The Pathway Knowledge and Skills Chart describes what all/most learners/workers need to know and be able to do to demonstrate competence within a career pathway. Following the pathway description, there are four sets of knowledge and skill expectations:

A. Foundational Academic Expectations
B. Essential Knowledge and Skills
C. Cluster (Foundation) Knowledge and Skills
D. Pathway Knowledge and Skills

PATHWAY DESCRIPTION

Design/Pre-Construction Pathway: People with careers in design/pre-construction create our future! They turn a concept into a set of plans. Their plans guide other construction professionals as they continue the building process.
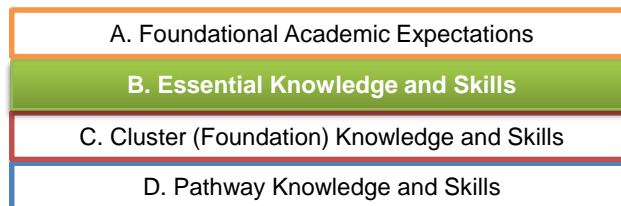
A. FOUNDATIONAL ACADEMIC EXPECTATIONS

All secondary students should meet their state's academic standards. All Essential Cluster and Pathway Knowledge and Skills are predicated on the assumption that foundational academic skills have been attained. Some knowledge and skill statements will further define critical linkages and applications of academics in the cluster and/or pathway.

A. Foundational Academic Expectations
B. Essential Knowledge and Skills
C. Cluster (Foundation) Knowledge and Skills
D. Pathway Knowledge and Skills
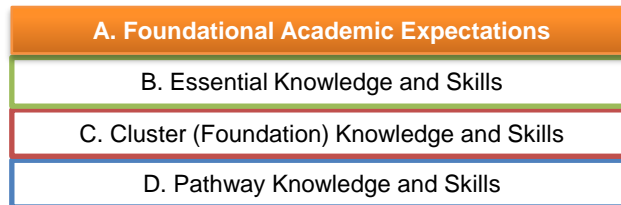
B. ESSENTIAL KNOWLEDGE AND SKILLS

The following Essential Knowledge and Skill statements apply to careers in all clusters and pathways. Persons preparing for careers in this pathway should be able to demonstrate these skills in the context of this cluster and pathway.

A. Foundational Academic Expectations
B. Essential Knowledge and Skills
C. Cluster (Foundation) Knowledge and Skills
D. Pathway Knowledge and Skills

Essential Topic ESS01	**ACADEMIC FOUNDATIONS:** *Achieve additional academic knowledge and skills required to pursue the full range of career and postsecondary education opportunities within a career cluster.*
ESS01.01	**Complete required training, education, and certification to prepare for employment in a particular career field.**

ESS01.01.01	Identify training, education and certification requirements for occupational choice.
ESS01.01.02	Participate in career-related training and/or degree programs.
ESS01.01.03	Pass certification tests to qualify for licensure and/or certification in chosen occupational area.

ESS01.02   **Demonstrate language arts knowledge and skills required to pursue the full range of post-secondary education and career opportunities.**

ESS01.02.01	Model behaviors that demonstrate active listening.
ESS01.02.02	Adapt language for audience, purpose, situation. (i.e. diction/structure, style).
ESS01.02.03	Organize oral and written information.
ESS01.02.04	Compose focused copy for a variety of written documents such as agendas, audio-visuals, bibliographies, drafts, forms/documents, notes, oral presentations, reports, and technical terminology.
ESS01.02.05	Edit copy to create focused written documents such as agendas, audio-visuals, bibliographies, drafts, forms/documents, notes, oral presentations, reports, and technical terminology.
ESS01.02.06	Comprehend key elements of oral and written information such as cause/effect, comparisons/contrasts, conclusions, context, purpose, charts/tables/graphs, evaluation/critiques, mood, persuasive text, sequence, summaries, and technical subject matter.
ESS01.02.07	Evaluate oral and written information for accuracy, adequacy/sufficiency, appropriateness, clarity, conclusions/solutions, fact/opinion, propaganda, relevancy, validity, and relationship of ideas.
ESS01.02.08	Identify assumptions, purpose, outcomes/solutions, and propaganda techniques.
ESS01.02.09	Predict potential outcomes and/or solutions based on oral and written information regarding trends.
ESS01.02.10	Present formal and informal speeches including discussion, information requests, interpretation, and persuasive arguments.

ESS01.03   **Demonstrate mathematics knowledge and skills required to pursue the full range of post-secondary education and career opportunities.**

ESS01.03.01	Identify whole numbers, decimals, and fractions.
ESS01.03.02	Demonstrate knowledge of basic arithmetic operations such as addition, subtraction, multiplication, and division.
ESS01.03.03	Demonstrate use of relational expressions such as equal to, not equal, greater than, less than, etc.
ESS01.03.04	Apply data and measurements to solve a problem.
ESS01.03.05	Analyze Mathematical problem statements for missing and/or irrelevant data.
ESS01.03.06	Construct charts/tables/graphs from functions and data.
ESS01.03.07	Analyze data when interpreting operational documents.

ESS01.04	**Demonstrate science knowledge and skills required to pursue the full range of post-secondary and career education opportunities.**
ESS01.04.01	Evaluate scientific constructs including conclusions, conflicting data, controls, data, inferences, limitations, questions, sources of errors, and variables.
ESS01.04.02	Apply scientific methods in qualitative and quantitative analysis, data gathering, direct and indirect observation, predictions, and problem identification.

Essential Topic ESS02	**COMMUNICATIONS:** *Use oral and written communication skills in creating, expressing and interpreting information and ideas including technical terminology and information.*
ESS02.01	**Select and employ appropriate reading and communication strategies to learn and use technical concepts and vocabulary in practice.**
ESS02.01.01	Determine the most appropriate reading strategy for identifying the overarching purpose of a text (i.e. skimming, reading for detail, reading for meaning or critical analysis).
ESS02.01.02	Demonstrate use of content, technical concepts and vocabulary when analyzing information and following directions.
ESS02.01.03	Select the reading strategy or strategies needed to fully comprehend the content within a written document (i.e., skimming, reading for detail, reading for meaning or critical analysis).
ESS02.01.04	Interpret information, data, and observations to apply information learned from reading to actual practice.
ESS02.01.05	Transcribe information, data, and observations to apply information learned from reading to actual practice.
ESS02.01.06	Communicate information, data, and observations to apply information learned from reading to actual practice.
ESS02.02	**Demonstrate use of the concepts, strategies, and systems for obtaining and conveying ideas and information to enhance communication in the workplace.**
ESS02.02.01	Employ verbal skills when obtaining and conveying information.
ESS02.02.02	Record information needed to present a report on a given topic or problem.
ESS02.02.03	Write internal and external business correspondence that conveys and/or obtains information effectively.
ESS02.02.04	Communicate with other employees to clarify workplace objectives.
ESS02.02.05	Communicate effectively with customers and employees to foster positive relationships.
ESS02.03	**Locate, organize and reference written information from various sources to communicate with co-workers and clients/participants.**

ESS02.03.01	Locate written information used to communicate with co-workers and customers.
ESS02.03.02	Organize information to use in written and oral communications.
ESS02.03.03	Reference the sources of information.

ESS02.04   **Evaluate and use information resources to accomplish specific occupational tasks.**

ESS02.04.01	Use informational texts, Internet web sites, and/or technical materials to review and apply information sources for occupational tasks.
ESS02.04.02	Evaluate the reliability of information from informational texts, Internet Web sites, and/or technical materials and resources.

ESS02.05   **Use correct grammar, punctuation and terminology to write and edit documents.**

ESS02.05.01	Compose multi-paragraph documents clearly, succinctly, and accurately.
ESS02.05.02	Use descriptions of audience and purpose when preparing and editing written documents.
ESS02.05.03	Use correct grammar, spelling, punctuation, and capitalization when preparing written documents.

ESS02.06   **Develop and deliver formal and informal presentations using appropriate media to engage and inform audiences.**

ESS02.06.01	Prepare oral presentations to provide information for specific purposes and audiences.
ESS02.06.02	Identify support materials that will enhance an oral presentation.
ESS02.06.03	Prepare support materials that will enhance an oral presentation.
ESS02.06.04	Deliver an oral presentation that sustains listeners' attention and interest.
ESS02.06.05	Align presentation strategies to the intended audience.
ESS02.06.06	Implement multi-media strategies for presentations.

ESS02.07   **Interpret verbal and nonverbal cues/behaviors to enhance communication with co-workers and clients/participants.**

ESS02.07.01	Interpret verbal behaviors when communicating with clients and co-workers.
ESS02.07.02	Interpret nonverbal behaviors when communicating with clients and co-workers.

ESS02.08   **Apply active listening skills to obtain and clarify information.**

ESS02.08.01	Interpret a given verbal message/information.
ESS02.08.02	Respond with restatement and clarification techniques to clarify information.

ESS02.09   **Develop and interpret tables, charts, and figures to support written and oral communications.**

ESS02.09.01	Create tables, charts, and figures to support written and oral communications.
ESS02.09.02	Interpret tables, charts, and figures used to support written and oral communication.

ESS02.10	**Listen to and speak with diverse individuals to enhance communication skills.**
ESS02.10.01	Apply factors and strategies for communicating with a diverse workforce.
ESS02.10.02	Demonstrate ability to communicate and resolve conflicts within a diverse workforce.
ESS02.11	**Exhibit public relations skills to increase internal and external customer/client satisfaction.**
ESS02.11.01	Communicate effectively when developing positive customer/client relationships.

Essential Topic ESS03	**PROBLEM-SOLVING AND CRITICAL THINKING:** *Solve problems using critical thinking skills (analyze, synthesize, and evaluate) independently and in teams. Solve problems using creativity and innovation.*

ESS03.01	**Employ critical thinking skills independently and in teams to solve problems and make decisions (e.g., analyze, synthesize and evaluate).**
ESS03.01.01	Identify common tasks that require employees to use problem-solving skills.
ESS03.01.02	Analyze elements of a problem to develop creative solutions.
ESS03.01.03	Describe the value of using problem-solving and critical thinking skills to improve a situation or process.
ESS03.01.04	Create ideas, proposals, and solutions to problems.
ESS03.01.05	Evaluate ideas, proposals, and solutions to problems.
ESS03.01.06	Use structured problem-solving methods when developing proposals and solutions.
ESS03.01.07	Generate new and creative ideas to solve problems by brainstorming possible solutions.
ESS03.01.08	Critically analyze information to determine value to the problem-solving task.
ESS03.01.09	Guide individuals through the process of recognizing concerns and making informed decisions.
ESS03.01.10	Identify alternatives using a variety of problem-solving and critical thinking skills.
ESS03.01.11	Evaluate alternatives using a variety of problem-solving and critical thinking skills.
ESS03.02	**Employ critical thinking and interpersonal skills to resolve conflicts with staff and/or customers.**
ESS03.02.01	Analyze situations and behaviors that affect conflict management.
ESS03.02.02	Determine best options/outcomes for conflict resolution using critical thinking skills.
ESS03.02.03	Identify with others' feelings, needs, and concerns.
ESS03.02.04	Implement stress management techniques.
ESS03.02.05	Resolve conflicts with/for customers using conflict resolution skills.

ESS03.02.06	Implement conflict resolution skills to address staff issues/problems.
ESS03.03	**Identify, write and monitor workplace performance goals to guide progress in assigned areas of responsibility and accountability.**
ESS03.03.01	Write realistic performance goals, objectives and action plans.
ESS03.03.02	Monitor performance goals and adjust as necessary.
ESS03.03.03	Recognize goal achievement using appropriate rewards in the workplace.
ESS03.03.04	Communicate goal achievement with managers and co-workers.
ESS03.04	**Conduct technical research to gather information necessary for decision-making.**
ESS03.04.01	Align the information gathered to the needs of the audience.
ESS03.04.02	Gather technical information and data using a variety of resources.
ESS03.04.03	Analyze information and data for value to the research objectives.
ESS03.04.04	Evaluate information and data to determine value to research objectives.

Essential Topic ESS04	**INFORMATION TECHNOLOGY APPLICATIONS:** *Use information technology tools specific to the career cluster to access, manage, integrate, and create information.*
ESS04.01	**Use Personal Information Management (PIM) applications to increase workplace efficiency.**
ESS04.01.01	Manage personal schedules and contact information.
ESS04.01.02	Create memos and notes.
ESS04.02	**Employ technological tools to expedite workflow.**
ESS04.02.01	Use information technology tools to manage and perform work responsibilities.
ESS04.03	**Operate electronic mail applications to communicate within a workplace.**
ESS04.03.01	Use email to share files and documents.
ESS04.03.02	Identify the functions and purpose of email systems.
ESS04.03.03	Use email to communicate within and across organizations.
ESS04.04	**Operate Internet applications to perform workplace tasks.**
ESS04.04.01	Access and navigate Internet (e.g., use a web browser).
ESS04.04.02	Search for information and resources.
ESS04.04.03	Evaluate Internet resources for reliability and validity.
ESS04.05	**Operate writing and publishing applications to prepare business communications.**
ESS04.05.01	Prepare simple documents and other business communications.
ESS04.05.02	Prepare reports and other business communications by integrating graphics and other non-text elements.
ESS04.05.03	Prepare complex multi-media publications.
ESS04.06	**Operate presentation applications to prepare presentations.**
ESS04.06.01	Prepare presentations for training, sales and information sharing.

ESS04.06.02	Deliver presentations with supporting materials.
ESS04.07	**Employ spreadsheet applications to organize and manipulate data.**
ESS04.07.01	Create a spreadsheet.
ESS04.07.02	Perform calculations and analyses on data using a spreadsheet.
ESS04.08	**Employ database applications to manage data.**
ESS04.08.01	Manipulate data elements.
ESS04.08.02	Manage interrelated data elements.
ESS04.08.03	Analyze interrelated data elements.
ESS04.08.04	Generate reports showing interrelated data elements.
ESS04.09	**Employ collaborative/groupware applications to facilitate group work.**
ESS04.09.01	Facilitate group work through management of shared schedule and contact information.
ESS04.09.02	Facilitate group work through management of shared files and online information.
ESS04.09.03	Facilitate group work through instant messaging or virtual meetings.
ESS04.10	**Employ computer operations applications to manage work tasks.**
ESS04.10.01	Manage computer operations.
ESS04.10.02	Manage file storage.
ESS04.10.03	Compress or alter files.
ESS04.11	**Use computer-based equipment (containing embedded computers or processors) to control devices.**
ESS04.11.01	Operate computer driven equipment and machines.
ESS04.11.02	Use installation and operation manuals.
ESS04.11.03	Troubleshoot computer driven equipment and machines.
ESS04.11.04	Access support as needed to maintain operation of computer driven equipment and machines.

Essential Topic ESS05	**SYSTEMS:** *Understand roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment. Identify how key organizational systems affect organizational performance and the quality of products and services. Understand global context of industries and careers.*
ESS05.01	**Describe the nature and types of business organizations to build an understanding of the scope of organizations.**
ESS05.01.01	List the types and functions of businesses.
ESS05.01.02	Describe the types and functions of businesses.
ESS05.01.03	Explain the functions and interactions of common departments within a business.
ESS05.02	**Implement quality control systems and practices to ensure quality products and services.**

ESS05.02.01	Describe quality control standards and practices common to the workplace.

Essential Topic ESS06	**SAFETY, HEALTH AND ENVIRONMENTAL:** *Understand the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance. Follow organizational policies and procedures and contribute to continuous improvement in performance and compliance.*

ESS06.01 **Implement personal and jobsite safety rules and regulations to maintain safe and healthful working conditions and environments.**

ESS06.01.01	Assess workplace conditions with regard to safety and health.
ESS06.01.02	Align safety issues with appropriate safety standards to ensure a safe workplace/jobsite.
ESS06.01.03	Identify safety hazards common to workplaces.
ESS06.01.04	Identify safety precautions to maintain a safe worksite.
ESS06.01.05	Select appropriate personal protective equipment as needed for a safe workplace/jobsite.
ESS06.01.06	Inspect personal protective equipment commonly used for selected career pathway.
ESS06.01.07	Use personal protective equipment according to manufacturer rules and regulations.
ESS06.01.08	Employ a safety hierarchy and communication system within the workplace/jobsite.
ESS06.01.09	Implement safety precautions to maintain a safe worksite.

ESS06.02 **Complete work tasks in accordance with employee rights and responsibilities and employers obligations to maintain workplace safety and health.**

ESS06.02.01	Identify rules and laws designed to promote safety and health in the workplace.
ESS06.02.02	State the rationale of rules and laws designed to promote safety and health.

ESS06.03 **Employ emergency procedures as necessary to provide aid in workplace accidents.**

ESS06.03.01	Use knowledge of First Aid procedures as necessary.
ESS06.03.02	Use knowledge of CPR procedures as necessary.
ESS06.03.03	Use safety equipment as necessary.

ESS06.04 **Employ knowledge of response techniques to create a disaster and/or emergency response plan.**

ESS06.04.01	Complete an assessment of an emergency and/or disaster situation.
ESS06.04.02	Create an emergency and/or disaster plan.

Essential Topic ESS07	**LEADERSHIP AND TEAMWORK:** *Use leadership and teamwork skills in collaborating with others to accomplish organizational goals and objectives.*

ESS07.01	**Employ leadership skills to accomplish organizational goals and objectives.**
ESS07.01.01	Analyze the various roles of leaders within organizations (e.g. contribute ideas; share in building an organization; act as role models to employees by adhering to company policies, procedures, and standards; promote the organization's vision; and mentor others).
ESS07.01.02	Exhibit traits such as empowerment, risk, communication, focusing on results, decision-making, problem solution, and investment in individuals when leading a group in solving a problem.
ESS07.01.03	Exhibit traits such as compassion, service, listening, coaching, developing others, team development, and understanding and appreciating others when acting as a manager of others in the workplace.
ESS07.01.04	Exhibit traits such as enthusiasm, creativity, conviction, mission, courage, concept, focus, principle-centered living, and change when interacting with others in general.
ESS07.01.05	Consider issues related to self, team, community, diversity, environment, and global awareness when leading others.
ESS07.01.06	Exhibit traits such as innovation, intuition, adaptation, life-long learning and coachability to develop leadership potential over time.
ESS07.01.07	Analyze leadership in relation to trust, positive attitude, integrity, and willingness to accept key responsibilities in a work situation.
ESS07.01.08	Describe observations of outstanding leaders using effective management styles.
ESS07.01.09	Participate in civic and community leadership and teamwork opportunities to enhance skills.
ESS07.02	**Employ organizational and staff development skills to foster positive working relationships and accomplish organizational goals.**
ESS07.02.01	Implement organizational skills when facilitating others' work efforts.
ESS07.02.02	Explain how to manage a staff that satisfies work demands while adhering to budget constraints.
ESS07.02.03	Describe how staff growth and development to increase productivity and employee satisfaction.
ESS07.02.04	Organize team involvement within a group environment.
ESS07.02.05	Work with others to develop and gain commitment to team goals.
ESS07.02.06	Distribute responsibility and work load fairly.
ESS07.02.07	Model leadership and teamwork qualities to aid in employee morale.
ESS07.02.08	Identify best practices for successful team functioning.
ESS07.02.09	Explain best practices for successful team functioning.
ESS07.03	**Employ teamwork skills to achieve collective goals and use team members' talents effectively.**
ESS07.03.01	Work with others to achieve objectives in a timely manner.
ESS07.03.02	Promote the full involvement and use of team member's individual talents and skills.

ESS07.03.03	Employ conflict management skills to facilitate solutions.
ESS07.03.04	Demonstrate teamwork skills through working cooperatively with co-workers, supervisory staff, and others, both in and out of the organization, to achieve particular tasks.
ESS07.03.05	Demonstrate teamwork processes that provide team building, consensus, continuous improvement, respect for the opinions of others, cooperation, adaptability, and conflict resolution.
ESS07.03.06	Develop plans to improve team performance.
ESS07.03.07	Demonstrate commitment to and a positive attitude toward team goals.
ESS07.03.08	Take responsibility for shared group and individual work tasks.
ESS07.03.09	Assist team members in completing their work.
ESS07.03.10	Adapt effectively to changes in projects and work activities.
ESS07.03.11	Negotiate effectively to arrive at decisions.

ESS07.04 **Establish and maintain effective working relationships with all levels of personnel and other departments in order to accomplish objectives and tasks.**

ESS07.04.01	Build effective working relationships using interpersonal skills.
ESS07.04.02	Use positive interpersonal skills to work cooperatively with co-workers representing different cultures, genders and backgrounds.
ESS07.04.03	Manage personal skills to accomplish assignments.
ESS07.04.04	Treat people with respect.
ESS07.04.05	Provide constructive praise and criticism.
ESS07.04.06	Demonstrate sensitivity to and value for diversity.
ESS07.04.07	Manage stress and control emotions.

ESS07.05 **Conduct and participate in meetings to accomplish work tasks.**

ESS07.05.01	Develop meeting goals, objectives and agenda.
ESS07.05.02	Assign responsibilities for preparing materials and leading discussions.
ESS07.05.03	Prepare materials for leading discussion.
ESS07.05.04	Assemble and distribute meeting materials.
ESS07.05.05	Conduct meeting to achieve objectives within scheduled time.
ESS07.05.06	Demonstrate effective communication skills in meetings.
ESS07.05.07	Produce meeting minutes including decisions and next steps.
ESS07.05.08	Use parliamentary procedure, as needed, to conduct meetings.

ESS07.06 **Employ mentoring skills to inspire and teach others.**

ESS07.06.01	Use motivational techniques to enhance performance in others.
ESS07.06.02	Provide guidance to enhance performance in others.

Essential Topic ESS08	**ETHICS AND LEGAL RESPONSIBILITIES:** *Know and understand the importance of professional ethics and legal responsibilities.*

ESS08.01 **Apply ethical reasoning to a variety of workplace situations in order to make ethical decisions.**

ESS08.01.01	Evaluate alternative responses to workplace situations based on legal responsibilities and employer policies.
ESS08.01.02	Evaluate alternative responses to workplace situations based on personal or professional ethical responsibilities.

ESS08.01.03	Identify personal and long-term workplace consequences of unethical or illegal behaviors.
ESS08.01.04	Explain personal and long-term workplace consequences of unethical or illegal behaviors.
ESS08.01.05	Determine the most appropriate response to workplace situations based on legal and ethical considerations.
ESS08.01.06	Explain the most appropriate response to workplace situations based on legal and ethical considerations.
ESS08.02	**Interpret and explain written organizational policies and procedures to help employees perform their jobs according to employer rules and expectations.**
ESS08.02.01	Locate information on organizational policies in handbooks and manuals.
ESS08.02.02	Discuss how specific organizational policies and procedures influence a specific work situation.

Essential Topic ESS09	**EMPLOYABILITY AND CAREER DEVELOPMENT:** *Know and understand the importance of employability skills. Explore, plan, and effectively manage careers. Know and understand the importance of entrepreneurship skills.*

ESS09.01	**Identify and demonstrate positive work behaviors and personal qualities needed to be employable.**
ESS09.01.01	Demonstrate self-discipline, self-worth, positive attitude, and integrity in a work situation.
ESS09.01.02	Demonstrate flexibility and willingness to learn new knowledge and skills.
ESS09.01.03	Exhibit commitment to the organization.
ESS09.01.04	Identify how work varies with regard to site, from indoor confined spaces to outdoor areas, including aerial space and a variety of climatic and physical conditions.
ESS09.01.05	Apply communication strategies when adapting to a culturally diverse environment.
ESS09.01.06	Manage resources in relation to the position (i.e. budget, supplies, computer, etc).
ESS09.01.07	Identify positive work-qualities typically desired in each of the career cluster's pathways.
ESS09.01.08	Manage work roles and responsibilities to balance them with other life roles and responsibilities.
ESS09.02	**Develop a personal career plan to meet career goals and objectives.**
ESS09.02.01	Develop career goals and objectives as part of a plan for future career direction.
ESS09.02.02	Develop strategies to reach career objectives.
ESS09.03	**Demonstrate skills related to seeking and applying for employment to find and obtain a desired job.**

ESS09.03.01	Use multiple resources to locate job opportunities.
ESS09.03.02	Prepare a résumé.
ESS09.03.03	Prepare a letter of application.
ESS09.03.04	Complete an employment application.
ESS09.03.05	Interview for employment.
ESS09.03.06	List the standards and qualifications that must be met in order to enter a given industry.
ESS09.03.07	Employ critical thinking and decision-making skills to exhibit qualifications to a potential employer.

ESS09.04 **Maintain a career portfolio to document knowledge, skills and experience in a career field.**

ESS09.04.01	Select educational and work history highlights to include in a career portfolio.
ESS09.04.02	Produce a record of work experiences, licenses, certifications and products.
ESS09.04.03	Organize electronic or physical portfolio for use in demonstrating knowledge, skills and experiences.

ESS09.05 **Demonstrate skills in evaluating and comparing employment opportunities in order to accept employment positions that match career goals.**

ESS09.05.01	Compare employment opportunities to individual needs and career plan objectives.
ESS09.05.02	Evaluate employment opportunities based upon individual needs and career plan objectives.
ESS09.05.03	Demonstrate appropriate methods for accepting or rejecting employment offers.

ESS09.06 **Identify and exhibit traits for retaining employment to maintain employment once secured.**

ESS09.06.01	Model behaviors that demonstrate reliability and dependability.
ESS09.06.02	Maintain appropriate dress and behavior for the job to contribute to a safe and effective workplace/jobsite.
ESS09.06.03	Complete required employment forms and documentation such as I-9 form, work visa, W-4 and licensures to meet employment requirements.
ESS09.06.04	Summarize key activities necessary to retain a job in the industry.
ESS09.06.05	Identify positive work behaviors and personal qualities necessary to retain employment.

ESS09.07 **Identify and explore career opportunities in one or more career pathways to build an understanding of the opportunities available in the cluster.**

ESS09.07.01	Locate and identify career opportunities that appeal to personal career goals.
ESS09.07.02	Match personal interest and aptitudes to selected careers.

ESS09.08	**Recognize and act upon requirements for career advancement to plan for continuing education and training.**
ESS09.08.01	Identify opportunities for career advancement.
ESS09.08.02	Pursue education and training opportunities to acquire skills necessary for career advancement.
ESS09.08.03	Examine the organization and structure of various segments of the industry to prepare for career advancement.
ESS09.08.04	Research local and regional labor (workforce) market and job growth information to project potential for advancement.
ESS09.08.05	Manage employment relations to make career advancements.
ESS09.09	**Continue professional development to keep current on relevant trends and information within the industry.**
ESS09.09.01	Use self assessment, organizational priorities, journals, Internet sites, professional associations, peers and other resources to develop goals that address training, education and self-improvement issues.
ESS09.09.02	Read trade magazines and journals, manufacturers' catalogues, industry publications and Internet sites to keep current on industry trends.
ESS09.09.03	Participate in relevant conferences, workshops, mentoring activities and in-service training to stay current with recent changes in the field.
ESS09.10	**Examine licensing, certification and credentialing requirements at the national, state and local levels to maintain compliance with industry requirements.**
ESS09.10.01	Examine continuing education requirements related to licensing, certification, and credentialing requirements at the local, state and national levels for chosen occupation.
ESS09.10.02	Examine the procedures and paperwork involved in maintaining and updating licensure, certification and credentials for chosen occupation.
ESS09.10.03	Align ongoing licensing, certification and credentialing requirements to career plans and goals.
ESS09.11	**Examine employment opportunities in entrepreneurship to consider entrepreneurship as an option for career planning.**
ESS09.11.01	Describe the opportunities for entrepreneurship in a given industry.

Essential Topic ESS10	**TECHNICAL SKILLS:** *Use of technical knowledge and skills required to pursue careers in all career cluster, including knowledge of design, operation, and maintenance of technological systems critical to the career cluster.*

|	
ESS10.01	**Employ information management techniques and strategies in the workplace to assist in decision-making.**
ESS10.01.01	Use information literacy skills when accessing, evaluating and disseminating information.
ESS10.01.02	Describe the nature and scope of information management.
ESS10.01.03	Maintain records to facilitate ongoing business operations.

ESS10.02	**Employ planning and time management skills and tools to enhance results and complete work tasks.**
ESS10.02.01	Develop goals and objectives.
ESS10.02.02	Prioritize tasks to be completed.
ESS10.02.03	Develop timelines using time management knowledge and skills.
ESS10.02.04	Use project-management skills to improve workflow and minimize costs.

C. CLUSTER (FOUNDATION) KNOWLEDGE AND SKILLS

The following Cluster (Foundation) Knowledge and Skill statements apply to all careers in the Architecture and Construction Cluster. Persons preparing for careers in the Architecture and Construction Cluster should be able to demonstrate these skills in addition to those found on the Essential Knowledge and Skills Chart.

A. Foundational Academic Expectations
B. Essential Knowledge and Skills
C. Cluster (Foundation) Knowledge and Skills
D. Pathway Knowledge and Skills
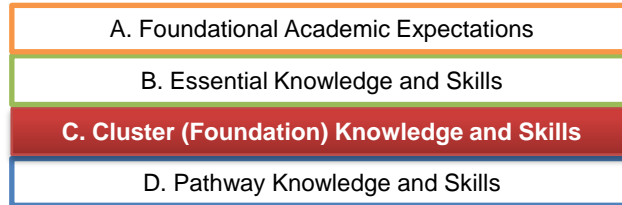
Cluster Topic ACC01	**ACADEMIC FOUNDATIONS:** *Achieve additional academic knowledge and skills required to pursue the full range of career and postsecondary education opportunities within a career cluster.*
ACC01.01	**Perform math operations such as estimating and distributing materials and supplies to complete jobsite/workplace tasks.**
ACC01.01.01	Use basic math functions to complete jobsite/workplace tasks.
Sample Indicators	Identify whole numbers, decimals, fractions, complex numbers, and polynomials.
	Apply basic arithmetic add, subtract, multiply, and divide operations.
	Apply relational (equal, not equal, greater than, less then, etc.) and logical operators in a logical expression.
ACC01.01.02	Use geometric formulas to determine areas and volumes of various structures.
Sample Indicators	Calculate areas and volumes of structures.
	Estimate materials and supplies needed.
ACC01.01.03	Use appropriate formulas to determine percentages /decimals.
Sample Indicators	Calculate percentages/decimals.
	Use percentages/decimals to perform measurement tasks.
ACC01.01.04	Use appropriate formulas to determine ratios, fractions, and proportion measures.
Sample Indicators	Calculate ratios, fractions and proportion measures.
	Use ratios, fractions and proportion measures to perform measurement tasks.
ACC01.01.05	Use appropriate formulas to determine measurements of dimensions, spaces and structures.
Sample Indicators	Measure dimensions, spaces and structures using U.S. Standard unit.
	Measure dimensions, spaces and structures using Metric units.

	Use dimensions, spaces and structures calculations to estimate materials and supplies needed.
ACC01.01.06	Conceptualize a three-dimensional form from a two-dimensional drawing to visualize proposed work.
Sample Indicators	Build Create three-dimensional form models.

ACC01.02 **Apply principles of physics as they relate to worksite/jobsite situations to work with materials and load applications.**

ACC01.02.01	Apply basic concepts of statics and loads to planning.
Sample Indicators	Use the basic concepts of static and load calculations for rigging and moving loads.
ACC01.02.02	Identify the physical properties present when using common construction materials in order to use the materials safely, effectively and efficiently.
Sample Indicators	Use the basic concepts of physics when working with common construction materials.

Cluster Topic **ACC02**	**COMMUNICATIONS:** *Use oral and written communication skills in creating, expressing and interpreting information and ideas including technical terminology and information.*

ACC02.01 **Use vocabulary and visual cues commonly used in design and construction to be successful in workplace/jobsite communications.**

ACC02.01.01	Match vocabulary and visual cues to workplace/jobsite situations.
Sample Indicators	Use correct terminology to convey verbal and visual.
ACC02.01.02	Utilize vocabulary and visual cues in context of design and construction situations.
Sample Indicators	Confirm understanding of verbal and visual instructions.
	Ask questions concerning details of instructions.
	Perform assignments as requested.

Cluster Topic **ACC03**	**PROBLEM-SOLVING AND CRITICAL THINKING:** *Solve problems using critical thinking skills (analyze, synthesize, and evaluate) independently and in teams. Solve problems using creativity and innovation.*

ACC03.01 **Create and implement project plans considering available resources and requirements of a project/problem to accomplish realistic planning in design and construction situations.**

ACC03.01.01	Plan, organize, schedule and manage a project/job to optimize workflow and outcome.
Sample Indicators	Report results of the project/job.
ACC03.01.02	Manage the schedule of a project/job.
Sample Indicators	Identify timeline required to complete a project/job.
	Evaluate efficiency and effectiveness of a project/job.
ACC03.01.03	Estimate resources/materials required for a specific project or problem.
Sample Indicators	Estimate correct amount of required resources/materials.
	Create a budget.

ACC03.01.04	Use available resources/materials effectively while completing a project or resolving a problem with a project plan.
Sample Indicators	Evaluate waste of resources/materials.
	Evaluate necessity for additional resources/materials.
ACC03.01.05	Determine alternative solutions for a specific project/problem.
Sample Indicators	Evaluate feasibility of alternative suggestions.
	Implement appropriate alternatives.

ACC03.02   **Evaluate and adjust design and construction project plans and schedules to respond to unexpected events and conditions.**

ACC03.02.01	Incorporate potential job disruptions into planning time lines.
Sample Indicators	Identify potential events and conditions that disrupt the completion of a job.
	Solve situational problems involved with unexpected events and conditions.
ACC03.02.02	Adjust project plans and schedules when presented with unexpected information.
Sample Indicators	Modify existing plans to reflect an unexpected change.
	Modify existing schedules to reflect an unexpected change.
	Modify existing budget to reflect unexpected change.
ACC03.02.03	Identify and assess critical situations as they arise to resolve issues.
Sample Indicators	Evaluate potential solutions and determine best solution.
	Appraise critical situations and implement appropriate response.
ACC03.02.04	Generate a project update that tracks changes necessitated by unexpected events and conditions.
Sample Indicators	Present an oral and/or written status report on the project.

Cluster Topic ACC04	**INFORMATION TECHNOLOGY APPLICATIONS:** *Use information technology tools specific to the career cluster to access, manage, integrate, and create information.*
	No additional statements in this topic beyond those found in the Essential Knowledge and Skills Chart.

Cluster Topic ACC05	**SYSTEMS:** *Understand roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment. Identify how key organizational systems affect organizational performance and the quality of products and services. Understand global context of industries and careers.*

ACC05.01   **Comply with regulations and applicable codes to establish a legal and safe workplace/jobsite.**

ACC05.01.01	Identify governmental regulations and national, state and/or local building codes that apply to a given workplace/jobsite.
Sample Indicators	Follow governmental regulations and building codes.
	Follow industry regulations and building codes.
	Follow jurisdictional regulations and building codes.
	Use information given in regulations and codes correctly.
	Pass job inspections and comply with regulations at all times.
	Pass required substance abuse screening.

ACC05.01.02	Evaluate workplace/jobsite activities for compliance with governmental and other applicable safety regulations such as EPA and OSHA.
Sample Indicators	Read and discuss information on OSHA, EPA and other safety regulations.
	Pass safety inspections and comply with regulations at all times.
ACC05.01.03	Use MSDS (Material Safety Data Sheets) information for the management, use and disposal of materials.
Sample Indicators	Obtain, understand and follow MSDS (Material Safety Data Sheets) information.
	Use materials safely.
ACC05.01.04	Identify workplace/jobsite environmental hazards of a given situation.
Sample Indicators	Follow safe practices relating to environmental hazards.

ACC05.02 **Examine how the roles and responsibilities among trades/professions work in relationship to complete a project/job.**

ACC05.02.01	Describe how relationships between trades/professions can facilitate smooth workflow and outcome to meet project goals.
Sample Indicators	Coordinate work between trades.
ACC05.02.02	Explain how the hierarchy of roles on a jobsite facilitate smooth workflow and outcome to meet project goals.
Sample Indicators	Incorporate job functions in the reporting chain of supervision.
	Evaluate the safety issues and responsibilities managed by each level of supervision.

ACC05.03 **Examine all factors effecting the project and the planning process.**

ACC05.03.01	Understand social, environmental and political factors that affect the project.
Sample Indicators	Label all systems on a set of construction documents.
	Discuss the interrelationship of the systems in the built environment.
	Use the concept of "Critical Path Method (CPM)" and/or similar sequential methods so that work progresses efficiently.
ACC05.03.02	Understand the context of the projects.

ACC05.04 **Understand and manage union-management relationships and contracts to create a cooperative work environment.**

ACC05.04.01	Analyze a proposed contract in terms of the company's position and union's position in labor contract negotiations.
Sample Indicators	Document how quality improves profitability.
	Report on issues that affect quality.
ACC05.04.02	Assess a situation for compliance with terms of a contract.

Cluster Topic ACC06	**SAFETY, HEALTH AND ENVIRONMENTAL:** *Understand the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance. Follow organizational policies and procedures and contribute to continuous improvement in performance and compliance.*
ACC06.01	**Assess and control the types and sources of workplace hazards to ensure a safe workplace and jobsite.**

ACC06.01.01	Demonstrate methods to correct common design and construction hazards.
Sample Indicators	Identify and describe common hazards in the workplace.
	Identify and describe major sources of information about hazards in the workplace (e.g., Material Safety Data Sheets (MSDS), work procedures, exposure control plans, training materials, labels, and signage).
	Identify sources of combustible/flammable materials, fire and emergencies to establish a fire safe environment.
	Interpret safety signs and symbols.
	Identify methods for disposing of hazardous materials.
ACC06.01.02	Identify types and sources of workplace hazards common to design and construction situations.
ACG06.01.03	Demonstrate personal and group health and safety practices.
Sample Indicators	Demonstrate principals of safe physical movement to avoid slips, trips, and spills.
	Inspect and use personal protective equipment (PPE).

Cluster Topic ACC07	**LEADERSHIP AND TEAMWORK:** *Use leadership and teamwork skills in collaborating with others to accomplish organizational goals and objectives.*

ACC07.01	**Establish specific goals to manage project assignments in a timely manner.**
ACC07.01.01	Establish project goals that assist in meeting project specifications and deadlines.
Sample Indicators	Define and describe project goals.
	Identify and list key project activities.
	Identify and report activity deadlines.
ACC07.01.02	Organize work teams that effectively manage assignments.
Sample Indicators	Determine and list assignments by activity and personnel.
	Complete assignments.
	Monitor and write a report on progress of the project.
	Evaluate completed project according to customer requirements.

Cluster Topic ACC08	**ETHICS AND LEGAL RESPONSIBILITIES:** *Know and understand the importance of professional ethics and legal responsibilities.*

ACC08.01	**Recognize legal and ethical relationships between employees and employers to establish workplace/jobsite rules, regulations and guidelines in a design and/or construction setting.**
ACC08.01.01	Access appropriate resources to identify the roles, rights and responsibilities of an employee and an employer.
Sample Indicators	Practice workplace/jobsite conduct incorporating employee and employer roles, rights and responsibilities.
ACC08.01.02	Examine insurance documentation to determine liability issues associated with a job.
Sample Indicators	Describe liability issues as needed.

ACC08.01.03	Comply with employer policies, procedures, and job specific agreements such as sexual harassment avoidance and substance abuse control to prevent ethical and legal problems.
Sample Indicators	Comply with employer policies and procedures.
	Comply with project labor agreements.

ACC08.02 **Read regulations and contracts to ensure ethical and safety elements are observed.**

ACC08.02.01	Study regulations and codes to identify those applicable to the local area.
Sample Indicators	Locate and implement regulations and codes applicable to tasks and projects.
	Comply with local, state and Federal codes.
ACC08.02.02	Explain the various aspects of service contracts to ensure compliance.
Sample Indicators	Evaluate and follow service contracts.
ACC08.02.03	Recognize the relationship and responsibilities of various parties to a contract.
Sample Indicators	Fulfill contractual roles and responsibilities.
	Monitor relationships with other parties.
ACC08.02.04	Recognize the definition of specialized words or phrases to fully understand documents and contracts.
Sample Indicators	Use industry jargon or terminology appropriately.
	Use industry acronyms correctly.
	Use words with multiple meanings correctly in context.

ACC08.03 **Use ethical and legal standards to avoid conflicts of interest in a design and/or construction setting.**

ACC08.03.01	Identify conflicts of interest relating to a job or project to prevent ethical or legal problems.
Sample Indicators	Resolve issues relating to any potential conflicts of interest.

Cluster Topic ACC09	**EMPLOYABILITY AND CAREER DEVELOPMENT:** *Know and understand the importance of employability skills. Explore, plan, and effectively manage careers. Know and understand the importance of entrepreneurship skills.*

ACC09.01 **Explain written organizational policies, rules and procedures common in design and construction settings to help employees perform their jobs.**

ACC09.01.01	Locate appropriate information on organizational policies in handbooks and manuals.
Sample Indicators	Identify the contents of various organizational publications.
	Select the appropriate document(s) as reference for the situation.
ACC09.01.02	Discuss how specific organizational policies and rules influence a specific work situation.
Sample Indicators	Locate and identify specific organizational policy, rule or procedure to assist with a given situation.
	Explain specific organizational policy, rule or procedure to improve a given situation.

ACC09.02	**Recognize the responsibilities and personal characteristics to develop individual goals for professionalism.**
ACC09.02.01	Identify appropriate responsibilities and personal characteristics by researching workplace/jobsite information.
Sample Indicators	Practice the responsibilities and characteristics of a professional craftsperson.
	Identify all critical/important functions.
	Document customer satisfaction.
ACC09.02.01	Present a professional image in the workplace/jobsite.
Sample Indicators	Maintain appropriate professional memberships.
	Follow rules, regulations and guidelines.

Cluster Topic ACC10	**TECHNICAL SKILLS:** *Use the technical knowledge and skills required to pursue the targeted careers for all pathways in the career cluster, including knowledge of design, operation, and maintenance of technological systems critical to the career cluster.*

ACC10.01	**Read, interpret, and use technical drawings, documents, and specifications to plan a project.**
ACC10.01.01	Interpret drawings used in project planning.
Sample Indicators	Recognize elements and symbols of blueprints and drawings.
ACC10.01.02	Describe written standards and that specifications that apply.
Sample Indicators	Interpret and explain standards and specifications.
ACC10.01.03	Recognize how specifications and standards are arranged for proper access.
Sample Indicators	Use specifications and standards.
	Apply specifications and standards appropriately.
ACC10.01.04	Use architect's plan, manufacturer's illustrations and other materials to communicate specific data and visualize proposed work.
Sample Indicators	Sketch/draw/illustrate concepts and ideas.
	Draw or sketch plan/layout to be completed.
	Use proper measurements to determine layout.

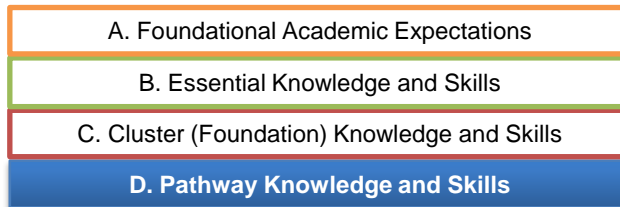| ACC10.02	**Use and maintain appropriate tools, machinery, equipment, and resources to accomplish project goals.**
ACC10.02.01	Select tools, machinery, equipment, and resources that match requirements of the job.
Sample Indicators	Operate tools, machinery and equipment in a safe manner.
	Properly maintain and care for tools, machines and equipment.
	Safely use tools, machines, and equipment productively and efficiently in alignment with industry standards.
ACC10.02.02	Identify sources of information concerning state-of-the-art tools, equipment, materials, technologies and methodologies.
Sample Indicators	Read current periodicals, industry publications and manufacturer's catalogs.
	Use state-of-the-art tools, equipment, materials, technologies and methodologies.
ACC10.02.03	Demonstrate use of tools, machinery, equipment and other resources commonly used in design and construction.

D. PATHWAY KNOWLEDGE AND SKILLS

The following knowledge and skill statements apply to all careers in the Design/Pre-Construction Pathway. The statements are organized within six topics.

A. Foundational Academic Expectations
B. Essential Knowledge and Skills
C. Cluster (Foundation) Knowledge and Skills
D. Pathway Knowledge and Skills

Pathway Topic ACPA01	ACADEMICS
ACPA01.01	**Employ basic methods of data collection and analysis to provide information for projects.**
ACPA01.01.01	Use available research methods when project planning and problem-solving.
Sample Indicators	Select and employ proper method for a given project.
ACPA01.01.02	Provide appropriate precedents for development of a project.
Sample Indicators	Articulate logical rationale for use of chosen precedents.

Pathway Topic ACPA02	COMMUNICATIONS
ACPA02.01	**Use communication skills and strategies to work effectively with potential clients.**
ACPA02.01.01	Deliver a presentation that explains a concept of design or preconstruction.
Sample Indicators	Show project plans for visual impact.
	Evaluate customer comprehension.
ACPA02.01.02	Employ facilitation skills while leading meetings that involve a variety of clients and agencies.
Sample Indicators	Identify types of client/agency needs.
	Mediate diversity to meet needs.

Pathway Topic ACPA03	SYSTEMS
ACPA03.01	**Integrate structural, environmental, safety, building envelopes and building service systems to design and construct buildings and structures.**
ACPA03.01.01	Describe building systems and their interrelationships.
Sample Indicators	Select and integrate building systems.
ACPA03.01.02	Develop design criteria for building systems in a given scenario.
ACPA03.02	**Review traditional project phases and various roles within them to plan for and implement phases within a project.**

ACPA03.02.01	Explain the relationship of traditional project phases and the various roles within them to a current project.
Sample Indicators	Work through project phases.

Pathway Topic ACPA04	SAFETY, HEALTH, AND ENVIRONMENTAL
ACPA04.01	**Apply the suitable practices of environmental impact to enhance project acceptance and quality.**
ACPA04.01.01	Evaluate the sustainable design elements of a given project.
Sample Indicators	Integrate sustainable elements into project designs.
ACPA04.01.02	Align sustainable design elements of a given project.
ACPA04.02	**Apply objective construction guidelines for the accommodation of people with varying physical abilities to meet accessibility requirements.**
ACPA04.02.01	Explain how the Americans with Disabilities Act influences the compliance requirements for project designs.
Sample Indicators	Integrate Americans with Disabilities Act compliance into project designs.
ACPA04.02.02	Design project plans that comply with OSHA standards.
Sample Indicators	Demonstrate comprehensive knowledge and application of OSHA Standards.

Pathway Topic ACPA05	LEADERSHIP AND TEAMWORK
ACPA05.01	**Appreciate the diversity of needs, values and social patterns in project design to appropriately meet client needs.**
ACPA05.01.01	Identify the geographic and cultural issues related to project design in a given situation.
Sample Indicators	Apply cultural traditions and diversity to project design.
ACPA05.01.02	Participate in appropriate trade and professional associations.

Pathway Topic ACPA06	TECHNICAL
ACPA06.01	**Develop technical drawings drafted by hand and computer-generated plans to design structures.**
ACPA06.01.01	Identify client requirements.
Sample Indicators	Develop a set of technical drawings meeting the client's specifications.
ACPA06.01.02	Use communication skills and strategies to work effectively with people (including clients, team members, and others).
ACPA06.01.03	Draw and sketch by hand to communicate ideas effectively.
ACPA06.01.04	Learn to read and produce technical drawings, understanding the significance of each line in a drawing.
ACPA06.02	**Employ appropriate representational media to communicate concepts and design.**
ACPA06.02.01	Convey graphic information using multi-dimensional drawings.
Sample Indicators	Employ basic drawing skills.

	Convey three-dimensional information in two dimensional drawings.
ACPA06.02.02	Build models using referenced drawings and sketches.
Sample Indicators	Employ basic model building techniques.
	Verify accuracy of model based on drawings and sketches used.
ACPA06.02.03	Utilize computer technology when communicating concepts and designs.
Sample Indicators	Employ basic computer modeling techniques.

ACPA06.03   **Employ principles, conventions, standards, applications and restrictions pertaining to the manufacture and use of construction materials, components and assemblies to incorporate into project design.**

ACPA06.03.01	Select building materials and assemblies upon evaluation that meet project specifications.
Sample Indicators	Develop and communicate an assigned building assembly.
ACPA06.03.02	Use appropriate combinations of building materials and components that satisfy the requirements of building programs.
Sample Indicators	Select the more appropriate building assembly.

ACPA06.04   **Apply basic organizational, spatial, structural and constructional principles to the design of interior and exterior space so that design plans are effective.**

ACPA06.04.01	Develop design alternatives that address a given problem.
Sample Indicators	Evaluate and select the most appropriate solution.