**Carpentry 1**  
*Grade 11*

Core and Sustainable Construction  
EMIS Subject Code 178000

Carpentry and Masonry Skills  
EMIS Subject Code 178001

**Carpentry 2**  
*Grade 12*

Structural Systems  
EMIS Subject Code 178003

Structural Coverings and Finishes  
EMIS Subject Code 178004

**Course of Study**

Lancaster City Schools  
345 E. Mulberry Street  
Lancaster Ohio  43130  
April 2015
WHEREAS, the Carpentry 1 and 2 Course of Study is based upon the Construction Technologies Career Field Technical Content Standards for the Carpentry Specialization; and

WHEREAS, the Carpentry Advisory Committee of the (Lancaster City Schools) has reviewed the course of study, edited competencies to address local labor market needs and acknowledges the school district’s ability to offer specialized programs; and

WHEREAS, the Carpentry Advisory Committee recommends the Carpentry Course of Study be approved and adopted;

NOW, THEREFORE, BE IT RESOLVED, in accordance with the superintendent’s recommendation, that Lancaster City Schools adopts the Carpentry 1 and 2 Course of Study.

Approval date: ________________

__________________________________________  __________________________________________
Superintendent  Board President
Advisory Committee Review

After reviewing this document, we recommend that the *Carpentry Course of Study* be approved and adopted.

Name

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Business

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Date

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Name

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Business

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Date

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Name

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Business

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Date

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Postsecondary Partners Review

After reviewing this document, we recommend that the *Carpentry Course of Study* be approved and adopted.

__________________________________________  ______________________________________
Name                                                                                   Name

__________________________________________  ______________________________________
College/University                                                                       College/University

__________________________________________  ______________________________________
Date                                                                                   Date

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Name                                                                                   Name

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College/University                                                                       College/University

__________________________________________  ______________________________________
Date                                                                                   Date
# Table of Contents

Foreword ................................................................. 1  
Acknowledgements .................................................. 2  
Vision/Mission .......................................................... 3  
LCS Educational Philosophy ........................................ 4  
LCS Goals and Objectives ........................................... 5  
Philosophy and Principles for Implementation .................. 6  
Ohio Career Field Technical Content Standards .............. 7  
Pathway Philosophy ................................................... 8  
Program Description ................................................ 9  

**Scope and Sequence Carpentry 1**

- Core and Sustainable Construction ............................ 10  
- Carpentry and Masonry Skills ................................... 18  

**Scope and Sequence Carpentry 2**

- Structural Systems .............................................. 25  
- Structural Coverings and Finishes ............................ 32  

Pupil Performance Evaluation ..................................... 39  
Pupil Evaluation Methods ........................................... 40  
Industrial-Driven Authentic Assessment Based on SkillsUSA 41  

Appendix A – Common Core Literacy Standards .............. 44  
Appendix B – Common Core Mathematical Standards .......... 48
Foreword

The Carpentry 1 and 2 Course of Study sample was built using the Construction Technologies Career Field Technical Content Standards, which form the curricular framework for Ohio College Tech Prep and career-technical education programs in the construction industry. This sample course of study can be used in total, in part or as guideline for secondary carpentry teachers to develop or revise their own carpentry courses of study to fit local business/industry and education needs. It is designed to form the basis for developing an integrated delivery system that provides opportunities for new and challenging courses such as: Core and Sustainable Construction EMIS Subject Code 178000; Carpentry and Masonry Skills EMIS Subject Code 178001; Structural Systems EMIS Subject Code 178001 and; Structural Coverings and Finishes EMIS Subject Code 178004.

This document represents a collaborative effort of the following professional partners: the Ohio Department of Education’s Office of Career-Technical and Adult Education, the College Tech Prep Curriculum Service Center at the University of Toledo and a panel of secondary educators with specific expertise in carpentry.

The Carpentry1 and 2 Course of Study sample provides:

- philosophy for career field technical content standards;
- scope of the pathway/specialization;
- program description;
- sequence of competencies with respective assessment and inquiry-based learning problems; and
- templates that can be used to complete local board of education approval, advisory committee review, program philosophy, program goals and other pertinent course of study components.

This document forms the basis for developing an integrated delivery system that provides opportunities for new and challenging programs and courses. It is hoped that the document will enhance and expand career-technical education, College Tech Prep and postsecondary degree programs in carpentry and related fields.

The document is available on the Internet at www.techprepohio.org and through the Ohio Department of Education Web at www.ode.state.oh.us with keywords: career field initiative.
Acknowledgements

A number of individuals contributed their time and expertise to this development. Those listed below provided vision and implementation support for the *Carpentry 1 and 2 Course of Study* sample and respective educational programs.

- Andy Phillips, Carpentry Instructor, Lancaster City Schools
- Jeff Bates, Building and Property Trades Instructor, Lancaster City Schools
- Doug Moos, Construction Technology Instructor, Lancaster City
- Chad Rice, Secondary Curriculum Coordinator, Lancaster City
- Anthony Knickerbocker, Assistant Principal/CT Director, Lancaster City
- Jenny O’Hare, Director of Instruction, Lancaster City
- Steve Wigton, Superintendent, Lancaster City
LANCASTER CITY SCHOOLS
Vision and Mission

The Vision

Lancaster City Schools will prepare, inspire, and empower all students to be life-long learners and socially responsible citizens who are able to communicate and meet the challenges of an ever-changing global society.

The Mission

Lancaster City Schools, the Place to Be for Learning, Caring, Succeeding
Lancaster City Schools
Educational Philosophy

The School Board believes in the dignity and uniqueness of each student and recognizing their inherent differences, endeavors to provide a broad curriculum enabling students to reach their maximum potential.

Success in education necessitates a curriculum that considers multiple learning styles and which encompasses a variety of teaching methods.

Mental and emotional development begins at birth and continues throughout life. Each of our schools must strive to create an atmosphere which fosters healthy and productive attitudes toward education and which encourages a life-long interest in learning.

The Lancaster City Schools are committed to:

1. teaching 21st century skills pertaining to reading, writing, mathematics, historical perspective, scientific inquiry, technology, arts, culture, health and wellness, social and vocational areas to meet or exceed a mastery level so that students continue intellectual growth and development;

2. providing experiences which enable students to develop critical thinking, reasoning, problem solving and decision making skills;

3. stimulating creativity, encouraging personal enrichment,

4. and providing approaches to wellness that enable students to define their individuality;

5. fostering attitudes of acceptance and respect for the ideas, beliefs and goals of others;

6. fostering attitudes of social responsibility so that every student contributes to their community in a positive way;

Our ultimate goal is to generate graduates of the Lancaster City Schools who, as adults, will stand confidently, participate fully, learn continually and contribute meaningfully to our world.
Lancaster City Schools
Goals and Objectives

The goal of this school system is to accept responsibility for the development of each child into an adult who can stand confidently, participate fully, learn continually and contribute meaningfully to our world.

To achieve the desired goal, five equally important objectives with desired outcomes will be incorporated into our curriculum planning:

1. To ensure that each student develops mastery in academic skills.

2. To ensure that each student develops the capacity to recognize and analyze current and future challenges and opportunities.

3. To ensure the development of meaningful interpersonal relationships among students, staff and the community.

4. To ensure that staff, students and parents are afforded maximum feasible participation in the development and evaluation of programs and policies that meet the educational needs of all stakeholders.

5. To ensure maximum efficiency in the allocation of human and material resources.
Philosophy and Principles for Implementation

Ohio Career Field Initiative

The overarching framework for Ohio career-technical education is outlined in the Ohio Revised Code and subsequent administrative rules, which specify career-technical programming based on 16 career fields. To view the full text of Administrative Rule 3301-61-03 (Criteria for Secondary Workforce Development Programs), go to www.ode.state.oh.us and keyword search: CTAE rules and regulations. These fields provide the framework for an Ohio career field initiative that seeks to foster the educational shift needed to respond to the needs of a rapidly changing global environment.

A career field is a “grouping of occupations and broad industries based on commonalities” (see www.careerclusters.org). Career fields are the basis for developing both broad and specialized technical content standards that serve as a framework for curriculum, instruction, assessment and program design, addressing the needs of an entire industry and business sector. Ohio’s 16 career fields align with national efforts to broaden career-technical education, integrate career-technical with academic study and reflect the workforce needs of today and tomorrow. For today’s students to be adequately prepared for tomorrow’s workforce, they must have an education that:

- incorporates a broad, long-term conception of work in combination with the depth of specialization skills;
  Employees need a comprehensive understanding beyond a single occupational area. Occupationally focused programming needs to be provided in a larger context, so students can generalize learning, make connections between education and work, and adapt to changes in their careers. Workplace knowledge and skills are needed to prepare employees for collaborating and problem solving while contributing to the broader business process.

- emphasizes the acquisition of strong academic knowledge and skills; and
  Academic skills provide the foundation for career success. The integration of academic content standards with career field technical content standards helps to contextualize learning for students, making English language arts, mathematics, science and social studies relevant to students as a means to an important end—success at work and in life.

- facilitates high school-to-postsecondary transitions.
  A lifetime of change means a lifetime of learning, including postsecondary education. Students need knowledge and skills for success in a variety of postsecondary options, including apprenticeships, industry credentialing through adult education, two- and four-year college degree programs and graduate school.
Ohio Career Field Technical Content Standards

Career field technical content standards outline the knowledge and skills needed for success within a career field, multiple pathways and in some cases, areas of specialization. Validated by Ohio business and industry representatives in conjunction with Ohio educators, these standards form the basis for developing educational programming in Ohio secondary and postsecondary schools. The standards also serve as the framework for developing strong career pathways that connect secondary, adult and postsecondary education systems with the workplace.

While mirroring the diverse nature of each career field, all career field technical content standards documents will delineate competencies that outline the knowledge and skills that span the career field (core competencies) as well as those that relate to specific career field pathways (pathway competencies) and, in some cases, career field specialization (specialization competencies).

Additionally, academic benchmarks from Ohio’s academic content standards for English language arts, mathematics, science and social studies are correlated with the career field technical content standards. The embedded benchmarks have been determined by business representatives and academic and technical educators from secondary and postsecondary institutions to be strongly related to specific knowledge and skills statements or competencies for the given career field.

Key features of Ohio Career Field Technical Content Standards include:

- broad as well as specialized technical competencies;
- embedded benchmarks for the *English Language Arts, Mathematics, Science and Social Studies Academic Content Standards*; and
- workplace readiness competencies (communications; safety, health and environment; problem solving and critical thinking; leadership, management and teamwork; information technology applications; ethics and legal responsibility; business processes; and career development and employability).
Pathway Philosophy

A key component of the Ohio Career Field Initiative is a career pathway, which is a series of academic and technical career-focused course work and other learning experiences leading to a career specialty and employment in a career field. Pathways facilitate a seamless transition from high school to postsecondary education (including apprenticeships, adult education, two- and four-year colleges and graduate school) and from postsecondary education to the workplace.

To effectively facilitate the transition from secondary to postsecondary education and a career, high school career pathways should encompass:

- challenging technical course work in a chosen career field based on career field technical content standards;
- rigorous academics that meet Ohio’s academic content standards and grade-level expectations;
- electives that relate to career objectives;
- instructional enhancements such as experiential and authentic learning opportunities (e.g. work-based learning, mentorships, internships) and career-technical student organization participation;
- opportunities for program accreditation and student certification and licensure;
- preparation for transition to further study that includes college readiness and opportunities to earn college credit while in high school;
- preparation for transition to employment with advancement opportunities; and
- performance targets that include high school academic and technical testing/exit and postsecondary entry/placement requirements.

For additional information on the Career Field Initiative, including Ohio Career Field Technical Content Standards and Career Pathways, go to [www.ode.state.oh.us](http://www.ode.state.oh.us) and keyword search: career field.
Program Description

Program Overview
The Carpentry Specialization is designed for College Tech Prep and career-technical education students in Grades 9-12. The course of study portion of this pathway reflects the academic and technical competencies for secondary education students. The technical focus is on new and renovation construction from project design to owner occupancy. Students transitioning to post-secondary education will receive reinforcement and additional training in these areas through apprenticeship and post-secondary degree programs. The curriculum is driven by the construction industry, which prepares individuals for employment and lifelong learning.

Housing of the Program
The program is taught in a laboratory and various on and off campus construction sites that comply with state and local codes and regulations, the Occupational Safety and Health Administration (OSHA) guidelines and school policies. In addition, the program has access to a classroom setting for the technical theory and core competencies critical to success in the carpentry industry.

Occupations Addressed by the Program
The carpentry program will prepare students with the mathematics, science and technical skills to transform architectural and design plans into houses, apartments, industrial buildings, warehouses, office buildings, churches, schools, recreational facilities, etc. As one of the largest industries in the United States, the industry employs several million individuals. Carpenters may be involved in defined occupations, such as roofers, rough framers, dry-wall installers, cabinet makers, finish carpenters or broad occupations where the individual has mastered all aspects of the carpentry industry and handles everything from project design to owner occupancy.

Basic Program Operation
Classroom instruction and laboratory experiences are directed toward students’ thinking and decision making processes. Designed around problem-based, inquiry-based instructional processes, the program enables students to solve problems through critical thinking and decision making techniques. A variety of technical, social and economic projects are utilized to enhance each student’s innate abilities, drive and values.

Field Experiences and Community Service Opportunities
Collaborative educational experiences with business and industry are designed to support and enhance each student’s classroom and laboratory experiences. Opportunities outside the school setting provide a real-world atmosphere in which to learn and make technical connections to in-school training. An active advisory committee collaborates with instructors to enhance and expand each student’s learning experience.

Articulation Agreements
Upon successful completion of the 2 year Carpentry program at LHS, students can earn 22 college credits for the Construction Management program at Hocking College as per the articulation agreement.
**Academics**
Academic instructors in mathematics, English language arts, science and social studies collaborate with technical instructors to reflect academic experiences associated with construction activities. Projects, assignments and discussions are designed to maintain high academic standards that prepare students for post-secondary education, and demonstrate the application of the respective academics directly in the career field.

**Capstone**
Capstone projects are an integral part of the carpentry educational experience. Students will have experiences in research, business processes, communications, leadership and teamwork that enhance their technical background.

**Core Competencies**
Core competencies contained in the scope and sequence of this course of study are designed to be taught contextually within the technical competencies. Other than a few exceptions, core competencies do not stand alone nor should they be taught in a vacuum separate from the technical skills and knowledge. The contextual nature of teaching the core and technical competencies in concert enhances both aspects of these curriculum elements.

**Student Leadership**
SkillsUSA is an integral part of the carpentry educational experience. Students are provided experiences in business processes, communications, leadership and teamwork that will enhance their technical background and prepare them to be contributing members of the community and the profession. In addition to a variety of experiences and solid foundations of SkillsUSA at the local level, regional, state and national competitions are also provided for experience outside the local community.
Scope and Sequence Carpentry 1
Core and Sustainable Construction

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

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 |
**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 audience, 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.

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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.

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| Pathways | X: Design | X: Mechanical, Electrical, Plumbing | X: Structural |

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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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 |

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.

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

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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.

_An “X” indicates that the pathway applies to the outcome._

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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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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.

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

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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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Scope and Sequence Carpentry 1
Carpentry and Masonry Skills

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.

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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18
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 audience, 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.

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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.

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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          | Design | Mechanical, Electrical, Plumbing | Structural |

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 | Design | Mechanical, Electrical, Plumbing | Structural |

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.

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| Pathways | Design | Mechanical, Electrical, Plumbing | Structural |

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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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.

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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.

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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.
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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.

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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).

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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.
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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.

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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.

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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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24
Scope and Sequence Carpentry 2
Structural Systems

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.

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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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.
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1.2.9. Identify advantages and disadvantages involving digital and/or electronic communications (e.g., common content for large audience, 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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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.

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

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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.
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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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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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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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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.

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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.
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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.

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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).

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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

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

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

31
Scope and Sequence Carpentry 2
Structural Coverings and Finishes

Course Description:
This course will address applications of interior and exterior finish work. Students will identify material properties and select for appropriate application. Students will install thermal and moisture protection including roofing, siding, fascia and soffits, gutters, and louvers. Students will install drywall; trim-joinery and molding and apply wall, floor and ceiling coverings and finishes. Throughout the course, the safe handling of materials, personal safety, prevention of accidents and the mitigation of hazards are emphasized.

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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32
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 audience, 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 |

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.

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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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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 |

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 |

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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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 3.6. Roof Framing
Construct roof framing.

Competencies
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).

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Outcome 3.7. Exterior Finish Work
Complete exterior finish.

Competencies
3.7.1. Compare and contrast types and characteristics of doors and windows.
3.7.2. Identify, describe, and assemble materials for exterior finishing.
3.7.3. Install exterior door and window units and hardware.
3.7.4. Install weather stripping and apply caulking and sealant.
3.7.5. Install fascia and soffits with backing.
3.7.6. Cut and install molding and frieze board.
3.7.7. Case exterior openings.
3.7.8. Install exterior siding or covering.
3.7.9. Install exterior trim accessories (e.g., gutters, downspouts, louvers, shutters, posts, railings, decorative moldings).
3.7.10. Install draft stopping.

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Outcome 3.9. Interior Finish Work
Complete interior finish for residential, industrial and commercial facilities.
Competencies
3.9.1. Describe the different types and characteristics of drywall and finishing materials.
3.9.2. Lay out the drywall installation and nail or screw pattern and install drywall and corner accessories.
3.9.3. Describe the effects insulation, vapor barriers and ventilation can have on controlling moisture.
3.9.4. Install insulation and vapor barriers for wall and ceiling finishes.
3.9.5. Install drywall board.
3.9.6. Finish drywall board.
3.9.7. Lay out and install a suspended ceiling.
3.9.8. Prepare subfloor, install building paper and cut and install underlayment.
3.9.9. Lay out and install finished flooring (e.g., vinyl, carpet, wood, ceramic).
3.9.10. Install door units (e.g., pre-hung, double hung, folding, sliding) and door and builder’s hardware.
3.9.11. Install interior door and window trim (e.g., stools, sills, jamb extensions, casing, Mullions, aprons).
3.9.12. Apply common drywall finishing compounds.
3.9.13. Apply finish coatings (e.g., paint, stains, varnishes, texturing, wallpaper).
3.9.15. Install cabinetry, shelving and related hardware.

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

| Pathways | Design | Mechanical, Electrical, Plumbing | Structural |

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 6.1. Proposals
Develop and present a design, proposal, or concept.

Competencies
6.1.1. Collect and analyze data to identify required deliverables (e.g., reports, studies, building designs, drawings) based on client specifications.
6.1.2. Create a visualization of a proposed project using data from relevant materials according to client specifications and in compliance with building codes.
6.1.3. Incorporate building structural systems, environmental systems, safety systems, building envelope systems and building service systems into the design.
6.1.4. Incorporate the Americans with Disabilities Act (ADA) Standards for Accessible Design.

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

| Pathways | Design | Mechanical, Electrical, Plumbing | Structural |

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 |
Pupil Performance Evaluation

A number of evaluation tools and strategies are used throughout a technical program during a typical grading period and ultimately a school year. The course sequence identifies many of these tools and strategies in correlation with the respective skills and knowledge. Quizzes, tests, exams, reports, assignments, performance assessments, rubrics, projects and employability characteristics are only a few of the tools and strategies that need to be condensed into a final grade for grading periods, semesters, year-end and program completions. The ultimate goal is to devise a final pupil evaluation policy or strategy that accurately reflects the thousands of behaviors, performances and accomplishments a student demonstrates during a typical program.

The Career Field Technical Content Standards provide a specific starting and ending point for evaluation. Each competency was developed by individuals with professional expertise who were instructed to identify “what an individual needs to know and/or what an individual needs to be able to do to be successful in the respective career field.” These competencies therefore represent the end point that will be the central focus of the pupil evaluation policy.

Secondary and postsecondary educators leveled the predetermined competencies in terms of where they would be taught (secondary or post-secondary) and to what level of proficiency (introduced, proficient or reinforced). The pupil evaluation policy, therefore, is devised in such a way that it is an accurate reflection of this proficiency level. Parents, employers and other educators will be able to interpret the pupil’s knowledge and skill level from the evaluation policy.

Individual instructors may approach this task mixing a variety of evaluation tools and strategies. One specific pupil evaluation policy rarely fits the needs of every instructional situation. However, a sample pupil evaluation policy is provided as a suggestion for potential components and possible starting points.

**Laboratory component:** Occupational skills will represent 50 percent of the final laboratory grade. Skill evaluations will be compiled from rubrics, performance check sheets, inquiry-based projects and project analysis reports. A numerical score will be derived from each component to assist with calculations. The remaining 50 percent of the laboratory grade will consist of an objective assessment of each pupil’s employability skills. Students will have an opportunity to earn points toward an employability grade each day for punctuality, preparedness, laboratory duties and time on task. Points will be awarded as follows: 4pts. – punctuality; 4pts. – preparedness; 4pts. – lab duties; and 8pts. – time on task, for a total of 20 points per day and 100 points per week.

**Theory component:** The assessment of student knowledge will be comprised of quizzes, tests, exams, reports, assignments and each pupil’s employability skills during theory classes. A final numerical score will be acquired as follows: quizzes, tests, exams – 40 percent; reports, assignments – 20 percent; and employability skills – 40 percent. Employability skills include: 4pts. – punctuality, 4pts. – preparedness and 12pts. – time on task.

**Grading Scale:** The grading scale will based upon the school district policy and philosophy.
Pupil Evaluation Methods

Formative

Observation
Homework
Quizzes
Skill checks
Class work-individual or group
Clinical

Summative

Chapter tests
Projects
Unit tests
Research papers
Non-linguistic representations
Abstracts
Case studies

Diagnostic

Pre-assessment
Post-assessment
NCCER

Industry-Driven Authentic Assessment
Based on SkillsUSA
Industry-Driven Performance Assessment
Based on NCCER Curriculum

Industry-driven, authentic assessments based on the career-technical student organization, SkillsUSA, are linked to various competencies. This demonstrates the co-curricular nature of the career-technical student organization and provides an opportunity for authentic assessment of a student’s knowledge and skills at the local, regional, state and national levels. Complete information on the assessments, including scoring rubrics, can be obtained at http://www.nccer.org/default.aspx.

Unit 5: Communications

Prepared Speech – Evaluates a student’s ability to prepare and present clearly and effectively a series of thoughts relating to a central theme.
Extemporaneous Speaking – Evaluates a student’s ability to give a speech on an assigned topic with a minimum of advance notice.
Job Interview – Evaluates a student’s written, verbal and non-verbal skills in employment procedures when applying for a position.

Unit 6: Leadership and Teamwork

American Spirit – Evaluates a local chapter’s ability to work as a team in activities such as community service or citizenship projects.
Chapter Business Procedure – Evaluates a local chapter’s ability to work as a team to conduct a meeting using correct parliamentary procedure.
Chapter Display – Evaluates a local chapter’s ability to work as a team to construct a promotional display.
Community Service – Evaluates a local chapter’s ability to give leadership to a community service project and to work as a team to realize positive outcomes.
Teamwork – Evaluates a team’s preparation for employment and ability to demonstrate excellence and professionalism in collaborating on a project.

Unit 7: Safety

Occupational Health and Safety – Evaluates a team’s promotion of good health and safety habits in the workplace.
First Aid/CPR – Evaluates a student’s ability to react positively in a simulated situation demanding first aid intervention and to recognize excellence and professionalism in administering first aid and Cardiopulmonary Resuscitation (CPR).
Unit 8: Health and Environment

Occupational Health and Safety – Evaluates a team’s promotion of good health and safety habits in the workplace.
First Aid/CPR – Evaluates a student’s ability to react positively in a simulated situation demanding first aid intervention and to recognize excellence and professionalism in the administering of first aid and CPR.

Unit 11: Tools and Equipment

Job Skills Demonstration – Evaluates a student’s ability to demonstrate and explain an entry-level skill used in the occupational area for which he or she is training.

Unit 12: Business Practices

Customer Service – Evaluates a student’s preparation for employment and to recognize excellence and professionalism in the field of customer service.

Unit 13: Basic Construction Skills

Job Skills Demonstration – Evaluates a student’s ability to demonstrate and explain an entry-level skill used in the occupation area for which he or she is training.

Unit 14: Carpentry

Carpentry – Evaluates a student’s ability to perform selected jobs and skills related to residential and commercial carpentry including, but not limited to blueprints and specification, foundations and forms, rough framing, roof framing, exterior finish, stairs and lumber.
Teamwork – Evaluates a team’s preparation for employment and ability to demonstrate excellence and professionalism in collaborating on a project related to construction and drawing from multiple careers.
Appendix

The described competencies will be connected to the literacy and math Common Core Standards listed below: Appendix A - Common Core Literacy Standards for Construction and Engineering

Literacy

Key Ideas and Details:

**CCSS.ELA-Literacy.RST.11-12.1**
Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

**CCSS.ELA-Literacy.RST.11-12.2**
Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

**CCSS.ELA-Literacy.RST.11-12.3**
Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Craft and Structure:

**CCSS.ELA-Literacy.RST.11-12.4**
Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.

**CCSS.ELA-Literacy.RST.11-12.5**
Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

**CCSS.ELA-Literacy.RST.11-12.6**
Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

Integration of Knowledge and Ideas:

**CCSS.ELA-Literacy.RST.11-12.7**
Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

**CCSS.ELA-Literacy.RST.11-12.8**
Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
CCSS.ELA-Literacy.RST.11-12.9
Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

Range of Reading and Level of Text Complexity:

CCSS.ELA-Literacy.RST.11-12.10
By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.

CCSS.ELA-Literacy.WHST.11-12.1.a
Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.

CCSS.ELA-Literacy.WHST.11-12.1.b
Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases.

CCSS.ELA-Literacy.WHST.11-12.1.c
Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.

CCSS.ELA-Literacy.WHST.11-12.1.d
Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

CCSS.ELA-Literacy.WHST.11-12.1.e
Provide a concluding statement or section that follows from or supports the argument presented.

CCSS.ELA-Literacy.WHST.11-12.2
Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.

CCSS.ELA-Literacy.WHST.11-12.2.a
Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

CCSS.ELA-Literacy.WHST.11-12.2.b
Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions,
concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic.

**CCSS.ELA-Literacy.WHST.11-12.2.c**
Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.

**CCSS.ELA-Literacy.WHST.11-12.2.d**
Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.

**CCSS.ELA-Literacy.WHST.11-12.2.e**
Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).

**CCSS.ELA-Literacy.WHST.11-12.3**
(See note; not applicable as a separate requirement)

**Production and Distribution of Writing:**

**CCSS.ELA-Literacy.WHST.11-12.4**
Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

**CCSS.ELA-Literacy.WHST.11-12.5**
Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

**CCSS.ELA-Literacy.WHST.11-12.6**
Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

**Research to Build and Present Knowledge:**

**CCSS.ELA-Literacy.WHST.11-12.7**
Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

**CCSS.ELA-Literacy.WHST.11-12.8**
Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
CCSS.ELA-Literacy.WHST.11-12.9
Draw evidence from informational texts to support analysis, reflection, and research.

Range of Writing:

CCSS.ELA-Literacy.WHST.11-12.10
Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
The described competencies will be connected to the literacy and math Common Core Standards listed below: Appendix B - Common Core Mathematics Standards Manufacturing and Engineering

Mathematical Practices

CCSS.Math.Practice.MP1 Make sense of problems and persevere in solving them.

CCSS.Math.Practice.MP2 Reason abstractly and quantitatively.

CCSS.Math.Practice.MP3 Construct viable arguments and critique the reasoning of others.

CCSS.Math.Practice.MP4 Model with mathematics.

CCSS.Math.Practice.MP5 Use appropriate tools strategically.

CCSS.Math.Practice.MP6 Attend to precision.

CCSS.Math.Practice.MP7 Look for and make use of structure.

CCSS.Math.Practice.MP8 Look for and express regularity in repeated reasoning.

Mathematical Standards

Define trigonometric ratios and solve problems involving right triangles

CCSS.Math.Content.HSG.SRT.C.6
Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.

CCSS.Math.Content.HSG.SRT.C.7
Explain and use the relationship between the sine and cosine of complementary angles.

CCSS.Math.Content.HSG.SRT.C.8
Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.*

Understand and apply theorems about circles

CCSS.Math.Content.HSG.C.A.1
Prove that all circles are similar.

CCSS.Math.Content.HSG.C.A.2
Identify and describe relationships among inscribed angles, radii, and chords. Include the relationship
between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; 
the radius of a circle is perpendicular to the tangent where the radius intersects the circle.

**CCSS.Math.Content.HSG.C.A.3**
Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a 
quadrilateral inscribed in a circle.

**CCSS.Math.Content.HSG.C.A.4**
Construct a tangent line from a point outside a given circle to the circle.

**Explain volume formulas and use them to solve problems**

**CCSS.Math.Content.HSG.GMD.A.1**
Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of 
a cylinder, pyramid, and cone. *Use dissection arguments, Cavalieri's principle, and informal limit 
arguments.*

**CCSS.Math.Content.HSG.GMD.A.2**
Give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and 
other solid figures.

**CCSS.Math.Content.HSG.GMD.A.3**
Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.

**Apply trigonometry to general triangles**

**CCSS.Math.Content.HSG.SRT.D.9**
Derive the formula \( A = \frac{1}{2} ab \sin(C) \) for the area of a triangle by drawing an auxiliary line from a vertex 
perpendicular to the opposite side.

**CCSS.Math.Content.HSG.SRT.D.10**
Prove the Laws of Sines and Cosines and use them to solve problems.

**CCSS.Math.Content.HSG.SRT.D.11**
Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right 
and non-right triangles (e.g., surveying problems, resultant forces).

**Understand and apply theorems about circles**

**CCSS.Math.Content.HSG.C.A.1**
Prove that all circles are similar.

**CCSS.Math.Content.HSG.C.A.2**
Identify and describe relationships among inscribed angles, radii, and chords. *Include the relationship 
between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; 
the radius of a circle is perpendicular to the tangent where the radius intersects the circle.*
**CCSS.Math.Content.HSG.C.A.3**
Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.

**CCSS.Math.Content.HSG.C.A.4**
Construct a tangent line from a point outside a given circle to the circle.

**Explain volume formulas and use them to solve problems**

**CCSS.Math.Content.HSG.GMD.A.1**
Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. *Use dissection arguments, Cavalieri's principle, and informal limit arguments.*

**CCSS.Math.Content.HSG.GMD.A.2**
Give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures.

**CCSS.Math.Content.HSG.GMD.A.3**
Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.