

2005 Construction Technologies Competency Summary

At the end of the secondary program (12), apprenticeship (ApT) and associate degree (AD) each competency is coded: I = Introductory; P = Proficient; R = Reinforce. In addition, the business, industry, and labor (BIL) partnership validated each competency with E for Essential and R for Recommended.

Competency		Ford PAS Modules
CONSTRUCTION TECHNOLOGIES CORE BODY OF KNOWLEDGE		
Unit 1: Career Exploration and Development		
1.1	Explore career pathways in construction technology	4
1.2	Explore professional development opportunities for a construction technology professional	4
1.3	Examine the physical aptitudes necessary to perform critical work functions	–
1.4	Demonstrate sufficient ability to complete essential work functions (e.g., completing a full shift, walking, carrying objects for extended periods)	–
1.5	Prepare for career advancement in construction technology (e.g., extended college)	–
1.6	Examine licensing, certification, and credentialing at the state, national and local level	4
1.7	Explain apprenticeships and their role <i>in the construction industry</i>	3,4
1.8	Determine the apprenticeship best suited to a career goal	–
1.9	Explain the rights and responsibilities of participants in a construction industry and training programs	–
Unit 2: Materials		
2.1	Examine the various materials used in construction	–
2.2	Explain the various material finishing techniques	–
2.3	Explain the various material testing techniques	–
2.4	Select materials for various construction applications	–
2.5	Describe the handling and use of basic construction materials	–
2.6	Analyze the physical and chemical principles critical to the construction industry	–
Unit 3: Estimating		
3.1	Demonstrate mathematical calculations necessary to estimate time, material, equipment and design needs	6
3.2	Estimate needed materials and equipment	–
3.3	Estimate the amount of labor needed and the respective costs	6
3.4	Analyze the economic impact of various work functions	6
3.5	Describe estimating techniques and responsibilities	–

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Unit 4: Inter-relational Systems		
4.1	Explore diverse organizational structures and goals within the construction industry	6
4.2	Differentiate between residential, commercial, industrial and institutional construction segments	–
4.3	Analyze the relationships among various <i>construction</i> stakeholders	1,4,5,15
4.4	Investigate factors that may affect various construction organizational structures	–
4.5	Explain typical construction contract relationships	–
4.6	Apply industry standards and practices to maintain project quality	6,8
Unit 5: Communications		
5.1	Apply active listening skills to obtain and clarify information provided in oral communications	1,2,3,4,10,12,15
5.2	Listen and speak effectively to contribute to group discussions and meetings	1,2,5,6,10,12
5.3	Deliver formal and informal presentations that demonstrate organization and delivery skills	2,4,5,6,7,11,12
5.4	Write coherent and focused communications that support a defined perspective	1,2,10,11
5.5	Utilize communication technology	1,2,3,4,6,7,8,9,10,11,12,14
5.6	Employ computer technology in construction operations	–
5.7	Explain the impact of emerging electronic technology in construction	–
5.8	Utilize written contract documents to direct the work	1,2,3,4,5,8,9,11,12,15
5.9	Explain the fundamentals of schematics, specifications and construction drawings	1,10,11
5.10	Read and interpret construction drawings, specifications and other contractual documents	–
Unit 6: Leadership and Teamwork		
6.1	Demonstrate the ability to work on a team <i>in a construction environment</i>	1,4,6,10,11
6.2	Perform responsibly as a team member	1–15
6.3	Use mentoring skills to inspire others to achieve	–
6.4	Describe the basic origins of conflict and the needs that motivate behavior	1,5
6.5	Examine the different responses to conflict as they relate to results	1,5
6.6	Resolve conflicts to maintain a smooth workflow	1,5,6
Unit 7: Safety		
7.1	Maintain general safety in accordance with government regulations and health standards	–

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7.2	Evaluate the ergonomic factors associated with the construction industry	11
7.3	Survey state, federal and local worker safety, health and environmental regulations	3,5,14,15
7.4	Demonstrate practices that contribute to an accident free environment	–
7.5	Explain emergency response plans in a variety of industry settings	–
7.6	Complete the requirements for First Aid and CPR certification	–
7.7	Examine access and egress procedures	–
7.8	Analyze structural issues related to worker safety and health	–
7.9	Process safety documentation	–
7.10	Demonstrate the American National Standards Institute (ANSI) hand signals to communicate with other workers	–
7.11	Utilize universal signs and symbols that apply to given workplace situations	–
Unit 8: Health and Environment		
8.1	Survey state, federal and local worker health and environmental regulations	–
8.2	Demonstrate practices that contribute to a healthy environment	–
8.3	Explain the environmental aspects of work sites with contaminated soil and water	5,15
8.4	Analyze design and construction elements to control mold	–
8.5	Handle hazardous materials in accordance with government regulations and health standards	–
Unit 9: Legal and Ethical Aspects		
9.1	Differentiate between legal and ethical issues	3,5,9,10
9.2	Complete work related duties within an ethical framework	5,9,10,11,15
9.3	Assess the implications of ethical and unethical behavior	5,7,9,10,15
9.4	Survey mandated standards	–
9.5	Comply with governmental regulations and applicable codes	3,5,15
9.6	Explain employee and employer liability	–
9.7	Perform duties according to regulations, policies, laws, legislated rights and contract provisions	3,5,10,14,15
9.8	Explain accessibility issues	–
Unit 10: Problem Solving and Critical Thinking		
10.1	Employ critical thinking and problem solving skills to formulate solutions to problems	1,2,5,6,8,9,10,11,12 13,14,15
10.2	Apply problem solving and critical thinking techniques to the conflict between available resources, requirements of the project and construction time lines	1,4,6,8,10,11

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10.3	Combine critical thinking and team building skills to solve problems	1,2,5,6,8,10,11,12,13
10.4	Evaluate and adjust plans and schedules to respond to unexpected events and conditions	1,6,7,8
Unit 11: Tools and Equipment		
11.1	Identify the hand and power tools and equipment appropriate to the task	–
11.2	Demonstrate the appropriate uses of tools to complete work functions	–
11.3	Maintain hand and power tools appropriate to the work site	–
11.4	Use appropriate personal protective equipment (PPE)	–
Unit 12: Business Practices		
12.1	Develop a management plan for business	5,6,7
12.2	Identify basic procedures in the accounting cycle	7
12.3	Compare and contrast business side versus practice side licenses, insurance, bonds and certifications	–
Unit 13: Basic Construction Skills		
13.1	Explore performance skills in carpentry	–
13.2	Explore performance skills of electricians	–
13.3	Explore performance skills in environmental controls technology	–
13.4	Explore performance skills in brick, block and cement masonry	–
13.5	Explore performance skills in plumbing and pipefitting	–
13.6	Explore performance skills in heavy equipment operations	–
13.7	Explore performance skills in interior construction	–
13.8	Explore performance skills in wood technology products and cabinetry	–
13.9	Explore performance skills in architecture	–
13.10	Explore performance skills in construction management	–
CAREER PATHWAY: CONSTRUCTION		
Unit 14: Carpentry		
14.1	Interpret construction drawings and demonstrate construction layout procedures	–
14.2	Select materials for various construction applications	–
14.3	Construct footings and foundations	–
14.4	Construct all-weather wood foundations	–
14.5	Construct forms for slabs and paving	–
14.6	Construct foundations, grade beams and forms	–
14.7	Complete floor framing	–
14.8	Layout walls and rough openings	–
14.9	Frame walls and rough openings	–
14.10	Frame metal wall partitions	–
14.11	Construct ceiling framing	–

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14.12	Construct roof framing	–
14.13	Install prefabricated roof trusses	–
14.14	Install drip edges, eaves flashing and vents	–
14.15	Install shingles	–
14.16	Complete exterior finish	–
14.17	Install insulation	–
14.18	Complete interior finish	–
14.19	Install cabinets and storage devices	–
14.20	Construct stairs	–
14.21	Demonstrate specialized carpentry applications	–
14.22	Apply technical skills to restoring and remodeling existing structures	–
14.23	Evaluate and complete the work required to repair existing structures	–
14.24	Create work assignments for crew and individuals	6
14.25	Organize material and equipment delivery to maximize productivity	–
14.26	Integrate worker orientation and employee development	–
14.27	Promote cooperation and teamwork	1–15
14.28	Analyze the role of the lead carpenter on a construction project	–
14.29	Organize and prepare carpenters to perform the job effectively and efficiently	–
Unit 15: Brick, Block and Cement Masonry		
15.1	Prepare materials for brick or block construction	–
15.2	Lay brick and block	–
15.3	Install mortar joints	–
15.4	Prepare the construction site	–
15.5	Perform masonry construction	–
15.6	Install concrete masonry units (CMU)	–
15.7	Perform special masonry installations	–
15.8	Build chimneys and fireplaces	–
15.9	Prepare materials for concrete construction	–
15.10	Prepare for residential, commercial or road work	–
15.11	Construct footings and foundations	–
15.12	Lay out and construct forms for slabs and paving	–
15.13	Place and finish concrete	–
15.14	Install joints and cure concrete	–
15.15	Demonstrate specialty work and concrete finishes	–
15.16	Demonstrate the safe operation of concrete machinery	–
15.17	Explain and describe how to deal with special conditions	–
Unit 16: Electrical		
16.1	Explain electrical principles and theories	12
16.2	Analyze basic electrical theory	12

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16.3	Analyze and evaluate alternating current (AC)	12
16.4	Solve mathematical problems related to electricity	12
16.5	Explain and apply National Electrical Code (NEC) and other applicable codes	–
16.6	Demonstrate test equipment	–
16.7	Read and interpret blueprints	1
16.8	Demonstrate various uses for fasteners and anchors	–
16.9	Install rough-in wiring	–
16.10	Install finish wiring	–
16.11	Complete commercial and industrial installations	–
16.12	Explain distribution systems	–
16.13	Install motors and power wiring in accordance with NEC	–
16.14	Differentiate between specialized systems	–
16.15	Demonstrate electrical safety practices	–
16.16	Construct housekeeping pads and light pole bases	–
16.17	Construct electrical drawings (i.e., as built)	–
Unit 17: Environmental Controls Technology		
17.1	Appraise the fundamental concepts of human comfort	–
17.2	Analyze and measure electrical values	12
17.3	Troubleshoot single phase, split phase and three phase circuits and devices	–
17.4	Explain the physical laws as applied to refrigeration	–
17.5	Analyze the mechanical refrigeration cycle and components	–
17.6	Explain the refrigeration cycle and its components	–
17.7	Identify and perform soldering and brazing procedures	–
17.8	Demonstrate the proper use of piping materials, fabrication and application	–
17.9	Perform leak detection procedures	–
17.10	Demonstrate specialized environmental controls technology test equipment and tools	–
17.11	Install refrigeration and air conditioning equipment	–
17.12	Perform service maintenance (SM) on related environmental controls technology equipment	–
17.13	Troubleshoot refrigeration and air conditioning equipment	–
17.14	Service and repair refrigeration and air conditioning equipment (secure EPA refrigerant certification)	–
17.15	Identify and install forced air heating systems	–
17.16	Troubleshoot and service heating systems	–
17.17	Explain the fundamentals of hot water and chilled water systems (hydronics)	–
17.18	Explain the application, selection and installation of hydronic system components	–
17.19	Explain the application, selection and installation of low pressure steam systems	–

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17.20	Assess sheet metal standards and materials	–
17.21	Demonstrate different sheet metal fabrication procedures	–
17.22	Create work sequences for tasks and units of work	6
17.23	Create work assignments for crew and individuals	6
17.24	Clarify client expectations	–
17.25	Employ positive client relationships	–
Unit 18: Plumbing and Pipefitting		
18.1	Analyze information from a site plan	–
18.2	Prepare sketches and diagrams	1,5,6,10,11
18.3	Rough in drainage systems	–
18.4	Rough in water supply systems	–
18.5	Select appropriate piping materials	–
18.6	Evaluate residential water systems	–
18.7	Explain fuel piping systems	–
18.8	Install common fixtures and appliances	–
18.9	Explain water and drainage system maintenance and repair	–
Unit 19: Heavy Equipment Operations		
19.1	Explain and demonstrate safety procedures necessary to perform heavy equipment operations	–
19.2	Explain soil types	–
19.3	Define grades used in construction	–
19.4	Explain the heavy equipment types and processes for basic construction operations	–
19.5	Analyze the heavy equipment used in earth moving operations	–
19.6	Analyze the heavy equipment used in building and structure construction	–
19.7	Analyze the heavy equipment used in underground and utilities construction	–
19.8	Analyze the heavy equipment in paving operations	–
19.9	Specify scraper types and functions	–
19.10	Specify bulldozer types and functions	–
19.11	Specify motor grader types and functions	–
19.12	Specify backhoe types and functions	–
19.13	Specify front-end loader types and functions	–
19.14	Specify dump truck types and functions	–
19.15	Specify tractor types and functions	–
19.16	Specify compactor types and functions	–
19.17	Specify hydraulic excavator types and functions	–
19.18	Specify forklift types and functions	–
19.19	Specify crane types and functions	–
Unit 20: Interior Design Applications		
20.1	Design interior project needs	–
20.2	Lay out interior needs	–

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20.3	Determine wall layout and rough openings	–
20.4	Install and finish drywall	–
20.5	Demonstrate painting and wall covering	–
20.6	Demonstrate various plastering applications	–
20.7	Assess flooring needs and explain installation procedures	–
20.8	Assess and describe various tile applications	–
20.9	Assess and describe trim applications	–
20.10	Determine lighting needs and explain the appropriate installations	–
20.11	Determine storage needs	–
20.12	Identify and describe ceiling framing	–
20.13	Apply basic organizational and spatial principles to the design of interior space	–
20.14	Evaluate and select fixtures, equipment, materials and assemblies to meet project objectives	–
Unit 21: Wood Products Technology and Cabinet Making		
21.1	Evaluate wood as a raw material for wood products technology and cabinet making	–
21.2	Analyze the wood materials available for wood products technology and cabinet making	–
21.3	Identify the finished products of wood products technology and cabinet making	–
21.4	Identify and explain the fundamentals of wood defects and the principle of basic lumber grading, wood drying processes, wood seasoning and conditioning	–
21.5	Explain how increased technological aspects and trends (i.e., manufacturing processes) may or may not change the success of the wood industry in the future	–
21.6	Explain sharpening and honing applications	–
21.7	Operate power equipment	–
21.8	Design and utilize jigs and fixtures	–
21.9	Construct basic cabinetry joints	–
21.10	Construct cabinet frames	–
21.11	Construct a frameless cabinet using 32mm technology	–
21.12	Identify and describe the various hardware available for wood products technology and cabinet making	–
21.13	Construct cabinet doors and drawers	–
21.14	Explain the various adhesives and identify their respective applications	–
21.15	Apply laminates and veneers	–
21.16	Prepare a surface for finishing	–
21.17	Demonstrate finishing processes	–

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CAREER PATHWAY: PRE-CONSTRUCTION DESIGN		
Unit 22: Pre-Construction		
22.1	Employ methods of data collection and analysis to gather project information	6,7,8,15
22.2	Determine potential client or agency needs and propose solutions	8,10,11
22.3	Assess building systems and their interrelationships to develop design criteria	–
22.4	Examine traditional project phases and their roles	–
22.5	Identify environmental design elements for a given project	5,12
22.6	Apply design requirements to accommodate people with varying physical abilities	–
22.7	Explain the diversity of needs, values and social patterns in project design	–
22.8	Use relevant materials to visualize a proposed project and transfer data to the project design	–
Unit 23: Design		
23.1	Apply basic organizational, spatial, structural and constructional principles to the design of interior and exterior space	–
23.2	Evaluate and select building materials and assemblies to meet project objectives	–
23.3	Employ appropriate representational media to convey a design	–
Unit 24: Architectural Documents		
24.1	Draw a floor plan from a preliminary sketch	–
24.2	Draw foundation and roof plans	–
24.3	Draw elevations	–
24.4	Draw sections and details	–
24.5	Draw plumbing and HVAC plans	–
24.6	Draw site plan	–
24.7	Design a residential structure	–
24.8	Design a commercial structure	–
24.9	Prepare electrical drawings	–
24.10	Apply technical skills to rehabilitate and/or restore existing structures	–
24.11	Evaluate and complete the work required to repair existing structures	–
Unit 25: Urban Planning		
25.1	Examine the concepts of urban planning	–
25.2	Assess the issues related to urban planning	–
25.3	Use various technical tools to study issues of urban growth, development and management	–
25.4	Participate in community meetings	–

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CAREER PATHWAY: CONSTRUCTION MANAGEMENT		
Unit 26: Site Development		
26.1	Establish and maintain line and grade	–
26.2	Manage an excavation to meet specifications	–
26.3	Detect work site safety and environmental hazards	–
Unit 27: Planning and Coordination		
27.1	Create work sequences for tasks and units of work	6
27.2	Organize material and equipment delivery to maximize productivity	–
27.3	Create work assignments for crew and individuals	6
27.4	Explain how to expedite materials and assign work to complete a job	–
27.5	Explain the building stages needed to complete a construction project	–
27.6	Align and incorporate the build environment and its systems to complete the project	–
27.7	Identify requirements for closeout and certificate of occupancy	–
27.8	Apply technical skills to restoring existing structures	–
27.9	Interpret a site plan	–
Unit 28: Supervisory Relationships with Workers		
28.1	Integrate worker orientation and employee development	–
28.2	Promote cooperation, teamwork and jobsite safety	1–15
28.3	Analyze the role of the supervisor on a construction project	–
28.4	Organize and prepare skilled workers to perform the job effectively and efficiently	–
28.5	Demonstrate conflict resolution skills	1,5,6
Unit 29: Client Relations		
29.1	Clarify client expectations	–
29.2	Employ positive client relationships	–