe the importance of a synchronized delivery schedule with multiple vendors.
- 7.1.4. Describe the impact of expediting the delivery of materials according to scheduled work assignments.
- 7.1.5. Prepare and process unused material inventory for return credit.

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### Outcome 7.2. Field Organization

Investigate and understand the sequence of building stages, systems and inspection processes within a build environment.

#### Competencies

- 7.2.7. Identify the roles and goals of construction professionals within a given delivery system (e.g., owners, architects, engineers, suppliers, general and trade contractors, consultants, regulators).

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**Outcome 7.5. Maintenance Operations**

Provide maintenance, repair and renovations to maintain the long-term conservation and protection of facility buildings and grounds.

**Competencies**

7.5.5. Compare and contrast green and traditional practices in the selection of materials, chemicals and equipment.

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**Construction Technologies Career Field**  
**Carpentry and Masonry Technical Skills**

Subject Code: 178001

Outcome & Competency Descriptions

**Course Description:**

This first course in the pathway will introduce to students the materials, methods, and equipment used in carpentry and masonry. Students will organize a project work sequence by interpreting plans and diagrams within a construction drawing set. They will layout and install basic wall, floor and roof applications. Students will perform introductory concrete applications including formwork, reinforcement, mixing, and finishing. Current advancements in technology, safety, applicable code requirements and correct practices are learned.

**Strand 1. Business Operations/21st Century Skills**

Learners apply principles of economics, business management, marketing and employability in an entrepreneur, manager and employee role to the leadership, planning, developing and analyzing of business enterprises related to the career field.

**Outcome 1.1. Employability Skills**

Develop career awareness and employability skills (e.g., face-to-face, online) needed for gaining and maintaining employment in diverse business settings.

**Competencies**

- 1.1.1. Identify the knowledge, skills and abilities necessary to succeed in careers.
- 1.1.2. Identify the scope of career opportunities and the requirements for education, training, certification, licensure and experience.
- 1.1.3. Develop a career plan that reflects career interests, pathways and secondary and postsecondary options.
- 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.
- 1.1.5. Develop strategies for self-promotion in the hiring process (e.g., filling out job applications, résumé writing, interviewing skills, portfolio development).
- 1.1.6. Explain the importance of work ethic, accountability and responsibility and demonstrate associated behaviors in fulfilling personal, community and workplace roles.
- 1.1.7. Apply problem-solving and critical-thinking skills to work-related issues when making decisions and formulating solutions.
- 1.1.8. Identify the correlation between emotions, behavior and appearance and manage those to establish and maintain professionalism.
- 1.1.9. Give and receive constructive feedback to improve work habits.
- 1.1.10. Adapt personal coping skills to adjust to taxing workplace demands.
- 1.1.11. Recognize different cultural beliefs and practices in the workplace and demonstrate respect for them.
- 1.1.12. Identify healthy lifestyles that reduce the risk of chronic disease, unsafe habits and abusive behavior.

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Pathways	X	Design	X	Mechanical, Electrical, Plumbing	X	Structural
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### Outcome 1.2. Leadership and Communications

Process, maintain, evaluate and disseminate information in a business. Develop leadership and team building to promote collaboration.

#### Competencies

- 1.2.1. Extract relevant, valid information from materials and cite sources of information.
- 1.2.2. Deliver formal and informal presentations.
- 1.2.3. Identify and use verbal, nonverbal and active listening skills to communicate effectively.
- 1.2.4. Use negotiation and conflict-resolution skills to reach solutions.
- 1.2.5. Communicate information (e.g., directions, ideas, vision, workplace expectations) for an intended audience and purpose.
- 1.2.6. Use proper grammar and expression in all aspects of communication.
- 1.2.7. Use problem-solving and consensus-building techniques to draw conclusions and determine next steps.
- 1.2.8. Identify the strengths, weaknesses and characteristics of leadership styles that influence internal and external workplace relationships.
- 1.2.9. Identify advantages and disadvantages involving digital and/or electronic communications (e.g., common content for large audiences, control of tone, speed, cost, lack of non-verbal cues, potential for forwarding information, longevity).
- 1.2.10. Use interpersonal skills to provide group leadership, promote collaboration and work in a team.
- 1.2.11. Write professional correspondence, documents, job applications and resumés.
- 1.2.12. Use technical writing skills to complete forms and create reports.
- 1.2.13. Identify stakeholders and solicit their opinions.
- 1.2.14. Use motivational strategies to accomplish goals.

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Pathways	X	Design	X	Mechanical, Electrical, Plumbing	X	Structural
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### Outcome 1.3. Business Ethics and Law

Analyze how professional, ethical and legal behavior contributes to continuous improvement in organizational performance and regulatory compliance.

#### Competencies

- 1.3.1. Analyze how regulatory compliance affects business operations and organizational performance.
- 1.3.2. Follow protocols and practices necessary to maintain a clean, safe and healthy work environment.
- 1.3.3. Use ethical character traits consistent with workplace standards (e.g., honesty, personal integrity, compassion, justice).
- 1.3.4. Identify how federal and state consumer protection laws affect products and services.
- 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.

1.3.6. Identify deceptive practices (e.g., bait and switch, identity theft, unlawful door-to-door sales, deceptive service estimates, fraudulent misrepresentations) and their overall impact on organizational performance.

1.3.7. Identify the labor laws that affect employment and the consequences of noncompliance for both employee and employer (e.g., harassment, labor, employment, employment interview, testing, minor labor laws, Americans with Disabilities Act, Fair Labor Standards Acts, Equal Employment Opportunity Commission [EEOC]).

1.3.8. Verify compliance with computer and intellectual property laws and regulations.

1.3.9. Identify potential conflicts of interest (e.g., personal gain, project bidding) between personal, organizational and professional ethical standards.

*An "X" indicates that the pathway applies to the outcome.*

Pathways	X	Design	X	Mechanical, Electrical, Plumbing	X	Structural
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#### **Outcome 1.4. Knowledge Management and Information Technology**

Demonstrate current and emerging strategies and technologies used to collect, analyze, record and share information in business operations.

##### **Competencies**

1.4.1. Use office equipment to communicate (e.g., phone, radio equipment, fax machine, scanner, public address systems).

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).

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.

1.4.4. Use system hardware to support software applications.

1.4.5. Use information technology tools to maintain, secure and monitor business records.

1.4.6. Use an electronic database to access and create business and technical information.

1.4.7. Use personal information management and productivity applications to optimize assigned tasks (e.g., lists, calendars, address books).

1.4.8. Use electronic media to communicate and follow network etiquette guidelines.

*An "X" indicates that the pathway applies to the outcome.*

Pathways	X	Design	X	Mechanical, Electrical, Plumbing	X	Structural
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#### **Outcome 1.5. Global Environment**

Evaluate how beliefs, values, attitudes and behaviors influence organizational strategies and goals.

##### **Competencies**

1.5.1. Describe how cultural understanding, cultural intelligence skills and continual awareness are interdependent.

- 1.5.2. Describe how cultural intelligence skills influence the overall success and survival of an organization.
- 1.5.3. Use cultural intelligence to interact with individuals from diverse cultural settings.
- 1.5.4. Recognize barriers in cross-cultural relationships and implement behavioral adjustments.
- 1.5.5. Recognize the ways in which bias and discrimination may influence productivity and profitability.
- 1.5.6. Analyze work tasks for understanding and interpretation from a different cultural perspective.
- 1.5.7. Use intercultural communication skills to exchange ideas and create meaning.
- 1.5.8. Identify how multicultural teaming and globalization can foster development of new and improved products and services and recognition of new opportunities.

*An "X" indicates that the pathway applies to the outcome.*

Pathways	X	Design	X	Mechanical, Electrical, Plumbing	X	Structural
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## **Strand 2. Safety, Tools, and Equipment**

Learners apply principles of protection, prevention and mitigation to create and maintain safe working conditions at construction sites. Knowledge and skills may be applied in all aspects of personal and site safety, including handling materials, using tools and equipment, working with and around electricity, using personal protective equipment and operating heavy equipment.

### **Outcome 2.1. Site Safety**

Handle materials, prevent accidents and mitigate hazards.

#### **Competencies**

- 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.
- 2.1.2. Identify and rectify or mitigate construction hazards associated with thresholds, slippery surfaces and lighting.
- 2.1.3. Calculate an example of load factors for constructing scaffolding, railings, ladders and temporary structures.
- 2.1.6. Identify the source of electrical hazards and use shutdown and established lock-out/tag-out procedures.
- 2.1.7. Identify and eliminate worksite clutter in accordance with standards for cleanliness and safety.
- 2.1.8. Identify procedures for the handling, storage and disposal of hazardous materials.
- 2.1.9. Identify the location of emergency flush showers, eyewash fountains, Safety Data Sheets (SDSs), fire alarms and exits.
- 2.1.10. Select and operate fire extinguishers based on the class of fire.
- 2.1.11. Identify the components of a hazardous materials safety plan.
- 2.1.14. Describe the interactions of incompatible substances when measuring and mixing chemicals.

*An "X" indicates that the pathway applies to the outcome.*

Pathways	X	Design	X	Mechanical, Electrical, Plumbing	X	Structural
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## Outcome 2.2. Personal Safety

Practice personal safety in construction.

### Competencies

- 2.2.1. Interpret personal safety rights according to the employee Right-to-Know plan.
- 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.
- 2.2.3. Select, use, store, maintain and dispose of personal protective equipment (PPE) appropriate to job tasks, conditions and materials.
- 2.2.4. Identify workplace risk factors associated with lifting, operating and moving heavy objects and establish an ergonomics process.
- 2.2.5. Identify, inspect and use safety equipment appropriate for the task.
- 2.2.6. Demonstrate first aid and cardiopulmonary resuscitation (CPR).

An "X" indicates that the pathway applies to the outcome.

Pathways	X	Design	X	Mechanical, Electrical, Plumbing	X	Structural
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## Strand 3. Structural Construction

Learners apply principles of architectural engineering to erect residential, commercial and industrial buildings. Knowledge and skills may be applied in constructing footings and foundations; framing floors, walls, ceilings, roofs and stairs; completing exterior and interior finishes; and repairing, restoring or remodeling existing structures.

### Outcome 3.1. Brick, Block, and Concrete

Mix and pour concrete and lay brick and block.

### Competencies

- 3.1.1. Complete layout calculations.
- 3.1.3. Construct foundations, footings and retaining walls.
- 3.1.4. Lay brick and block with mortar.
- 3.1.8. Install concrete masonry units (CMUs).
- 3.1.9. Cast and finish concrete.
- 3.1.11. Level base material.

An "X" indicates that the pathway applies to the outcome.

Pathways	X	Design	X	Mechanical, Electrical, Plumbing	X	Structural
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### Outcome 3.2. Site Management

Analyze site management operations.

### Competencies

- 3.2.1. Identify topographical and existing features of areas (i.e., property lines, utilities, streets, setbacks) on survey maps (parcel map, survey plat).
- 3.2.2. Interpret features of a site plan.

3.2.3. Apply conventional engineering and field measurement processes to survey for site development.

An "X" indicates that the pathway applies to the outcome.

Pathways	X	Design	X	Mechanical, Electrical, Plumbing	X	Structural
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#### Outcome 3.4. Floor Framing

Install floor framing systems.

##### Competencies

- 3.4.1. Identify, describe, and assemble materials for floor framing.
- 3.4.4. Lay out, cut and install floor joists.
- 3.4.5. Frame floor openings.
- 3.4.6. Install bridging (e.g., wood, metal).
- 3.4.7. Install subflooring using adhesives and fasteners.

An "X" indicates that the pathway applies to the outcome.

Pathways	X	Design	X	Mechanical, Electrical, Plumbing	X	Structural
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#### Outcome 3.5. Wall Framing

Construct wall and ceiling framing.

##### Competencies

- 3.5.2. Lay out walls and rough openings.
- 3.5.3. Compare and contrast metal and wood framing.
- 3.5.4. Locate partitions, determine stud layout and strike wall lines.
- 3.5.5. Describe wall framing techniques used in masonry construction.
- 3.5.6. Cut and assemble wood and metal wall framing components (e.g., corner posts, T-posts, door openings, window openings, headers, cripples, king studs, trimmers, common studs).
- 3.5.7. Erect and plumb partitions and walls with top and bottom plates.
- 3.5.8. Brace exterior walls and install wind bracing.
- 3.5.10. Lay out, cut, and install ceiling joists and bracing.

An "X" indicates that the pathway applies to the outcome.

Pathways	X	Design	X	Mechanical, Electrical, Plumbing	X	Structural
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#### Outcome 3.6. Roof Framing

Construct roof framing.

##### Competencies

- 3.6.1. Compare and contrast roof types and materials.
- 3.6.2. Identify, describe and assemble materials for roof framing.

- 3.6.3. Lay out, cut and install ridge boards and common rafters.
- 3.6.4. Lay out, cut and install hip rafters and install valley rafters and jack rafters.
- 3.6.5. Lay out, cut and install gable-end studs and lookouts.
- 3.6.6. Frame roof openings, dormers and chimney saddles.
- 3.6.7. Install roof sheathing.
- 3.6.8. Install prefabricated roof trusses with required hardware.
- 3.6.10. Install underlayment (ice and water barriers) and shingles.
- 3.6.11. Lay out and install shingles and other roof finishes (e.g., fiberglass, asphalt, wood, valley material, felt paper, starter strip, hip and ridge caps).

*An "X" indicates that the pathway applies to the outcome.*

Pathways	X	Design	X	Mechanical, Electrical, Plumbing	X	Structural
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### **Outcome 3.7. Exterior Finish Work**

Complete exterior finish.

#### **Competencies**

- 3.7.2. Identify, describe, and assemble materials for exterior finishing.
- 3.7.8. Install exterior siding or covering.

*An "X" indicates that the pathway applies to the outcome.*

Pathways	X	Design	X	Mechanical, Electrical, Plumbing	X	Structural
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### **Outcome 3.8. Stairs**

Construct open riser, utility, circular and geometric stairs.

#### **Competencies**

- 3.8.1. Describe stairway types and their components.
- 3.8.2. Calculate rise and run and design stairway risers, treads, stringers and clearances.
- 3.8.3. Lay out, cut, and install stair components.

*An "X" indicates that the pathway applies to the outcome.*

Pathways	X	Design	X	Mechanical, Electrical, Plumbing	X	Structural
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## **Strand 6. Planning and Design**

Learners apply principles of architectural and civil engineering, drawing and construction with current technology to develop, present and use construction proposals, plans and schematics. Knowledge and skill may be applied throughout the project from preconstruction design through all stages of building in residential, commercial and industrial applications.

### **Outcome 6.4. Construction Drawings**

Read and interpret plans and diagrams within a construction drawing set (i.e., topographical, grading and drainage, architectural, structural, plumbing, mechanical, electrical) to organize a project work sequence.

**Competencies**

- 6.4.1. Collect and analyze project information to determine resources and tasks required to complete a project.
- 6.4.2. Read and interpret a site plan.
- 6.4.3. Use architect’s and engineer’s scales to read and interpret construction drawings for material calculations and installation at the jobsite.
- 6.4.4. Read, interpret, and organize construction drawings, specifications and other contractual documents.

*An “X” indicates that the pathway applies to the outcome.*

Pathways	X	Design	X	Mechanical, Electrical, Plumbing	X	Structural
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**Outcome 6.5. Construction Math**

Calculate materials needed to complete construction projects.

**Competencies**

- 6.5.1. Find surface area and volume for three-dimensional objects, accurate to a specified level of precision.
- 6.5.2. Apply measurement scales to layout length, width, and angle measurements.
- 6.5.3. Apply algebraic procedures and geometric concepts to reading construction documents.
- 6.5.4. Use proportional reasoning and apply indirect measurement techniques (e.g., right triangle trigonometry, properties of similar triangles).

*An “X” indicates that the pathway applies to the outcome.*

Pathways	X	Design	X	Mechanical, Electrical, Plumbing	X	Structural
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**Construction Technologies Career Field**  
**Heavy Equipment Operations**  
 Subject Code: 178026  
 Outcome & Competency Descriptions

**Course Description:**

Students perform heavy equipment operating techniques and perform operator level maintenance. Students will learn to survey using lasers, transits and machine control systems. Additionally, students learn the techniques and processes for clearing, grubbing, stripping, excavating, backfilling, stockpiling, and cutting and spreading of fill material. Throughout the course, safety is emphasized.

**Strand 2. Safety, Tools, and Equipment**

Learners apply principles of protection, prevention and mitigation to create and maintain safe working conditions at construction sites. Knowledge and skills may be applied in all aspects of personal and site safety, including handling materials, using tools and equipment, working with and around electricity, using personal protective equipment and operating heavy equipment.

**Outcome 2.1. Site Safety**

Handle materials, prevent accidents and mitigate hazards.

**Competencies**

- 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.
- 2.1.2. Identify and rectify or mitigate construction hazards associated with thresholds, slippery surfaces and lighting.
- 2.1.3. Calculate an example of load factors for constructing scaffolding, railings, ladders and temporary structures.
- 2.1.4. Apply inspection, rejection criteria, hitch configurations and load-handling practices to slings and rigging hardware.
- 2.1.5. Demonstrate the proper use of American National Standards Institute (ANSI) hand signals.
- 2.1.6. Identify the source of electrical hazards and use shutdown and established lock-out/tag-out procedures.
- 2.1.7. Identify and eliminate worksite clutter in accordance with standards for cleanliness and safety.
- 2.1.8. Identify procedures for the handling, storage and disposal of hazardous materials.
- 2.1.9. Identify the location of emergency flush showers, eyewash fountains, Safety Data Sheets (SDSs), fire alarms and exits.
- 2.1.10. Select and operate fire extinguishers based on the class of fire.
- 2.1.11. Identify the components of a hazardous materials safety plan.
- 2.1.12. Create a hazardous materials safety plan.
- 2.1.13. Set up for ergonomic workflow.
- 2.1.14. Describe the interactions of incompatible substances when measuring and mixing chemicals.

*An "X" indicates that the pathway applies to the outcome.*

Pathways	X	Design	X	Mechanical, Electrical, Plumbing	X	Structural
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## Outcome 2.2. Personal Safety

Practice personal safety in construction.

### Competencies

- 2.2.1. Interpret personal safety rights according to the employee Right-to-Know plan.
- 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.
- 2.2.3. Select, use, store, maintain and dispose of personal protective equipment (PPE) appropriate to job tasks, conditions and materials.
- 2.2.4. Identify workplace risk factors associated with lifting, operating and moving heavy objects and establish an ergonomics process.
- 2.2.5. Identify, inspect and use safety equipment appropriate for the task.
- 2.2.6. Demonstrate first aid and cardiopulmonary resuscitation (CPR).

An "X" indicates that the pathway applies to the outcome.

Pathways	X	Design	X	Mechanical, Electrical, Plumbing	X	Structural
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## Outcome 2.3. Equipment Operation

Operate equipment used to move materials, earth and other heavy materials.

### Competencies

- 2.3.1. Select the equipment and attachments needed to complete the task.
- 2.3.2. Follow the manufactures' recommendations for safety, maintenance, limitations and use.
- 2.3.3. Perform pre- and post-operation inspections and adjustments and report malfunctions.
- 2.3.4. Operate levers, pedals or valves to activate power equipment.
- 2.3.5. Drive and maneuver equipment with and without trailers.

An "X" indicates that the pathway applies to the outcome.

Pathways	X	Design	X	Mechanical, Electrical, Plumbing	X	Structural
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## Outcome 2.4. Equipment and Machinery Preventative Maintenance

Clean, maintain and perform planned preventative maintenance (PPM) on equipment and machinery.

### Competencies

- 2.4.1. Lubricate machinery and equipment.
- 2.4.2. Ensure the presence and functionality of safety systems and hardware.
- 2.4.3. Service electrical systems (e.g., fuses, bulbs).
- 2.4.4. Perform machine adjustments (e.g., belts, drive chains).
- 2.4.5. Service filtration systems.
- 2.4.6. Identify, select and maintain fluid levels.
- 2.4.7. Maintain instrument, machinery and equipment cleanliness, appearance and safety devices.
- 2.4.8. Inspect and maintain fluid conveyance and storage components (e.g., hoses, lines, valves, nozzles).
- 2.4.9. Calibrate metering, monitoring, and sensing equipment.

2.4.10. Inspect and maintain tooling and implements.

*An "X" indicates that the pathway applies to the outcome.*

Pathways	X	Design	X	Mechanical, Electrical, Plumbing	X	Structural
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### Strand 3. Structural Construction

Learners apply principles of architectural engineering to erect residential, commercial and industrial buildings. Knowledge and skills may be applied in constructing footings and foundations; framing floors, walls, ceilings, roofs and stairs; completing exterior and interior finishes; and repairing, restoring or remodeling existing structures.

#### Outcome 3.3. Excavation

Perform excavation activities from clearing and grubbing to finish grading in accordance with excavation specifications on prints and in local building codes.

#### Competencies

- 3.3.1. Describe excavation, trenching, and shoring designs.
- 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).
- 3.3.3. Collect samples and explain the environmental impact of contaminated soil and water on the worksite.
- 3.3.4. Explain disposal procedures for contaminated soil, water and waste.
- 3.3.5. Describe procedures to control water runoff and drainage.
- 3.3.6. Identify the actual location and elevation and determine variance.
- 3.3.7. Check alignment and elevations.
- 3.3.8. Clear and grub land to prepare site for grading.
- 3.3.9. Explain the types of grade (e.g., subgrade, finished grade).
- 3.3.10. Identify the types of stakes and describe their functions.
- 3.3.11. Describe fill materials, their appropriateness and their functions.
- 3.3.12. Lay out stakes in sequence and set grade.

*An "X" indicates that the pathway applies to the outcome.*

Pathways	X	Design	X	Mechanical, Electrical, Plumbing	X	Structural
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### Strand 7. Construction and Facility Management

Learners apply principles of business, facility and site operations and project management to build and operate residential, commercial and industrial facilities. Knowledge and skill may be applied in managing and supervising site operations; developing work sequences for tasks and units of work; coordinating material and equipment delivery; planning building stages and the build environment; and providing facility management, maintenance and custodial services.

#### Outcome 7.5. Maintenance Operations

Provide maintenance, repair and renovations to maintain the long-term conservation and protection of facility buildings and grounds.

**Competencies**

7.5.1. Schedule preventative maintenance, repair, and renovation to maintain a safe and healthy environment using computer-aided facilities management programs as appropriate.

7.5.5. Compare and contrast green and traditional practices in the selection of materials, chemicals and equipment.

*An "X" indicates that the pathway applies to the outcome.*

Pathways	X	Design	X	Mechanical, Electrical, Plumbing	X	Structural
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**Construction Technologies Career Field**  
**Structural Systems**  
Subject Code: 178003  
Outcome & Competency Descriptions

**Course Description:**

Students will learn procedures and techniques required for layout and framing of walls and ceilings, including roughing-in door and window openings, constructing corners and partitions; bracing walls and ceilings; and applying sheathing. Students will learn methods of roof, cold formed steel, and wood stair framing. Students will learn site and personal safety, material properties, design procedures, and code requirements for structural systems.

**Strand 1. Business Operations/21st Century Skills**

Learners apply principles of economics, business management, marketing and employability in an entrepreneur, manager and employee role to the leadership, planning, developing and analyzing of business enterprises related to the career field.

**Outcome 1.1. Employability Skills**

Develop career awareness and employability skills (e.g., face-to-face, online) needed for gaining and maintaining employment in diverse business settings.

**Competencies**

- 1.1.1. Identify the knowledge, skills and abilities necessary to succeed in careers.
- 1.1.2. Identify the scope of career opportunities and the requirements for education, training, certification, licensure and experience.
- 1.1.3. Develop a career plan that reflects career interests, pathways and secondary and postsecondary options.
- 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.
- 1.1.5. Develop strategies for self-promotion in the hiring process (e.g., filling out job applications, résumé writing, interviewing skills, portfolio development).
- 1.1.6. Explain the importance of work ethic, accountability and responsibility and demonstrate associated behaviors in fulfilling personal, community and workplace roles.
- 1.1.7. Apply problem-solving and critical-thinking skills to work-related issues when making decisions and formulating solutions.
- 1.1.8. Identify the correlation between emotions, behavior and appearance and manage those to establish and maintain professionalism.
- 1.1.9. Give and receive constructive feedback to improve work habits.
- 1.1.10. Adapt personal coping skills to adjust to taxing workplace demands.
- 1.1.11. Recognize different cultural beliefs and practices in the workplace and demonstrate respect for them.
- 1.1.12. Identify healthy lifestyles that reduce the risk of chronic disease, unsafe habits and abusive behavior.

*An "X" indicates that the pathway applies to the outcome.*

Pathways	X	Design	X	Mechanical, Electrical, Plumbing	X	Structural
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### Outcome 1.2. Leadership and Communications

Process, maintain, evaluate and disseminate information in a business. Develop leadership and team building to promote collaboration.

#### Competencies

- 1.2.1. Extract relevant, valid information from materials and cite sources of information.
- 1.2.2. Deliver formal and informal presentations.
- 1.2.3. Identify and use verbal, nonverbal and active listening skills to communicate effectively.
- 1.2.4. Use negotiation and conflict-resolution skills to reach solutions.
- 1.2.5. Communicate information (e.g., directions, ideas, vision, workplace expectations) for an intended audience and purpose.
- 1.2.6. Use proper grammar and expression in all aspects of communication.
- 1.2.7. Use problem-solving and consensus-building techniques to draw conclusions and determine next steps.
- 1.2.8. Identify the strengths, weaknesses and characteristics of leadership styles that influence internal and external workplace relationships.
- 1.2.9. Identify advantages and disadvantages involving digital and/or electronic communications (e.g., common content for large audiences, control of tone, speed, cost, lack of non-verbal cues, potential for forwarding information, longevity).
- 1.2.10. Use interpersonal skills to provide group leadership, promote collaboration and work in a team.
- 1.2.11. Write professional correspondence, documents, job applications and resumés.
- 1.2.12. Use technical writing skills to complete forms and create reports.
- 1.2.13. Identify stakeholders and solicit their opinions.
- 1.2.14. Use motivational strategies to accomplish goals.

An "X" indicates that the pathway applies to the outcome.

Pathways	X	Design	X	Mechanical, Electrical, Plumbing	X	Structural
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### Outcome 1.3. Business Ethics and Law

Analyze how professional, ethical and legal behavior contributes to continuous improvement in organizational performance and regulatory compliance.

#### Competencies

- 1.3.1. Analyze how regulatory compliance affects business operations and organizational performance.
- 1.3.2. Follow protocols and practices necessary to maintain a clean, safe and healthy work environment.
- 1.3.3. Use ethical character traits consistent with workplace standards (e.g., honesty, personal integrity, compassion, justice).
- 1.3.4. Identify how federal and state consumer protection laws affect products and services.
- 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.

1.3.6. Identify deceptive practices (e.g., bait and switch, identity theft, unlawful door-to-door sales, deceptive service estimates, fraudulent misrepresentations) and their overall impact on organizational performance.

1.3.7. Identify the labor laws that affect employment and the consequences of noncompliance for both employee and employer (e.g., harassment, labor, employment, employment interview, testing, minor labor laws, Americans with Disabilities Act, Fair Labor Standards Acts, Equal Employment Opportunity Commission [EEOC]).

1.3.8. Verify compliance with computer and intellectual property laws and regulations.

1.3.9. Identify potential conflicts of interest (e.g., personal gain, project bidding) between personal, organizational and professional ethical standards.

*An "X" indicates that the pathway applies to the outcome.*

Pathways	X	Design	X	Mechanical, Electrical, Plumbing	X	Structural
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#### **Outcome 1.4. Knowledge Management and Information Technology**

Demonstrate current and emerging strategies and technologies used to collect, analyze, record and share information in business operations.

##### **Competencies**

1.4.1. Use office equipment to communicate (e.g., phone, radio equipment, fax machine, scanner, public address systems).

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).

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.

1.4.4. Use system hardware to support software applications.

1.4.5. Use information technology tools to maintain, secure and monitor business records.

1.4.6. Use an electronic database to access and create business and technical information.

1.4.7. Use personal information management and productivity applications to optimize assigned tasks (e.g., lists, calendars, address books).

1.4.8. Use electronic media to communicate and follow network etiquette guidelines.

*An "X" indicates that the pathway applies to the outcome.*

Pathways	X	Design	X	Mechanical, Electrical, Plumbing	X	Structural
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#### **Outcome 1.5. Global Environment**

Evaluate how beliefs, values, attitudes and behaviors influence organizational strategies and goals.

##### **Competencies**

1.5.1. Describe how cultural understanding, cultural intelligence skills and continual awareness are interdependent.

- 1.5.2. Describe how cultural intelligence skills influence the overall success and survival of an organization.
- 1.5.3. Use cultural intelligence to interact with individuals from diverse cultural settings.
- 1.5.4. Recognize barriers in cross-cultural relationships and implement behavioral adjustments.
- 1.5.5. Recognize the ways in which bias and discrimination may influence productivity and profitability.
- 1.5.6. Analyze work tasks for understanding and interpretation from a different cultural perspective.
- 1.5.7. Use intercultural communication skills to exchange ideas and create meaning.
- 1.5.8. Identify how multicultural teaming and globalization can foster development of new and improved products and services and recognition of new opportunities.

*An "X" indicates that the pathway applies to the outcome.*

Pathways	X	Design	X	Mechanical, Electrical, Plumbing	X	Structural
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## **Strand 2. Safety, Tools, and Equipment**

Learners apply principles of protection, prevention and mitigation to create and maintain safe working conditions at construction sites. Knowledge and skills may be applied in all aspects of personal and site safety, including handling materials, using tools and equipment, working with and around electricity, using personal protective equipment and operating heavy equipment.

### **Outcome 2.1. Site Safety**

Handle materials, prevent accidents and mitigate hazards.

#### **Competencies**

- 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.
- 2.1.2. Identify and rectify or mitigate construction hazards associated with thresholds, slippery surfaces and lighting.
- 2.1.3. Calculate an example of load factors for constructing scaffolding, railings, ladders and temporary structures.
- 2.1.4. Apply inspection, rejection criteria, hitch configurations and load-handling practices to slings and rigging hardware.
- 2.1.5. Demonstrate the proper use of American National Standards Institute (ANSI) hand signals.
- 2.1.6. Identify the source of electrical hazards and use shutdown and established lock-out/tag-out procedures.
- 2.1.7. Identify and eliminate worksite clutter in accordance with standards for cleanliness and safety.
- 2.1.8. Identify procedures for the handling, storage and disposal of hazardous materials.
- 2.1.9. Identify the location of emergency flush showers, eyewash fountains, Safety Data Sheets (SDSs), fire alarms and exits.
- 2.1.10. Select and operate fire extinguishers based on the class of fire.
- 2.1.11. Identify the components of a hazardous materials safety plan.
- 2.1.12. Create a hazardous materials safety plan.
- 2.1.13. Set up for ergonomic workflow.
- 2.1.14. Describe the interactions of incompatible substances when measuring and mixing chemicals.



An "X" indicates that the pathway applies to the outcome.

Pathways	X	Design	X	Mechanical, Electrical, Plumbing	X	Structural
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### Outcome 2.2. Personal Safety

Practice personal safety in construction.

#### Competencies

- 2.2.1. Interpret personal safety rights according to the employee Right-to-Know plan.
- 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.
- 2.2.3. Select, use, store, maintain and dispose of personal protective equipment (PPE) appropriate to job tasks, conditions and materials.
- 2.2.4. Identify workplace risk factors associated with lifting, operating and moving heavy objects and establish an ergonomics process.
- 2.2.5. Identify, inspect and use safety equipment appropriate for the task.
- 2.2.6. Demonstrate first aid and cardiopulmonary resuscitation (CPR).

An "X" indicates that the pathway applies to the outcome.

Pathways	X	Design	X	Mechanical, Electrical, Plumbing	X	Structural
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### Strand 3. Structural Construction

Learners apply principles of architectural engineering to erect residential, commercial and industrial buildings. Knowledge and skills may be applied in constructing footings and foundations; framing floors, walls, ceilings, roofs and stairs; completing exterior and interior finishes; and repairing, restoring or remodeling existing structures.

### Outcome 3.3. Excavation

Perform excavation activities from clearing and grubbing to finish grading in accordance with excavation specifications on prints and in local building codes.

#### Competencies

- 3.3.1. Describe excavation, trenching, and shoring designs.
- 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).
- 3.3.5. Describe procedures to control water runoff and drainage.
- 3.3.6. Identify the actual location and elevation and determine variance.
- 3.3.7. Check alignment and elevations.
- 3.3.10. Identify the types of stakes and describe their functions.
- 3.3.11. Describe fill materials, their appropriateness and their functions.
- 3.3.12. Lay out stakes in sequence and set grade.

An "X" indicates that the pathway applies to the outcome.

Pathways	X	Design	X	Mechanical, Electrical, Plumbing	X	Structural
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### Outcome 3.4. Floor Framing

Install floor framing systems.

#### Competencies

- 3.4.1. Identify, describe, and assemble materials for floor framing.
- 3.4.2. Construct and install sills and sill sealer.
- 3.4.3. Erect girders, beams and columns.
- 3.4.4. Lay out, cut and install floor joists.
- 3.4.5. Frame floor openings.
- 3.4.6. Install bridging (e.g., wood, metal).
- 3.4.7. Install subflooring using adhesives and fasteners.

*An "X" indicates that the pathway applies to the outcome.*

Pathways	X	Design	X	Mechanical, Electrical, Plumbing	X	Structural
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### Outcome 3.5. Wall Framing

Construct wall and ceiling framing.

#### Competencies

- 3.5.1. Identify platform and balloon framing.
- 3.5.2. Lay out walls and rough openings.
- 3.5.3. Compare and contrast metal and wood framing.
- 3.5.4. Locate partitions, determine stud layout and strike wall lines.
- 3.5.5. Describe wall framing techniques used in masonry construction.
- 3.5.6. Cut and assemble wood and metal wall framing components (e.g., corner posts, T-posts, door openings, window openings, headers, cripples, king studs, trimmers, common studs).
- 3.5.7. Erect and plumb partitions and walls with top and bottom plates.
- 3.5.8. Brace exterior walls and install wind bracing.
- 3.5.9. Install exterior wall sheathing and house wrap.
- 3.5.10. Lay out, cut, and install ceiling joists and bracing.

*An "X" indicates that the pathway applies to the outcome.*

Pathways	X	Design	X	Mechanical, Electrical, Plumbing	X	Structural
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### Outcome 3.6. Roof Framing

Construct roof framing.

#### Competencies

- 3.6.1. Compare and contrast roof types and materials.
- 3.6.2. Identify, describe and assemble materials for roof framing.

- 3.6.3. Lay out, cut and install ridge boards and common rafters.
- 3.6.4. Lay out, cut and install hip rafters and install valley rafters and jack rafters.
- 3.6.5. Lay out, cut and install gable-end studs and lookouts.
- 3.6.6. Frame roof openings, dormers and chimney saddles.
- 3.6.7. Install roof sheathing.
- 3.6.8. Install prefabricated roof trusses with required hardware.
- 3.6.9. Install drip edges, eaves flashing and roof vents.
- 3.6.10. Install underlayment (ice and water barriers) and shingles.
- 3.6.11. Lay out and install shingles and other roof finishes (e.g., fiberglass, asphalt, wood, valley material, felt paper, starter strip, hip and ridge caps).

*An "X" indicates that the pathway applies to the outcome.*

Pathways	X	Design	X	Mechanical, Electrical, Plumbing	X	Structural
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### **Outcome 3.8. Stairs**

Construct open riser, utility, circular and geometric stairs.

#### **Competencies**

- 3.8.1. Describe stairway types and their components.
- 3.8.2. Calculate rise and run and design stairway risers, treads, stringers and clearances.
- 3.8.3. Lay out, cut, and install stair components.
- 3.8.4. Install stair finish trim components (e.g., skirt boards, handrails, balusters, newels, volutes, balustrade systems).
- 3.8.5. Install prefabricated stairs and drop-down stair units (e.g., attic stairs).

*An "X" indicates that the pathway applies to the outcome.*

Pathways	X	Design	X	Mechanical, Electrical, Plumbing	X	Structural
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### **Strand 6. Planning and Design**

Learners apply principles of architectural and civil engineering, drawing and construction with current technology to develop, present and use construction proposals, plans and schematics. Knowledge and skill may be applied throughout the project from preconstruction design through all stages of building in residential, commercial and industrial applications.

#### **Outcome 6.4. Construction Drawings**

Read and interpret plans and diagrams within a construction drawing set (i.e., topographical, grading and drainage, architectural, structural, plumbing, mechanical, electrical) to organize a project work sequence.

#### **Competencies**

- 6.4.1. Collect and analyze project information to determine resources and tasks required to complete a project.
- 6.4.2. Read and interpret a site plan.
- 6.4.3. Use architect's and engineer's scales to read and interpret construction drawings for material calculations and installation at the jobsite.

6.4.4. Read, interpret, and organize construction drawings, specifications and other contractual documents.

*An "X" indicates that the pathway applies to the outcome.*

Pathways	X	Design	X	Mechanical, Electrical, Plumbing	X	Structural
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### **Outcome 6.5. Construction Math**

Calculate materials needed to complete construction projects.

#### **Competencies**

6.5.1. Find surface area and volume for three-dimensional objects, accurate to a specified level of precision.

6.5.2. Apply measurement scales to layout length, width, and angle measurements.

6.5.3. Apply algebraic procedures and geometric concepts to reading construction documents.

6.5.4. Use proportional reasoning and apply indirect measurement techniques (e.g., right triangle trigonometry, properties of similar triangles).

*An "X" indicates that the pathway applies to the outcome.*

Pathways	X	Design	X	Mechanical, Electrical, Plumbing	X	Structural
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**Construction Technologies Career Field  
Construction Pre-Apprenticeship/Capstone**

Subject Code: 178029

Outcome & Competency Descriptions

**Course Description:**

The capstone course provides opportunities for students to apply knowledge, attitudes and skills that were learned in Construction programs in a more comprehensive and authentic way. Capstones often include project/problem based learning opportunities that occur both in and away from school. Under supervision of the school and through community partnerships, students may combine classroom learning with work experience. This course can be delivered through a variety of delivery methods including cooperative education or apprenticeship.

## **PUPIL ASSESSMENT PROCEDURES**

### **PORTAGE LAKES JOINT VOCATIONAL SCHOOL DISTRICT**

In order to measure the progress of each student in the program and to measure the effectiveness of the total program, student evaluation procedures will include, but not be limited to, the following:

- quizzes
- tests
- daily participation
- daily attendance
- lab projects
- lab performance
- care of equipment
- portfolios
- oral presentations
- conduct and initiative

Measurement of learning will be an ongoing process with emphasis on laboratory activities and competency attainment. Student assessment will be translated into appropriate grades by the teacher. Assessment will be consistent with the school's grading system and district policies.

## GRADING SYSTEM

For the purpose of averaging grades the following numerical values are substituted for grades: A = 4.00, B = 3.00, C = 2.00, D = 1.00, F = 0. The points should be added and total divided by the number of grades given. The number is then converted back to a letter grade using the following scale:

Point Value Scale	Point Range	Percent Range
A = 4.0 Points	3.31-4.00	90-100
B = 3.0 Points	2.31-3.30	80-89
C = 2.0 Points	1.31-2.30	70-79
D = 1.0 Points	0.51-1.30	60-69
F = 0 Points	0.00-0.50	0-59

A student must have two passing nine week grades, one of which must be the second semester, in order to pass a full year course. Failure to complete the requirements of a course may result in a final grade of "F" – regardless of previous grades.

Students who receive an "incomplete" during any grading period have two weeks to complete the work necessary to earn a letter grade. Work not done in this time frame will result in an "F" for the incomplete assignments. A final grade will be calculated using all grades earned during the grading period, including Fs for incomplete work.

Grades students receive may be enhanced or reduced based on their attitude, daily performance, and accomplishments as specified in the Career Center's Board of Education policy.

If a senior is in danger of failing quarter 1 of their CTE courses, a meeting will be scheduled with the student's teachers, counselor, and home school counselor. If they do not pass quarter 1 and are in danger of failing quarter 2, they may be considered for dismissal from their program and return to their respective partner school.

## POTENTIAL FOR INDUSTRY RECOGNIZED CREDENTIALS AND COLLEGE CREDITS

### CREDENTIALS:

CITF Career Connection Certificates-Level 1-4 points  
CITF Career Connection Certificates-Level 2-4 points  
CITF Career Connection Certificates-Level 3-4 points  
Aerial Work Platform (AWP)-2 points  
Manlift Operation- 2 points  
Forklift- 2 points  
3M: Head, Eye, and Face Protection-1 point  
3M: Hearing and Noise Protection-1 point  
3M: Respiratory Protection-1 point  
Bleeding Control Basic 1.0 Course-Stop the Bleed-1 point  
OSHA 10-1 point  
CPR-1 point

### TOTAL POTENTIAL = 24 POINTS

\*Point values are assigned according to the current ODEW approved credential list for [Construction](#).

### COLLEGE CREDITS:

College credits are offered through the [Ohio Department of Higher Education Career Technical Assurance Guides \(CTAGs\)](#) program.

CTAG credit is contingent upon receiving specific grades in qualifying courses and specific scores on qualifying course webXams.

Verification forms to submit for credit upon course completion can be found [here](#). Please remember these credits can only be applied at Ohio public 2 and 4 year colleges who offer a similar corresponding class.

The following course can apply for CTAG credit from Building Trades:

Carpentry and Masonry Technical Skills - 178001

- CTON003 Construction Methods and Materials
- "C" or better in course and 75 or higher on WebXam
- 3 hours

CTS001 Safety - OSHA 10

- Provide proof that a student holds a current ad valid OSHA 10 safety card
- 1 hour

### TOTAL POTENTIAL = 4 CREDIT HOURS



Portage Lakes Career Center also has numerous articulation agreements with various colleges and universities. Please see the Assistant Superintendent for further information.

**Certification Schedule:**

September - Senior-Manlift and Forklift

January - Junior-OSHA 10

April-Junior-3M certifications

May - Junior-CPR, Career Connections 1, Career Connections 2

May - Seniors-Career Connections 3

**BUILDING TRADES CURRICULUM**

The goal is for students to learn the following skills within each quarter listed below. The order of units may vary within the quarters because of access to instructional materials, attendance and the learning needs of the students.

<p><b><u>Quarter 1</u></b> - Juniors</p> <ul style="list-style-type: none"> <li>● Basic hand tools identification and use</li> <li>● Blueprint reading</li> <li>● How to read a tape measure</li> <li>● Scale reading</li> <li>● Using leveling instruments</li> <li>● Power tool safety and use</li> <li>● Form footers</li> </ul>	<p><b><u>Quarter 5</u></b> - SENIORS</p> <ul style="list-style-type: none"> <li>● Equipment training on:</li> <li>● Bobcat s175 Skid Steer Loader</li> <li>● Bobcat E35i Mini Excavator</li> <li>● JLG 400s boom lift</li> <li>● JLG scissor lift</li> <li>● JLG Telehandler</li> </ul>
<p><b><u>Quarter 2</u></b> - Juniors</p> <ul style="list-style-type: none"> <li>● Concrete fundamentals</li> <li>● Basic masonry</li> <li>● Floor framing</li> <li>● OSHA 10</li> </ul>	<p><b><u>Quarter 6</u></b> - SENIORS</p> <ul style="list-style-type: none"> <li>● Work-Based Learning (WBL)</li> <li>● Roofing systems</li> <li>● Shingle Installation</li> <li>● Windows and Exterior Doors</li> <li>● Soffit and Fascia</li> <li>● Student projects</li> </ul>
<p><b><u>Quarter 3</u></b> - Juniors</p> <ul style="list-style-type: none"> <li>● Wall layout and framing</li> <li>● Ceiling framing</li> <li>● Stair layout</li> <li>● Rafter calculation</li> <li>● Review print reading and introduce AutoCAD</li> </ul>	<p><b><u>Quarter 7</u></b> - SENIORS</p> <ul style="list-style-type: none"> <li>● Work-Based Learning (WBL)</li> <li>● Vinyl siding</li> <li>● Insulation</li> <li>● Drywall install and finish</li> <li>● Interior doors</li> <li>● Trimwork</li> <li>● Capstone project</li> </ul>
<p><b><u>Quarter 4</u></b> - Juniors</p> <ul style="list-style-type: none"> <li>● Roof framing</li> <li>● Roof sheathing</li> <li>● Air infiltration barriers</li> <li>● Roofing systems</li> </ul>	<p><b><u>Quarter 8</u></b> - SENIORS</p> <ul style="list-style-type: none"> <li>● Work-Based Learning (WBL)</li> <li>● Student projects</li> <li>● Deconstruct house project with focus on sustainability and green construction practices</li> </ul>

