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# Wisconsin Youth Apprenticeship

## Architecture and Construction

### PROGRAM GUIDE



Department of Workforce Development

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## **Architecture and Construction YOUTH APPRENTICESHIP PROGRAM GUIDE**

### **Description**

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The Architecture and Construction career cluster comprises one of the largest industries in the United States. Careers ranging from architecture to welding are found within this particular cluster. According to the Department of Labor, the construction industry is the second largest employer in the U.S., second only to all government employees including the armed forces. Overall growth in construction trades within Wisconsin is predicted to climb to 17.9% through the year 2020. When the specific trades are evaluated for potential growth during that same time period, the need to support students learning to fill future employment gaps is very apparent. During this time period annual openings for Carpenters are expected to climb in demand by 46.7%. Heating, Ventilation, and Air Conditioning (HVAC) technician positions will see a 34.1% increase and Cement/Mason workers will increase in demand by 29.1% during that same time period. Earnings in this career cluster are higher than average and it offers more opportunities than most other industries for individuals who want to own or run their own business<sup>1</sup>.

The Architecture and Construction career cluster is expected to be driven by changing demographic trends. As baby boomers retire, there will be a need for more healthcare facilities, long term care facilities, and retirement communities. Educational buildings at all levels are getting older while enrollments continue to increase, which will require districts and colleges to build new facilities or renovate old ones<sup>2</sup>.

The Architecture and Construction career cluster involves careers in the designing, planning, management, building and maintaining the built environment. This Youth Apprenticeship occupational area focuses on two pathways within the Architecture and Construction industry: Construction and Design/Pre-Construction. People within the Construction pathway will choose between the skilled trades of Carpentry, Electrical, Masonry/Concrete, Mechanical/HVAC, and Plumbing/Sprinkler Fitting. People who work in the Design/Pre-Construction pathway turn a concept into a set of plans. Their plans guide other construction professionals as they continue the building process.<sup>3</sup>

The Youth Apprenticeship Program was approved by the Wisconsin State legislature in 1991 to provide a direct link between business, schools, and youth to meet the demands of technology, teamwork, communication, and leadership.

Wisconsin Youth Apprenticeship (YA) is a rigorous program that combines academic and related technical classroom instruction with mentored on the job learning for high school students. By training youth apprentices, employers play an active role in shaping the quality of their future workforce, improving the skill level of potential workers, and enhancing their

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<sup>1</sup> Department of Labor, High Growth Industry Profile- Construction, [www.doleta.gov](http://www.doleta.gov), accessed January 2014.

<sup>2</sup> Department of Labor, Occupational Outlook Handbook, Published January 8, 2014.

<sup>3</sup> States' Career Clusters, Architecture and Construction Brochure. [www.careertech.org](http://www.careertech.org) . Accessed 5-15-14.

competitive positioning in the marketplace. Employers, school districts, local consortiums, parents, and potential YA students are referred to the Youth Apprenticeship Program Operations Manual for general YA Program requirements.

## **Objective**

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The Wisconsin Architecture and Construction YA Program is designed to provide students with a working understanding of occupational and technical skills in one of the seven pathways within the Architecture and Construction industry. This program provides the framework for educators and industry to work together to produce work-ready, entry-level employees that will compete favorably in a global market, as well as, provide for post-secondary educational advancement while integrating work-based learning in the school and worksite.

The following features distinguish a YA Program from other similar youth work-based learning programs.

- Level Two Youth Apprenticeship is a two-year program for high school juniors and seniors with an interest in a particular field; i.e., architecture. One-year Youth Apprenticeship Programs are also available to pursue.
- Youth apprentices, parents, employers, YA program coordinators, and school districts enter into a written agreement approved by the Department of Workforce Development.
- Statewide skills are established by the industry, making the youth apprentice skill set more relevant to the state's employers.
- Youth apprentices are trained at the worksite by skilled mentors and are paid minimum wage or better for their work. Students average 10-15 hours/week, but may also work in the summer to complete their required hours.
- Youth apprentices receive a high school diploma and a Certificate of Occupational Proficiency from the Wisconsin Department of Workforce Development (DWD) at graduation.
- Youth apprentices may receive advanced standing credit and/or transcribed credit for the YA Program at a Wisconsin Technical College and/or at some four year colleges. See **Appendix F** for current details.
- Statewide skill standards focus on skills and knowledge needed by employers for entry level employment in the Architecture and Construction industry.

Students apply and are interviewed by Architecture and Construction employers for positions in the Architecture and Construction YA Program. The state approved skill standards and program guide for the Architecture and Construction YA Program are used in both the classroom instruction and worksite learning. If the local school district is unable to provide the related technical classroom instruction courses, they may contract with their local technical college or employer practitioners to do so.

The skill standards are competency based. Competencies are performance-based outcome statements of occupational related skills defined by representatives of Architecture and Construction worksites throughout Wisconsin and aligned with national skill standards. The competencies in this program are aligned with curriculum objectives from the Project Lead the Way (<http://www.pltw.org/>) and STEM Academy (<http://www.stem101.org/index.asp>) high school architectural and civil engineering programs, as well as, the National States' Career Cluster Skill Standards in Architecture and Construction, <http://www.careertech.org>. Competencies are also

aligned with the Wisconsin State Standards in Technology and Engineering and the National Center for Construction Education and Research. The competencies will be taught at the worksite in combination with supportive, related technical classroom instruction. While the skill competencies are established statewide, program implementation and oversight occurs through local consortium committees to assure local needs are met.

## **Target Population**

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This Youth Apprenticeship occupational area focuses on having YA students acquire basic skills pertinent to understanding and working within the Construction and Design/Pre-Construction pathways. Within the Design/Pre-Construction pathway, students will work with drafting and architectural technical documents in the first year along with the core employability, safety skills and certifications in OSHA and First Aid. Students will acquire basic concepts needed to read, edit, and create architectural drawings. The second year allows Architecture and Construction students to develop further skills in architectural planning and in specific residential and/or commercial design pieces.

YA students enrolled through the construction pathway will choose one pathway within the skilled trade areas for a one year level one program and two pathways for a level two or two year program. The pathways they will choose from within the skilled trades include: Carpentry, Electrical, Masonry/Concrete, Mechanical/HVAC, and Plumbing/Sprinkler Fitting. Students will also complete the core employability, safety and certifications in OSHA and First Aid.

All students successfully meeting current high school graduation requirements and with a good attendance record for that year are encouraged to apply for the Architecture and Construction Youth Apprenticeship (YA) Program. The student must apply to the program in the year previous to program entry and be on track toward fulfilling high school graduation requirements in their school district. SEE **Appendix G** for students entering or continuing the Architecture and Construction YA Program in 2014.

All Youth Apprentices must complete the industry-wide foundational skill competencies consisting of competencies in core employability skills and safety. The students will also complete the certifications under the program which include OSHA 10 and First Aid. The Required Skill competencies must be completed concurrently with the specific technical skills. Once a student successfully completes the Online 10-Hour Construction Industry course, the student receives a wallet card from OSHA Training Institute (OTI). The wallet card demonstrates that the student has the fundamental safety knowledge needed in the workplace. Young workers will develop a safety mindset and acquire marketable skills for a competitive edge.

Potential youth apprentices will be required to complete a minimum of 450 work hours with 180 hours (2 semesters) of related technical classroom instruction for a Level One (1-year) Architecture and Construction YA Program or a minimum of 900 work hours with 360 hours (4 semesters) of related technical classroom instruction for a Level Two (2-year) Architecture and Construction YA program.

Architecture and Construction YA students are required to earn OSHA and First Aid certification and perform all of the Core and Safety skills. **Level One (one year)** YA students also are required to complete a one year experience within a skilled trade area or the basic unit within the Design pathway. **Level Two (two year)** YA students are required to complete all of the requirements for a level one student in addition to another unit within one of the pathways.

Students may complete the same unit within the Construction Pathway to further hone their skills.

## **Architecture and Construction Units**

### **Construction Pathway**

- Carpentry
- Electrical
- Masonry/Concrete
- Mechanical/Heating, Ventilation, and Air Conditioning (HVAC)
- Plumbing/Sprinkler Fitting

### **Design/Pre-Construction Pathway**

- Architectural Drafting Unit- REQUIRED FIRST
- Architectural Planning Unit

## **Architecture and Construction Program Responsibilities**

The following responsibilities are outlined for individuals involved in the Architecture and Construction YA Program.

### **Students –**

1. Maintain academic skills and attendance at the high school to remain on track for high school graduation.
2. Participate in progress reviews as scheduled.
3. Exhibit maturity and responsibility to meet requirements of employment as designated by the employer.

### **Parents or Guardians -**

4. Ensure that adequate transportation is available to and from the worksite.
5. Participate in student progress reviews as scheduled.

### **School District -**

6. Recruit students and coordinate student enrollment in the program with the consortiums and/or employers.
7. Integrate the YA Program related technical classroom instruction and worksite training into the student's overall education program with high school graduation credit issued for each semester successfully completed.
8. Participate in student progress reviews as scheduled.

### **YA Program Coordinators -**

9. Apply and maintain approval from the DWD to operate a YA Program.
10. Ensure a minimum of 450 hours of worksite instruction/experience plus a minimum of 180 hours of related technical classroom instruction for each one year YA program.
11. Establish and meet regularly with an advisory committee that will identify when and where tasks will be taught during the Architecture and Construction YA Program.

12. Develop and maintain a yearly commitment with participating high schools, technical colleges, and local businesses to accommodate the number of students involved in the Architecture and Construction YA Program.
13. Establish and maintain a YA student grievance procedure.
14. Provide employer mentor training.

#### **Related Technical Classroom Instruction Faculty -**

15. Qualify in the specialty areas being taught in the YA Program.

#### **Employers and Worksite Mentors -**

16. SEE **Appendix B** – Architecture and Construction YA Implementation Guide for Employers.
17. Participate in a mentor training session and provide on the job training of the Youth Apprentices.

#### **Department of Workforce Development -**

18. Monitor national and state regulatory agencies, such as OSHA, for changes and impact on the Architecture and Construction Youth Apprenticeship Program.

#### **Program Guide Organization**

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The competencies in this program are aligned with curriculum objectives from the Project Lead the Way (<http://www.pltw.org/>) and STEM Academy (<http://www.stem101.org/index.asp>) high school architectural and civil engineering programs, as well as, the National States' Career Cluster Skill Standards in Architecture and Construction, <http://www.careertech.org>. Competencies are also aligned with the Wisconsin State Standards in Technology and Engineering and the National Center for Construction Education and Research.

The Architecture and Construction YA Program also requires that Related Technical Classroom Instruction is provided to support attainment of the knowledge necessary to master the competencies. While recommendations for specific Related Technical Classroom Instruction are detailed separately in **Appendix C**, instructional requirements will vary depending on local consortium and advisory group decisions. It is strongly advised that local consortiums work with their advisory groups to determine appropriate Related Technical Classroom Instruction based on their local needs and resources.

The Youth Apprenticeship Program curriculum is written and organized according to the Worldwide Instructional Design System (WIDS) format and includes the Architecture and Construction YA Skill Standards Checklist and Course Outcome Summary (COS) for the program. Overall progress is documented on the Skill Standards Checklist which lists skill level achievement for each competency achieved. The COS outlines each skill competency with its corresponding performance standards and learning objectives. The Performance Standards describe the tasks and behaviors, as applicable, that employers should look for in order to evaluate the competency. The Learning Objectives outline the recommended content to be covered in the related technical classroom instruction. SEE **Appendix D** - Wisconsin Instructional Design System (WIDS) Format and Youth Apprenticeship Program Guide Terms and **Appendix E** - Use and Distribution of the Curriculum for further details.

## **Evaluation**

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The student must successfully complete the related technical classroom instruction and demonstrate the minimum skill level required on the Architecture and Construction YA Skill Standards Checklist for each competency according to the applicable curriculum. Worksite mentors and/or instructors use this checklist to evaluate the learner on each of the required skills. It is the responsibility of the mentor(s) to rate the students skill level on all tasks performed at the worksite.

## **Architecture and Construction YA Program Completion**

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Upon successful completion of high school and the Level Two (2 year) Architecture and Construction YA Program requirements, the youth apprentice will receive a high school diploma and the applicable Certification of Occupational Proficiency from the Department of Workforce Development indicating “Architecture and Construction Youth Apprenticeship.” Youth Apprentices who successfully complete a Level One (1 year) Architecture and Construction YA Program and who are on track for graduation will be eligible for a Level One Certificate from the Department of Workforce Development. Furthermore, the YA students may:

1. Continue to work in the Architecture and Construction industry.
2. Apply to a registered apprenticeship.
3. Pursue a degree or diploma from a Wisconsin Technical College with advanced standing and/or transcribed credit.
4. Apply for admission to a four-year University of Wisconsin school with high school academic elective credit for admission.
5. Go into military service.

SEE **Appendix F** for current agreements for post-secondary credit at Wisconsin Technical Colleges and University of Wisconsin colleges.



## **Appendices**

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Appendix A - Work Contracts, Child Labor Laws, Liability and Insurance

Appendix B - Architecture and Construction YA Implementation Guide for Employers

- Benefits to the Employer
- Role of the Employer
- Role of the Mentor
- Checklist for Program Participation
- Checklist for Program Operation
- Frequently Asked Questions
- Work Contracts, Child Labor Laws, Liability and Insurance (insert Appendix A)

Appendix C - Recommended Related Technical Classroom Instruction

Appendix D - Wisconsin Instructional Design System (WIDS) Format and Youth Apprenticeship  
Program Guide Terms

Appendix E - Use and Distribution of the Curriculum

Appendix F - Post Secondary Credits

Appendix G - Grandfather Clause – Program Transition Guidelines

Appendix H - Architecture and Construction Skill Standards Checklist

Appendix I - Architecture and Construction YA Course Outcome Summary: Overview and  
Table of Contents (COS)

Appendix J - Architecture and Construction Required Skills Curriculum and Certifications  
(Units 1, 2 and 3)

Appendix K - Carpentry (Unit 4)

Appendix L - Electrical (Unit 5)

Appendix M - Masonry/Concrete (Unit 6)

Appendix N - Mechanical/Heating, Ventilation, and Air Conditioning (HVAC) (Unit 7)

Appendix O - Plumbing/Sprinkler Fitting (Unit 8)

Appendix P - Architectural Drafting Unit (Unit 9)

Appendix Q - Architectural Planning Unit (Unit 10)

## Appendix A

### WORK CONTRACTS, CHILD LABOR LAWS, LIABILITY AND INSURANCE

#### WORK CONTRACTS

##### Education Training Agreement -

Students and employers participating in an approved youth apprenticeship program must have a *signed Education/Training Agreement (ETA) on file with both the school AND the employer.* Employers without a valid ETA may be assessed (a) double compensation in the event of injury on the job, and/or (b) fines ranging from \$25 to \$1,000 for every day without a permit for a first offense to \$250 to \$5,000 for every day without a permit for a second offense within a five year period. The Local Youth Apprenticeship Coordinator will provide the employer with a copy of the ETA. This form is also available from the Department of Workforce Development at [http://dwd.wisconsin.gov/youthapprenticeship/forms\\_pubs.htm](http://dwd.wisconsin.gov/youthapprenticeship/forms_pubs.htm)

##### Work Permits -

Students and employers participating in an approved youth apprenticeship program do not need to obtain a separate work permit for the work to be performed as a part of the youth apprenticeship program, **although it is highly recommended.** If employers hire the youth apprentices to perform other work duties outside of their youth apprenticeship duties, a work permit will be required. Employers without a valid work permit (if applicable) may be assessed (a) double compensation in the event of injury on the job, and/or (b) fines ranging from \$25 to \$1,000 for every day without a permit for a first offense to \$250 to \$5,000 for every day without a permit for a second offense within a five year period.

#### CHILD LABOR LAWS

Youth apprentices enrolled in approved youth apprenticeship programs and their employers are subject to all state and federal child labor laws regarding the employment of minors. The Department of Workforce Development (DWD) will review all statewide youth apprenticeship curriculum for compliance with the child labor laws and will clarify the laws whenever necessary to allow for program implementation. Youth apprentices *are allowed* to work in **some prohibited** occupations because they meet the criteria of "**student learner**" **AND** the work performed is **incidental** to their training **and is for intermittent and for short periods of time** (DWD 270.14(3)(c)1). However, they are **not exempt** from the child labor laws by virtue of being enrolled in a youth apprenticeship program. Students and employers must comply with child labor laws with regard to daily/weekly hours, time of day, employment, etc.

While DWD can interpret the law, DWD cannot exonerate employers from liability should an accident occur on the job which results in injury to an employee and a subsequent lawsuit. Determining liability for an accident can only be settled in a court of law. DWD can assure employers that they will not be cited (by DWD) for illegally employing a minor in a prohibited occupation as long as the students are enrolled in a DWD approved youth apprenticeship program and a signed Education/Training Agreement is on file with both the student's high school and the employer. This means that employers will not be assessed treble fines should an injury occur which results in the employer being cited.

Readers should refer to DWD 270.12 and 270.14 [Child Labor Laws](#) for descriptions and definitions of the occupations or activities which are normally prohibited to minors.

## Architecture and Construction -

Youth apprentices who are 16-17 years old can perform the following tasks, *only after appropriate operation/safety training AND only as indicated below*. The **student learner exception** limits the minor to *using hazardous equipment* on an incidental basis [less than 5% of their work time] and only occasionally [can't be a regular part of their job]. For example, the student learner exception works better in a job like carpentry where most of the work is acceptable but once in a while you might need the minor to use a portable saw to cut a piece to fit. Further interpretation or clarification of Child Labor Laws should be directed to the Department of Workforce Development (DWD) Labor Standards Bureau Director.

- **Excavation Operation (270.12(9)) -**
  - Students may manually excavate or manually backfill trenches **only if** they do not exceed 4 feet in depth at any point, or are working in trenches that do not exceed 4 feet in depth at any point.
  - Students may manually excavate **only if** the depth does not exceed 4 feet below any ground surface adjoining the excavation, or the excavation does not exceed such depth, or the side walls are shored or sloped to the angle of repose.
  - Students may work within tunnels **only if** all driving and shoring operations are complete.
  - Student may work within shafts **only if** all sinking and shoring operations are complete.
  
- **Woodworking Power-drive Machine Use (270.12(27)) -**
  - Minors may operate power-driven woodworking machines **only if** placing of material on a moving chain or in a hopper or slide for automatic feeding. *All other types are considered hazardous.*
  - "*Power-driven woodworking machines*" means all fixed or portable machines or tools driven by power and used or designed for cutting, shaping, forming, surfacing, nailing, stapling, wire stitching, fastening, or otherwise assembling, pressing, or printing wood or veneer.
  
- **Saws and guillotine shears (270.12(25)) -**
  - Students may operate or assist on these types of machines **only if** they are equipped with automatic feed and ejection. *All other types are considered hazardous.*
  
- **Metal forming, punching and shearing power-driven machines (270.12(19))-**
  - Students may operate or assist on pressing or punching machines such as punch presses machines **only if** they are equipped with automatic feed and ejection, as well as, a fixed barrier guard to prevent the hands or fingers of the operator from entering the area between the dies; power presses; and plate punches. *All other types are considered hazardous.*
  
- **Roofing or on or about a Roof (270.12(24)) -**
  - Students are **not allowed** to work in roofing operations or on or about a roof.

- "On or about a roof" includes all work performed upon a roof, including carpentry and metal work, alterations, additions, maintenance and repair, including painting and coating of existing roofs; the construction of the sheathing or base of roofs; gutter and downspout work; the installation and servicing of heating, ventilation and air conditioning equipment or similar appliances attached to roofs; and any similar work that is required to be performed upon or about roofs.

However, student learners may work in roofing operations in accordance with an approved student learner agreement.

- Student Learner (DWD 270.14(3)(a))-  
Except as provided in paragraph (f), a **student learner shall be exempt** from the prohibitions in DWD 270.12 and 270.13 **if** the student learner is **performing service within a bona fide** school-work training program sponsored by an accredited school and authorized and approved by the state department of public instruction, the technical college system board, or the **department's youth apprenticeship program**.
- **Hoists and Hoisting Apparatus (270.12(12)) -**
  - Students age 16 and 17 years old are allowed to operate an elevator, crane, derrick, hoist or high-lift truck (including hoists commonly used on tow trucks and other hoists), **only if** it is an air operated hoist not exceeding one-ton capacity. *All other types are considered hazardous.*
  - Students may perform work that involves riding on a man lift or on a freight elevator **only if** the freight elevator operated by an assigned operator
  - Students under age 18 may operate an automatic elevator and an automatic signal operation elevator under certain conditions. (Refer to DWD 270.12 and 270.14).
- **Motor Vehicle Driver and Outside Helper (270.12(21)) -**  
A minor, **age 17**, may operate a motor vehicle as a part of employment **only if**:
  - the vehicle does not exceed 6,000 pounds gross weight;
  - driving is done during daylight hours only;
  - the driving amounts to no more than 20% of the work week or 1/3 of the work day;
  - the student has attended drivers' education training and holds a valid driver's license;
  - the driving takes place within a 30-mile radius of the minor's place of employment;
  - the minor has no record of any moving violations at the time of hire; and
  - the driving does not involve: towing of vehicles, route deliveries or sales, transportation for hire, urgent time-sensitive deliveries, transporting more than 3 passengers who are employees of employer at one time.

### **Student Learner Criteria -**

In order to be considered a student learner, youth apprentices must meet the following criteria:

1. They are enrolled in a youth apprenticeship program approved by DWD;
2. They are enrolled in school and receiving school credit for program participation;
3. They receive appropriate safety instruction at the school and at the workplace;
4. The work performed is under direct and close supervision of a qualified and experienced person;
5. The **work performed in any occupation declared hazardous** is **incidental** to their training **and** is for **intermittent and short periods of time** (refer to DWD 270.14(3)(c)1; and

6. There is a schedule of organized and progressive work processes to be performed on the job (i.e. the worksite is following the state curriculum).

### **Hours of Work -**

The hours an apprentice spends working in the program *during* the hours school is in session during the day DO NOT COUNT towards the limitation on total hours a minor may work. See the DWD [Child Labor](#) web site for applicable hours and times of the day that minors may work in Wisconsin.

## **LIABILITY AND INSURANCE**

As employees of the company, youth apprentices are covered by worker's compensation in the event of injury on the job. Employers should review their specific liability coverage to ensure there are no restrictions on employing minors and/or on coverage of minors operating particular machinery. Schools are not allowed to cover youth apprentices through their own workers' compensation policy while the youth apprentice is an employee of the local business.

As stated previously, DWD and/or local schools cannot exonerate employers from liability if a youth apprentice is injured on the job and a subsequent lawsuit is filed against the employer. Determining liability for an accident can only be settled in a court of law and will be based on the specific circumstances for each case. It is important that a signed ETA be on kept on file by both the school and the employer to ensure that employers will not be cited for illegally employing a minor in a prohibited occupation.

### **General Liability –**

An employer is liable for the service provided at their facility. In general an employer has adequate general liability and workers compensation coverage, no additional liability is required as a result of the Youth Apprenticeship program. However, before participating in the program, an employer may wish to consult with their insurance carrier.

### **Transportation –**

In general, the party responsible for transportation is liable in case of an accident. Youth apprentices responsible for their own transportation to and from the worksite are responsible for their own insurance. In instances where the school provides transportation for the youth apprentices, the school is responsible for insurance coverage. Only if the facility provides transportation to and from work for the youth apprentice is the facility responsible for this insurance coverage.

### **Workers Compensation –**

Once a youth apprentice becomes a paid employee they must be covered by the employer's workers compensation coverage.

### **Unemployment Compensation –**

If a youth apprentice is enrolled full-time in a public educational institution and receives school credit for their participation in the YA program, then they are NOT eligible to file for unemployment compensation from the employer. Youth apprentices who do NOT meet these criteria may be eligible for unemployment compensation benefits.

### **Worker Displacement –**

No employer may hire a youth apprentice who will displace any currently employed worker, including a partial displacement, such as reduction in the hours of non-overtime work, wages, or employment benefits.

### **Layoffs/Strikes –**

A youth apprentice cannot be hired when any other individual is on temporary layoff, with the clear possibility of recall, from the same or equivalent job OR if the employer has terminated the employment of any regular employee, or otherwise reduced the workforce, with the intention of filling the vacancy created with a youth apprentice. Local bargaining units should determine the status of youth apprentices already working in the facility in the event of a layoff. Youth apprentices may be laid off or transferred to work areas to take the place of laid off workers. Child labor laws prohibit youth apprentices from working in a company where a strike or lockout is in active progress.

### **Collective Bargaining Agreements –**

The youth apprenticeship program should not impair existing contracts for services or collective bargaining agreements. Any youth apprenticeship program that would be inconsistent with the terms of a collective bargaining agreement shall be approved only with the written concurrence of the labor organization and employer involved.

## Appendix B

### Wisconsin Architecture and Construction Youth Apprenticeship Implementation Guide for Employers

#### BENEFITS TO THE EMPLOYER

Architecture and construction careers comprise one of the largest industries in the United States. Many new jobs will be added and more opportunities will arise resulting from the need to replace experienced workers who leave jobs<sup>4</sup>. Earnings in this career cluster are higher than average and it offers more opportunities than most other industries for individuals who want to own or run their own business. Overall growth in construction trades within Wisconsin is predicted to climb to 17.9% through the year 2020. When the specific trades are evaluated for potential growth during that same time period, the need to support students learning to fill future employment gaps is very apparent. Annual openings for Carpenters are expected to climb to 46.7%. HVAC technician positions will see a 34.1% increase and Cement/Mason workers will increase in demand by 29.1% during that same time period<sup>5</sup>. The Youth Apprenticeship program in construction trades specifically addresses these career areas and will provide a framework for employers to work with students and begin to grow their next generation of talent.

The Architecture and construction career cluster is expected to be driven by changing demographic trends. As baby boomers retire, there will be a need for more healthcare facilities, long term care facilities, and retirement communities. Educational buildings at all levels are getting older while enrollments continue to increase, which will require districts and colleges to build new facilities or renovate old ones. DOL's Employment and Training Administration is supporting comprehensive partnerships that include employers, labor-management organizations, the public workforce system, and other entities that have developed innovative approaches that address the workforce needs of business while also effectively helping workers find good jobs with good wages and promising career pathways in the construction industry.

This set of workforce solutions is based on the construction industry's priorities that address issues such as:

- expanding the pipeline of youth entering the construction industry;
- enhancing the capacity of secondary schools to prepare youth to enter post-secondary programs and employment in the construction industry;
- providing a career lattice approach to the recruitment, education, training, professional development, and job placement of construction workers;
- helping alternative labor pools, such as women, learn about career opportunities and gain skills needed in the construction industry;
- enhancing the capacity of community colleges and the public workforce system to help alternative labor pools enter the industry;
- developing accelerated training programs that help dislocated workers quickly enter the construction industry; and
- creating comprehensive partnerships that help entry-level workers enhance their skills and utilize apprenticeship and other training programs.<sup>6</sup>

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<sup>4</sup> Architecture and Construction Career Cluster Brochure, <http://www.careertech.org/>, October 2014.

<sup>5</sup> Bureau of Labor Statistics, [www.bls.gov](http://www.bls.gov). Accessed, April 2014.

<sup>6</sup> Department of Labor, Occupational Outlook Handbook, Published Jan. 8, 2014.

By working with the Architecture and Construction Youth Apprenticeship Program you make an investment in the young people in your community. You will have access to a dependable recruitment pipeline of entry level workers that can be used to increase workforce diversity and provide supervisory opportunity for staff. You will be directly involved in the economic development efforts of your community as well as become a part of the creation of highly skilled workers, an excellent point in any public relations marketing.

A unique opportunity and added incentive for participation in the Architecture and Construction Youth Apprenticeship Program for both the employer and the student is that the competencies are aligned with the curriculum objectives of the Project Lead the Way (<http://www.pltw.org/>) and STEM Academy (<http://www.stem101.org/index.asp>) high school architectural and civil engineering programs, the national occupational skill standards recognized by the National Association of State Directors of Career Technical Education Consortium in Architecture and Construction (<http://www.careertech.org/>), and the Secretary's Commission on Achieving Necessary Skills (SCANS) at <http://wdr.doleta.gov/SCANS/>. The competencies are also aligned to the Wisconsin standards for Technology and Engineering.

Employers also play an active role in improving the quality of the future workforce by helping develop skill standards geared to employer needs, reducing employee turnover by hiring program graduates, supporting program graduates as they continue their education in post-secondary settings, raising the interest of other employees in education and training, and increasing the potential for teamwork and flexibility in work sharing. One employer noted, "This program is the single most effective use of taxpayer dollars to link our business community to the workforce and training needs of the community. We must expand, celebrate, promote and encourage participation in this endeavor. I have personally gained staff, changed some lives, and enjoyed the successes of the participants. It has enriched our staff in learning to operate as mentors, and enhanced our perception in the community as involved participants."<sup>7</sup>

## **ROLE OF THE EMPLOYER**

The work-based learning component of the Youth Apprenticeship Program is the **primary** method for teaching the required competencies. The local business becomes an extension of the classroom for the youth apprentice. The related classroom instruction is intended to *support* the work-based learning experience by providing theoretical knowledge and, when needed, providing appropriate skill development. The work-based learning component is designed to provide an on-the-job learning environment for students by being "apprenticed" to an experienced mentor.

As an employer of a youth apprentice, you will be responsible for the following:

### **Student Selection**

Review employment applications, interview candidates, and select the student(s) they want to hire. New Employee Orientation is provided by you according to your facility's Human Resources policies.

---

<sup>7</sup> Kent Olson, YA Employer, Wausau, WI



## **Wages**

Youth apprentices must receive minimum wage or higher. A pay schedule is agreed upon with the employer, local YA coordinator and the student. Most employers grant periodic raises dependent upon performance or length of employment.

## **Workers Compensation**

Once a youth apprentice becomes a paid employee they must be covered by the employer's workers compensation coverage. Other benefits may be provided at the discretion of the employer.

## **Education/Training Agreement (ETA)**

Employers must sign and comply with the requirements in the ETA, and have a copy on file. See *Appendix A "Work Contracts, Child Labor Laws, Liability & Insurance"* for more detail.

## **Work Permits**

See *Appendix A "Work Contracts, Child Labor Laws, Liability and Insurance"* for more detail.

## **Child Labor Laws**

Employers must ensure that the work of any student at their worksite is allowed by Child Labor Laws and is under the direct and close supervision of a qualified and experienced person. Students must be provided with adequate safety training both in the school and at the worksite. All Architecture and Construction Youth Apprenticeship skill standards **competencies** have been reviewed by the Wisconsin Department of Workforce Developments Labor Standards Bureau and are in compliance with the child labor rules.

See *Appendix A "Work Contracts, Child Labor Laws, Liability and Insurance"* for more detail.

## **Unemployment Compensation**

YA students are typically not eligible for unemployment compensation from the employer. See *Appendix A "Work Contracts, Child Labor Laws, Liability & Insurance"* for more detail.

## **Job Performance**

Employers review, evaluate, and report on the youth apprentice's job performance approximately every nine weeks to ensure they are learning the required competencies. Mentors are expected to participate in progress reviews with the apprentice, school staff and/or Youth Apprenticeship instructors, and parent(s)/guardian(s).

## **Worksite Hours**

Employers must provide for the youth apprentice to meet the following work requirements:

- Youth Apprentices in a Level Two (2-year) program must complete a *minimum* of **900 hours** of work-based learning while they are enrolled in the program. At least 500 hours of the required minimum work-based learning hours must take place when related classes are being held, so that classroom instruction can be integrated with worksite learning.
- Youth apprentices in a Level One (1 year) program must complete a *minimum* of **450 hours** of work based learning while they are enrolled in the program. At least 250 hours of the required minimum work-based learning hours must take place when related classes are being held, so that classroom instruction can be integrated with worksite learning.

- Youth apprentices may work *more* than the required minimum hours throughout the program as long as they do not exceed the daily or weekly hours allowable under the child labor laws.

### **Training to Competencies**

The employer is responsible for providing the worksite training required to meet the skills standard competencies specified in the applicable Architecture and Construction area. This requirement means that while the youth apprentice may be hired under one particular job function, he/she must be allowed to rotate and perform other functions in other departments to meet competencies if some of them are not normally a part of that job function.

### **Mentors**

Employers assign worksite mentors to supervise and train youth apprentices. They also allow the mentors to attend special training classes provided by the local YA consortium to become successful mentors of high school apprentices. See “Role of Mentors” below for more detail.

### **Organized Labor**

Usually the Architecture and Construction Youth Apprenticeship is considered an educational activity rather than a job classification/position status. However, the youth apprenticeship program should not impair existing contracts for services or collective bargaining agreements. Any youth apprenticeship program that would be inconsistent with the terms of a collective bargaining agreement shall be approved only with the written concurrence of the labor organization and employer involved. If youth apprentices will be working in areas covered by labor agreements, organized labor must be involved to approve the program at the worksite. See *Appendix A “Work Contracts, Child Labor Laws, Liability & Insurance”* for more detail.

## **ROLE OF THE MENTOR**

Workplace mentors are one of the most critical elements, which often determine the success of a youth apprenticeship. One mentor may work with more than one youth apprentice at a worksite, and the mentor may assign multiple “trainers” to instruct the youth apprentice while they rotate among various departments. Also see: “For Employer Mentors” online modules at: [http://dwd.wisconsin.gov/youthapprenticeship/training/skills\\_safety.htm](http://dwd.wisconsin.gov/youthapprenticeship/training/skills_safety.htm).

### **Effective Mentor Qualifications**

- Experience working with adolescents either on the job, through family, or through outside activities
- Effective teaching/training skills with adults and/or youth
- Highly skilled in the area in which the youth apprentices will be trained
- Good communication skills in the workplace
- Knowledge of and commitment to the Architecture and Construction Youth Apprenticeship program

## **Mentor Responsibilities**

- Develop a cooperative training schedule for the youth apprentice to ensure performance of the required work-based skills
- Work with instructors to coordinate the application of classroom learning objectives to the worksite
- Communicate regularly with the school, YA coordinator, and the instructor to ensure work-based learning objectives are being met
- Demonstrate tasks to youth apprentices and explain their importance
- Identify other trainers appropriate to train youth in the required competencies
- Evaluate the youth apprentice's progress on a regular basis and document achievements and skills
- Meet with the student, the student's parent(s)/guardian(s), and school staff and/or YA instructor at least once each grading period to review and update them on the student's progress
- Provide encouragement, support, and direction about the work site culture and skills
- Help the youth apprentice build self-confidence and self-esteem
- Be alert to personal problems that may affect the apprentice's work performance and guide them to seek help from appropriate sources
- Attend mentor training workshops and mentor meetings

Obtain additional resources for mentoring guidance from your YA coordinator.

## **CHECKLIST FOR PROGRAM PARTICIPATION**

The following checklist will help you to participate in an Architecture and Construction Youth Apprenticeship (YA) Program. Youth Apprenticeship coordinators are available to meet at your location to facilitate any phase of the YA program.

- Discuss the Architecture and Construction YA program with the local partnership that offers Youth Apprenticeship Programs.
- Consult with the management team of your organization and union officials, if applicable.
- Obtain approval from appropriate organization officials to hire youth apprentices.
- Identify mentors and arrange for mentor training through your local YA Coordinator.
- Interview Architecture and Construction YA candidates for the program.
- Select youth apprentice(s).
- Sign Education/Training Agreement (ETA).
- Secure a Work Permit form.
- Orient your new youth apprentice to the workplace according to your organization's Human Resources policies.

## **CHECKLIST FOR PROGRAM OPERATION**

The following checklist will help ensure continued operation of the Architecture and Construction Youth Apprenticeship (YA) Program.

- Provide worksite training according to the Architecture and Construction Youth Apprenticeship Area curriculum.

- Participate in progress reviews with youth apprentices, school staff and/or YA instructors, and parents/guardians.
- Meet regularly with the youth apprentices to discuss their performance and any other issues.
- Employ youth apprentices during school breaks, either part-time or full-time.
- Participate in recognition events organized by the school for youth apprenticeship graduates.

## FREQUENTLY ASKED QUESTIONS

For questions not addressed here, do not hesitate to call your local youth apprenticeship coordinator or visit the [Department of Workforce Development Youth Apprenticeship website](#).

### ***How does this program differ from other work-based programs like Internship or Skilled Certified Co-op education?***

Skilled Certified Coop Education and Youth Apprenticeship are similar in that they are both components of Wisconsin’s overall school to work transition programs. An important difference, however, is that Youth Apprenticeship students are exposed to an occupational cluster versus a specific job. Additionally, the skills the student learns are developed in association with Wisconsin Architecture and Construction personnel, Wisconsin technical college faculty, YA consortium coordinators, and school district coordinators/instructors. The curriculum is standardized throughout the state and developed with business and industry input vs. the Education sector.

### ***Will the mentor have to spend his/her entire time at work teaching the student?***

No. Apprentices need to be supervised, but you are not required to “shadow” them at all times. However, someone should be available for guidance as necessary. One mentor may work with more than one youth apprentice at a worksite, and the mentor may assign multiple “trainers” to instruct the youth apprentice while they rotate among various departments.

### ***Will the student do productive work?***

Yes. After appropriate training, youth apprentices can become productive employees of the facility. However, since they are often rotated through different departments they will require more training time than employees who stay in the same department. It is important to remember that this is a training program. Upon completion of the probationary period, students are expected to meet the requirements of the position.

### ***Will there be a lot of paperwork for me to complete?***

Prior to the program, employers are required to sign the Education Training Agreement and maintain it. During the program, employers are expected to verify the youth apprentice’s skills on the job and provide input during grading periods. Mentors must complete/maintain a simple “Skill Standards Checklist” as the student completes their competencies.

### ***What happens if I cannot provide all of the required competencies at my facility?***

In order to successfully complete the program and receive a Certificate of Occupational Proficiency, the youth apprentice must demonstrate proficiency in all areas required on the Skill Standards Checklist. If your facility does not provide the full range of services needed for competency mastery, the local youth apprenticeship coordinator may be able to arrange for the missing skills to be provided by another company. This arrangement should be discussed with the coordinator before you hire the youth apprentice.

***What costs will my business incur and will I be reimbursed?***

Primary costs to the employers are the wages paid to the youth apprentice and mentor during the training period. YA student wages are not reimbursed.

***Will I have to treat the youth apprentice differently than my other employees?***

It is important to remember youth apprentices are placed in your facility to learn. Patience and guidance are required while they learn responsible work habits as well as the required skills. However, they are expected to follow your facility's work rules, e.g., dress code, behavior, discipline, etc., and to become a productive member of the Architecture and Construction team.

***What is the typical time frame for activities over the course of a youth apprentice's stay with a facility?***

Most program activities follow a one-year or two-year cycle depending on the offerings within your company. There may be variance in the timing of learning activities to accommodate local and seasonal needs including trainer availability.

## Appendix C

### RECOMMENDATIONS FOR RELATED TECHNICAL CLASSROOM INSTRUCTION FOR ARCHITECTURE AND CONSTRUCTION YA

These recommendations are intended to be used by the Local YA Consortium when determining appropriate related technical instruction for Architecture and Construction YA. It is not all inclusive but should be used to assist the partnership with identification and/or development of course work that supports the work-based competencies as identified in the Skill Standards Checklist. As with all YA programs the consortium must ensure that the related instruction meets with the approval of their administration and school board.

#### OPERATIONAL NOTES

- Related Technical Classroom Instruction maybe offered by the employer, within the school district, at another school district, at a Wisconsin Technical College, and/or at a Community College or University by instructors qualified according to the Youth Apprenticeship Program Operations Manual. School districts also have the option to utilize the Trade Specialist Permit under *Wisconsin State Statute 118.19(7)*, which allows skilled apprentices with 3 years of practical experience beyond the apprenticeship in the trade area that matches the course(s) being taught; or has four years of institutional training in the subject area that matches the course(s) being taught to deliver instruction to students.
- Learning Objectives are the foundation of related technical classroom instruction. Consortiums may teach using locally developed coursework; however, it is recommended that agreements with the local technical college be pursued to obtain post-secondary credit for YA worksite and classroom experiences.
- A minimum of 180 hours (2 semesters) of related technical instruction is required for each one year YA program with 250 of the **work** hours coinciding with the instruction. The student must also receive high school credit towards graduation for this instruction, no matter the provider.
- It is suggested that the following courses or learning experiences be provided as a pre-requisite OR concurrently for students interested in this youth apprenticeship:
  - a. Introduction to Architecture and Construction Careers
  - b. Basic drafting, namely in 3D Modeling Software such as Revit or CAD
  - c. Construction/Building Trades/Woodworking
  - d. Computer File Management
  - e. Technical Math and Measuring, Geometry/Trigonometry
  - f. Physics
  - g. Additionally, students should complete a job shadow prior to enrollment in the Architecture and Construction YA program.
- Commercial programs or employer provided classroom certification programs are also appropriate provided that the student receives high school credit towards graduation for the class work. A variety of commercial courses are available. Programs that support Architecture and/or Civil Engineering learning based on the Project Lead the Way curriculum units (<http://www.pltw.org/>) or STEM Academy curriculum units (<http://www.stem101.com/index.asp>) are appropriate for this YA program.

- Courses chosen should coincide as much as possible to occupational program requirements if the student intends to continue in the Wisconsin Technical College System or University of Wisconsin system.
- Recommendations for this Appendix were obtained from Employers, Wisconsin Technical College Faculty, Wisconsin secondary Career and Technical Education teachers, and YA Consortium/School District Coordinators during Business and Industry Advisory meetings held in January, February and March 2014 for the Construction pathway. Recommendations for the Architecture and Construction YA program occurred in August 2010, and through the States' Career Clusters recommendations at <http://www.careertech.org/>, funded in part by the U.S. Department of Education.

## Architecture & Construction Youth Apprenticeship (YA) Plan of Study

**NAME:** \_\_\_\_\_ **DATE:** \_\_\_\_\_

The **Architecture & Construction Youth Apprenticeship Pathway Units** and **Related Technical Instruction course selection and delivery** are entirely within local consortium control. The recommendations listed below are only a suggested path of YA Architecture & Construction career planning and should be individualized to meet each learner’s educational and career goals. All plans should meet high school graduation requirements, as well as, college entrance requirements if applicable.

### HIGHLY Recommended for **Architecture & Construction** YA students

Educational Level	Grade	English/ Language Arts	Social Studies Social Sciences	Math	Science	Career Pathway Courses (Electives)	Recommended Enhancement Electives or Activities
		4 required	3 Required	2 Required	2 Required		
<b>Secondary</b>	<b>9</b>	Oral Communications (Speech)  Business Communications		Technical Math & Measuring  Algebra		Basic Drafting (CAD) Digital Electronics (AC/DC) Construction/Building Trades Computers- File Management Introduction to Construction Cabinet Making	Skills USA District House Builds Entrepreneurship Accounting
	<b>10</b>			Geometry		3D Modeling Drafting Entrepreneurship Intro to Business	Skills USA  Job-Shadowing
	<b>11</b>		Personal Financial Management	Trigonometry	Physics	Employability Skills Customer Service (Marketing) Principles of Business Management 3D Architectural Modeling with Revit (Design Pathway)  Project Lead the Way Courses: IED or CIM STEM Academy Courses also applicable	
	<b>12</b>		Economics		Environmental Science		



## Post-Secondary Occupational Opportunities

The chart below shows examples of career ladders organized by pathway.

For additional career cluster information, visit [www.careertech.org](http://www.careertech.org)

For additional career information on a specific occupation, visit <http://wiscareers.wisc.edu/> or <http://worknet.wisconsin.gov/worknet/default.aspx>

		High School Diploma, On-the-Job Training	Certificate, Licensing, and/or Associate's Degree (1-2 years college)	Bachelor's/Master's Degree (4 year college)
Architecture & Construction Pathways	<b>Design/ Pre-Construction</b>	Drafting Helper	Drafter Civil Engineer Technician Code Official Cost Estimator Interior Designer Mechanical Drafter Surveying Technician	Architect Cartographer Civil Engineer Demolition Engineer Environmental Designer Landscape Architect Preservationist Protection Engineer Surveyor Urban Planner
	<b>Construction</b>	Brick & Block Mason Carpenter Construction Laborer Insulation Worker Iron/Metalworker Masons and Millwrights Painter Plasterers/Dry Wall Plumber, Pipefitter, Steamfitter Roofer Tile and Marble Setter	Construction Management Technician Electrician Field Supervisor General Contractor HVAC (Heating, Ventilation, Air Conditioning) Technician Welder	Construction Manager Project Inspector Project Manager Site Safety Supervisor Superintendent

	<b>Maintenance/ Operations</b>	Same as in Construction Pathway Groundskeeper Meter Reader Scheduler Security and Fire Alarm System Installer	Estimator Field Supervisor General Maintenance Contractor HVAC Mechanic Remodeler Service Contractor Utility Monitoring and Regulation Technician Wastewater Maintenance Technician	Construction Inspector Environmental Engineer Equipment and Material Manager Facilities Engineer Operations Manager Safety Director Sales and Marketing Manager
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SOURCES: The States' Career Clusters Initiative (2010) [www.careertech.org](http://www.careertech.org); Worknet (2014) <http://worknet.wisconsin.gov/worknet/default.aspx>; and Fox Valley Technical College Dean of Manufacturing and Construction, Mike Cattalino; Northeast Wisconsin Technical College, Dean, Trades and Engineering Technologies, Mark Weber; Northeast Wisconsin Technical College, Apprenticeship Manager, Todd Kiel; and CESA 6 CTE Coordinator, Tania Kilpatrick.

## Appendix D

### WISCONSIN INSTRUCTIONAL DESIGN SYSTEM (WIDS) FORMAT AND YOUTH APPRENTICESHIP PROGRAM GUIDE TERMS

#### WIDS/YA Program DOCUMENTS:

##### Course Outcome Summary (COS)

The list of *competencies* and corresponding *performance standard criteria, conditions, and Learning Objectives* required for competency mastery

##### Architecture & Construction YA Program Guide

Description of the Architecture & Construction YA Program. In WIDS, this information is located in the Program Outcome Summary (POS)

##### Skill Standards Checklist

Listing of ALL the competencies in ALL of the industry-wide and industry-specific skill areas; the checklist provides the overall documentation for DWD of the skill achievement levels for the competencies in the Specialty Areas

#### WIDS TERMS:

##### Competency

The major skill or outcome stated in observable, measurable terms telling learners what they must be **able to do** AFTER a learning experience.

##### Performance Standards

Specifications by which performance of a competency will be evaluated (criteria) and the circumstances/situation (condition) in which the competency will be evaluated.

##### Core Skills

Competencies that address the abilities, values, and attitudes required for productive and successful employment.

##### Learning Objective

The background knowledge that is needed in order to master the competency; the related technical classroom instruction information needed by the learner to master the competency.

## Appendix E

### USE AND DISTRIBUTION OF THE CURRICULUM

**New and current employers** should be given at least one set of the complete curriculum package. The curriculum package includes a copy of the **Program Guide, Skill Standards Checklist** (<http://dwd.wisconsin.gov/dwd/forms/dws/detw-17019-e.htm>), and the **Course Outcome Summary (COS)**. In particular, the performance standards on the COS should be highlighted with the employer mentor(s) so that they know HOW to assess the learner for competency evaluation.

All related technical classroom **instructors** will need to be provided with the **Course Outcome Summary (COS)** in order to see the Learning Objectives for the related technical classroom instruction. The local Architecture and Construction Youth Apprenticeship advisory group should determine the requirements and delivery of the required related technical classroom instruction **prior to** offering this YA program in the local consortium area. The advisory group should ensure that each learning objective is being taught either at the employer facility, school, and/or technical college.

At the beginning of the Architecture and Construction YA program, **student learners** should receive a copy of the **Skill Standards Checklist** (<http://dwd.wisconsin.gov/dwd/forms/dws/detw-17019-e.htm>) and the applicable pages from the **Course Outcome Summary (COS)** to review with their instructor(s) and worksite mentor(s). This is the opportunity for instructors and mentors to highlight the worksite experiences, related technical classroom instruction, and assessments that will occur. In a performance-based curriculum successful learning is enhanced when the learners have the opportunity to review what will be expected of them in advance of the lessons.

It is recommended that a portfolio be prepared for EACH learner. The learner should be given the responsibility for maintaining this documentation and making it available to the instructor and/or worksite mentor for recording performance assessments.

When the performance criteria are completed successfully, the learner achievement level information must be recorded on the **Skill Standards Checklist** (<http://dwd.wisconsin.gov/dwd/forms/dws/detw-17019-e.htm>). The completed Skill Standards Checklist is the piece of documentation required by DWD in order to issue the Certification of Occupational Proficiency.

## Appendix F

### POST-SECONDARY CREDITS

#### Wisconsin Technical College System

Graduates of one-year or two-year Architecture and Construction Youth Apprenticeship programs may be awarded credits in Wisconsin Technical College programs. Each Technical College may grant credit through specific local articulation agreements. Contact the local technical college to determine the number and type of articulated credits available for Architecture & Construction YA. The credits may be taken as technical college courses within Youth Apprenticeship programs or may be granted through advanced standing agreements when students enroll in the technical college.

In addition, YA students should request a credit evaluation of their YA classroom and work experiences upon admission to the local technical college under the Wisconsin Technical College System "Credit for Prior Learning Policy" #323 and through the WTCS-YA Credit Articulation Guidance Document

[http://dwd.wisconsin.gov/youthapprenticeship/pdf/wtcs\\_ya\\_articulation\\_guidance\\_10\\_2010.pdf](http://dwd.wisconsin.gov/youthapprenticeship/pdf/wtcs_ya_articulation_guidance_10_2010.pdf).

#### UW Institutions Credits for *Admission* –

**Admission Credits for the Architecture & Construction Youth Apprenticeship Program are yet TO BE DETERMINED.**

## Appendix G

### GRANDFATHER CLAUSE – PROGRAM TRANSITION GUIDELINES

#### For NEW and CONTINUING Architecture & Construction YA Students

- If the student begins Architecture and Construction YA using the OLD checklist in Drafting & Design- Architecture, then the student must complete the YA program using the OLD checklist. The appropriate Level One or Level Two Certificate of Occupational Proficiency from the Wisconsin Department of Workforce Development (DWD) will be awarded.
- Senior graduating in 2015 **Level One** YA: The youth apprentice may complete either an OLD checklist in Drafting and Design- Architecture OR use the revised Architecture and Construction YA checklists. The appropriate Level One Certificate of Occupational Proficiency from the Wisconsin Department of Workforce Development (DWD) will be awarded.
- Senior graduating in 2015 **Level Two** YA: The youth apprentice completes the OLD checklist for the year 2 curriculum for Drafting and Design- Architecture YA. An appropriate Level Two Certificate of Occupational Proficiency from the Wisconsin Department of Workforce Development (DWD) will be awarded.
- Junior in 2014-2015, **Level One** YA: The youth apprentice may complete either an OLD checklist in Drafting and Design- Architecture or use the revised Architecture and Construction YA checklists. The appropriate Level One Certificate of Occupational Proficiency from the Wisconsin Department of Workforce Development (DWD) will be awarded for the Junior year participation in the YA program.
- Junior in 2014-2015, **Level Two** YA: The youth apprentice starts either the OLD checklist in Drafting & Design- Architecture or uses the revised Architecture and Construction checklists, however, the youth apprentice must complete the YA program using the same checklist the 2<sup>nd</sup> year, their Senior year. The appropriate Level Two Certificate of Occupational Proficiency from the Wisconsin Department of Workforce Development (DWD) will be awarded.
- Sophomores applying for the Architecture and Construction Program for 2015-2016: New youth apprentices must use the revised Architecture & Construction YA checklists **by the 2015-16** school years. A Certificate of Occupational Proficiency will not be issued to students who submit the old checklist.

**NOTE:** Additionally, Youth Apprenticeship students must maintain good academic standing and be on track for graduation to be eligible for a Certificate of Occupational Proficiency from the Department of Workforce Development.

## **Appendix H**

### **ARCHITECTURE AND CONSTRUCTION YOUTH APPRENTICESHIP**

#### **SKILL STANDARDS CHECKLIST**

[http://dwd.wisconsin.gov/dwd/forms/dws/detw\\_17019\\_e.htm](http://dwd.wisconsin.gov/dwd/forms/dws/detw_17019_e.htm)

[dwd.wisconsin.gov/youthapprenticeship/skills\\_checklists.htm](http://dwd.wisconsin.gov/youthapprenticeship/skills_checklists.htm)

## **Appendix I**

### **ARCHITECTURE AND CONSTRUCTION YOUTH APPRENTICESHIP**

#### **COURSE OUTCOME SUMMARY: OVERVIEW AND TABLE OF CONTENTS**



## Architecture & Construction Youth Apprenticeship Course Outcome Summary

### Course Information

<b>Organization</b>	Cooperative Educational Service Agency (CESA) 6 Consortium; WI
<b>Developers</b>	Tania Kilpatrick, Rita O'Brien, Kari Krull and Cyndy Sandberg
<b>Development Date</b>	June 2014

### Description

This curriculum describes the performance-based worksite Competencies, Performance Standards, and Learning Objectives for the Wisconsin Youth Apprenticeship (YA) Program in Architecture and Construction. The Wisconsin Architecture and Construction YA Program is designed to provide students with a working understanding of core industry skills and occupationally specific technical skills that serve as the standard for occupations in the Architecture and Construction industry. This program provides the framework for educators and industry to work together to produce work-ready, entry-level employees that will compete favorably in a global market, as well as, provide for post-secondary educational advancement while integrating work-based learning in the school and worksite.

The Architecture and Construction YA program competencies are aligned with the national States' Career Cluster Skill Standards maintained by the States' Career Clusters project (<http://www.careertech.org/>), as well as applicable skills in the Project Lead the Way (<http://www.pltw.org/>) Curriculum and STEM Academy (<http://www.stem101.org/index.asp>) The Wisconsin Standards for Technology and Engineering were also used for standards development. Architecture and Construction YA students are required to complete OSHA 10 and First Aid training as well as perform all of the Core and Safety skills for the pathway they enroll in. **Level One (one year)** YA students are to choose additional competencies from one of the skilled trades area within the Construction Pathway or the REQUIRED Architecture and Construction Unit in the specific pathway. **Level Two (two year)** YA students are to complete all of the Level One requirements plus an additional unit within their chosen pathway.

Pathway choices:

- Construction Pathway
  - Carpentry Unit
  - Electrical Unit
  - Masonry/Concrete Unit
  - Mechanical/HVAC Unit
  - Plumbing/Sprinkler Fitting Unit
  
- Design/Pre-Construction
  - Architectural Drafting Unit – REQUIRED FIRST
  - Architectural Planning Unit
  -

**EACH competency** (work site skill) is listed with its corresponding Performance Standards and Learning Objectives. The Performance Standards describe the behaviors, **as applicable**, that employers should look for in order to evaluate the competency. The Learning Objectives describe the classroom learning content for the required related technical instruction.

## Curriculum Sources

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- Milwaukee Area Technical College, Course Outcome Summary proposed revisions for Mechanical & Environmental Systems I (10/20/10), Mechanical & Environmental Systems II (10/20/10), and Structural Systems & Components (10/20/10).
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- Wisconsin Administrative Code, Department of Workforce Development, Chapter 270, Child Labor, (dated August 2005) and Wisconsin State Statutes Chapter 106, Apprentices, Employment and Equal Rights Program.

- Wisconsin Department of Workforce Development, Jim Chiolino, Labor Standards Bureau, Child Labor Laws, 2011 (Revised, June 2014).
- Wisconsin Department of Workforce Development, Architecture YA Advisory Review Committee, formed September 2010 for the purpose of revising and updating the Drafting & Design- Architectural Design Youth Apprenticeship curriculum.
- Wisconsin Department of Workforce Development, Drafting & Design- Architectural Design Youth Apprenticeship DACUM, April, 28, 1994.
- Worknet Occupation Task Lists for Architectural Drafters and Architects (except landscape or naval), <http://worknet.wisconsin.gov/worknet/default.aspx>. Accessed August 2014.

**Architecture & Construction Youth Apprenticeship  
Table of Contents  
REQUIRED SKILLS**

**APPENDIX J**

**Unit 1: Core Skills**

1. Apply applicable academic knowledge
2. Apply applicable career knowledge
3. Apply Architecture and Construction industry knowledge
4. Communicate effectively
5. Take direction and corrective feedback
6. Act professionally
7. Demonstrate customer service skills
8. Cooperate with others in a team setting
9. Think critically
10. Exhibit legal and ethical responsibilities
11. Use basic technology
12. Use resource wisely

**Unit 2: Safety**

1. Follow personal safety requirements
2. Maintain a safe work environment
3. Demonstrate professional role to be used in an emergency

**Unit 3: Certifications**

1. Occupational Safety and Health Administration (OSHA) 10 Training
2. First Aid

**APPENDIX K**

**UNIT 4: Construction Pathway: Carpentry Fundamentals Unit**

1. Read blueprints, plans and specifications
2. Interpret symbols and procedures
3. Identify job prep needs and develop job task plan
4. Execute job prep needs as a coordinated effort
5. Select tools and materials
6. Use hand tools and light duty tools
7. Operate tools and equipment safely
8. Assist with the installation of materials per job specifications
9. Demonstrate accuracy in measuring using various instruments
10. Maintain clean and safe work environment
11. Clean up work area
12. Practice quality craftsmanship
13. Assist with rough framing or forming
14. Assist with finish framing or forming
15. Assist with interior finishing
16. Assist with exterior finishing

## **APPENDIX L**

### **UNIT 5: Construction Pathway: Electrical Fundamentals Unit**

1. Read blueprints, plans and specifications
2. Interpret symbols and procedures
3. Identify job prep needs and develop job task plan
4. Execute job prep needs as a coordinated effort
5. Select tools and materials
6. Use hand tools and light duty tools
7. Operate tools and equipment safely
8. Assist with the installation of materials per job specifications
9. Demonstrate accuracy in measuring using various instruments
10. Maintain clean and safe work environment
11. Clean up work area
12. Practice quality craftsmanship
13. Assist with cutting wire, cable, conduit and raceway, cording and cutting chasses
14. Assist with pulling wires and attaching wires
15. Assist with connecting conductors to switches, receptacles or appliances
16. Assist with installation of switches, outlet boxes and fixture boxes
17. Assist in rough-in feeders and circuits

## **APPENDIX M**

### **UNIT 6: Construction Pathway: Masonry/Concrete Fundamentals Unit**

1. Read blueprints, plans and specifications
2. Interpret symbols and procedures
3. Identify job prep needs and develop job task plan
4. Execute job prep needs as a coordinated effort
5. Select tools and materials
6. Use hand tools and light duty tools
7. Operate tools and equipment safely
8. Assist with the installation of materials per job specifications
9. Demonstrate accuracy in measuring using various instruments
10. Maintain clean and safe work environment
11. Clean up work area
12. Practice quality craftsmanship
13. Assist with cutting brick and block
14. Assist with depositing, spreading, consolidating, and striking of concrete in a form
15. Lay masonry units to job specification
16. Assist with selecting the appropriate materials for the job
17. Perform volume estimates for concrete quantity requirements

## **APPENDIX N**

### **UNIT 7: Construction Pathway: Mechanical/Heating, Ventilation and Air Conditioning (HVAC) Fundamentals Unit**

1. Read blueprints, plans and specifications
2. Interpret symbols and procedures
3. Identify job prep needs and develop job task plan
4. Execute job prep needs as a coordinated effort
5. Select tools and materials
6. Use hand tools and light duty tools
7. Operate tools and equipment safely
8. Assist with the installation of materials per job specifications

9. Demonstrate accuracy in measuring using various instruments
10. Maintain clean and safe work environment
11. Clean up work area
12. Practice quality craftsmanship
13. Assist with basic equipment problem identification and diagnosis for heating and cooling systems
14. Assist with basic equipment repair for heating systems and cooling systems
15. Set up and fabricate metals
16. Assist with the installation of fabricated parts
17. Transfer measurements into a workable drawing

## **APPENDIX O**

### **UNIT 8: Construction Pathway: Plumbing/Sprinkler Fitting Fundamentals Unit**

1. Read blueprints, plans and specifications
2. Interpret symbols and procedures
3. Identify job prep needs and develop job task plan
4. Execute job prep needs as a coordinated effort
5. Select tools and materials
6. Use hand tools and light duty tools
7. Operate tools and equipment safely
8. Assist with the installation of materials per job specifications
9. Demonstrate accuracy in measuring using various instruments
10. Maintain clean and safe work environment
11. Clean up work area
12. Practice quality craftsmanship
13. Assist with the testing and maintenance of fixtures

## **APPENDIX P**

### **UNIT 9: Design/Pre-Construction Pathway: Architectural Drafting Unit**

1. Interpret technical drawings
2. Use measuring devices accurately
3. Organize databases, files and drawings
4. Reproduce documents and plans
5. Compile site measurements and other data
6. Use architectural drafting software
7. Develop 2D (orthographic) view drawings
8. Develop 3D view models
9. Dimension drawings
10. Apply lettering and basic annotation to drawings
11. Prepare working drawings
12. Assist to research building code and site requirements
13. Participate on an architectural design project

## **APPENDIX Q**

### **Unit 10: Design/Pre-Construction Pathway: Architectural Planning Unit**

1. Draw a site plan
2. Draw sectional and elevation views
3. Draw a floor plan
4. Develop a stair section drawing
5. Draw a floor system and foundation plan
6. Draw a framing plan
7. Draw a roof framing plan
8. Develop sustainable/conservation elements into a design
9. Review completed architectural plans and documents
10. Revise drawings
11. Construct a Bill of Materials
12. Assist to develop architectural detail schedules
13. Assist to coordinate architectural project activities

**Appendix J**

**ARCHITECTURE AND CONSTRUCTION  
YOUTH APPRENTICESHIP**

**REQUIRED SKILLS CURRICULUM  
UNITS 1-3**



## Unit 1: Required Skills

### Core Skills

Competency

#### 1. Apply academic knowledge

Performance Standard Condition

##### **Competence will be demonstrated**

- at the worksite and classroom

Performance Standard Criteria

##### **Performance will be successful when learners:**

- Read and comprehends work related materials
- Apply mathematical operations involving whole numbers, fractions, decimals, percentages, formulas and methods of measurement accurately when necessary
- Interpret charts, tables, and graphs

Learning Objectives:

##### MATH

- Add, subtract, multiply, and divide whole numbers, fractions, decimals and percent's
- Calculate averages, ratios, proportions, and rates
- Convert decimals to fractions, fractions to percent's and vice versa
- Measure and accurately report measurements of time, temperature, length, width, height, width, perimeter, area, volume, and weight
- Use appropriate formulas
- Convert measurements correctly (e.g., English (standard) to metric)
- Interpret meaning from data
- Correspond the correct number of significant figures in given values to the measuring device

##### ENGLISH

- Use standard English to compile information and prepare written reports
- Apply English language correctly (spelling, grammar, structure)
- Derive meaning from text through summarizing
- Discern meaning from written word
- Use acceptable language
- Write legibly

##### SCIENCE

- Explain the key elements of the scientific process
- Define the differences in qualitative and quantitative measurements
- Compare and contrast subjective and objective information
- Discriminate between fact and opinion
- Describe the basic engineering and architectural principles in structures
- Explain physical principles such as forces, friction, and energy

Comments:

## Unit 1: Required Skills

### Core Skills

Competency

#### 2. Apply career knowledge

Performance Standard Condition

**Competence will be demonstrated**

- at the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Demonstrate understanding of career development in the Architecture and Construction industry
- Obtain necessary skills and knowledge to meet position requirements

Learning Objectives:

- Explain the process for seeking employment
- Describe the major functions and duties of the career pathways within the Architecture and Construction career cluster
- Discuss educational, training, and credentialing requirements for a selected job
- Research job requirements and characteristics of a selected job
- Contrast "positive" and "less positive" aspects of a selected job
- Describe opportunities for advanced training in Architecture and Construction careers

Comments:

## Unit 1: Required Skills

### Core Skills

Competency

#### 3. Apply Architecture and Construction industry knowledge

Performance Standard Condition

**Competence will be demonstrated**

- at the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Demonstrate Architecture and Construction industry systems understanding based on ***current knowledge and training***
- Comply with specifications, regulations, and codes during a design process

Learning Objectives:

**SYSTEMS, PRINCIPLES, CONCEPTS**

- Describe how weight and mass relate to supports
- Describe the basic process for building a residential or commercial structure
- List the basic components of constructing a residential or commercial structure such as frame, foundation, roof, floor, walls, windows/doors, stairs, systems, etc.
- Explain the sequence of events for constructing buildings
- List the phases of the architectural planning process- initial contact, preliminary design studies, initial working drawings, final design considerations, completion of working drawings, permit procedures, and job supervision
- Identify the four most common materials used in the construction of residential and commercial building: wood, steel, masonry, and concrete

**HISTORY and TRENDS**

- Connect historical architectural and civil engineering achievements to current structural and design applications
- Explain how historical innovations have contributed to the evolution of civil engineering and architecture
- Explain how historical trends and technology have contributed to the evolution of construction building trades.

Comments:

## Unit 1: Required Skills

### Core Skills

Competency

#### 4. Communicate effectively

Performance Standard Condition

##### **Competence will be demonstrated**

- at the worksite and classroom

Performance Standard Criteria

##### **Performance will be successful when learners:**

- Deliver coherent verbal messages in words that can be understood
- Use appropriate and bias-free language
- Use appropriate body language
- Listen actively to others
- Demonstrate courtesy with self-introduction
- Respond to inquiries or statements within the scope of current responsibilities and understanding
- Do not provide confidential information without appropriate authorization
- Do not overreact in response to anger
- Record information in a timely manner
- Record written information legibly and accurately
- Organize and compile messages, technical information, and summaries accurately
- Use email, the Internet, printer, copier, scanner, and fax machine equipment appropriately as applicable
- Are sensitive to special, multicultural, and/or multilingual needs

Learning Objectives:

##### GENERAL

- Compare verbal and nonverbal behaviors
- Explain how empathy and bias can be communicated verbally & non-verbally

##### LISTEN

- Discuss effective and active listening skills
- Differentiate between hearing and listening

##### WRITTEN

- Discern meaning from written instructions
- Write clearly to communicate written ideas
- Discuss common recording errors and how to avoid them

##### CUSTOMER

- Identify internal and external customers at your facility
- Discuss steps to assess customer understanding
- Describe the steps to follow when dealing with complaints

##### TOOLS

- Describe technology used in communicating such as, telephone, texting, instant messaging (IM), computers, fax, intercom, beepers, tube systems, etc.
- Explain the proper use and etiquette required for these forms of communication technology
- Review the policies and procedures for using written communication tools in your company such as email, Internet, printer, copier, scanner, and/or fax

Comments:

## Unit 1: Required Skills

### Core Skills

Competency

#### 5. Take Direction and corrective feedback

Performance Standard Condition

**Competence will be demonstrated**

at the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Strive to understand the data, the people, and their views before making decisions and taking action.
- Work through difficult or awkward interpersonal situations in a positive manner
- Broach sensitive issues in a way that allows rational and open discussion
- Focus on issues and interests instead of people or positions, even when personally attacked
- Deliver tough messages with sensitivity to minimize the negative impact on others; critiques constructively
- Thoughtfully intervene in conflicts to improve communication, diffuse tension, and resolve problems
- Identify common ground and preserve relationships

Learning Objectives:

- Describe the difference between correction vs. judgment
- Accept feedback on behavior without taking it personally.
- Understand the difference the difference between instruction vs. judgment
- Describe how to listen proactively
- Explain the importance of understanding the employers perspective
- Identify how to obtain a mutual agreement on a problem and find potential solutions and select a plan of action

Comments:

## Unit 1: Required Skills

### Core Skills

Competency

#### 6. Act professionally

Performance Standard Condition

**Competence will be demonstrated**

- at the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Follow oral and written instructions
- Are pleasant, courteous, and professional with coworkers and internal and external customers
- Maintain appearance and dress that are appropriate according to the requirements of the employer
- Take personal responsibility for attendance
- Are punctual and reliable
- Begin work promptly
- Organize and prioritizes tasks efficiently
- Exhibit positive attitude and commitment to task at hand
- Complete assigned tasks accurately and in a timely manner
- Take responsibility for actions and decisions
- Recognize lack of knowledge and seeks help from information sources
- Evaluate work goals periodically with worksite professional
- Accept constructive criticism and applies suggestions
- Communicate safety, training, and job-specific needs
- Adhere to safety rules and regulations

Learning Objectives:

- Locate and explain written organizational policies, rules and procedures to help employees perform their jobs
- Locate and explain your company's employee manual for policies on Appearance, Breaks, Time Off, Cell Phone Use, Weather, Personal Issues, etc.
- List qualities of successful Architecture & Construction employees
- Describe how you can demonstrate enthusiasm and commitment at the worksite
- Define initiative
- Explain ways that you can show initiative at a worksite
- Explain methods to evaluate work assignments and prioritize them
- Describe how to effectively receive feedback

Comments:

## Unit 1: Required Skills

### Core Skills

Competency

#### 7. Demonstrate customer service skills

Performance Standard Condition

**Competence will be demonstrated**

- at the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Are knowledgeable about products and services
- Address the customer, either in person, by telephone, e-mail or other means
- Gather information about customer's needs, and customer's knowledge of products or services
- Respond to customer's comments and questions
- Solicit supervisor or co-worker support and advice when necessary to meet customer needs
- Coordinate as needed with other services to expedite delivery of service or product
- Handle complaints tactfully without insult or conflict

Learning Objectives:

- Define customer service
- Identify internal and external customers at your facility
- Describe how customer service affects a company's reputation and profitability
- Describe standards of service
- List strategies for maximizing customer satisfaction
- Describe the functions of other departments or units to serve the customer
- Describe the steps to follow when dealing with complaints
- Identify customer service methods to use when encountering an angry customer

Comments:

## **Unit 1: Required Skills**

### **Core Skills**

Competency

#### **8. Cooperate with others in a team setting**

Performance Standard Condition

##### **Competence will be demonstrated**

- at the worksite and classroom

Performance Standard Criteria

##### **Performance will be successful when learners:**

- Demonstrate respect relating to people
- Contribute to a group with ideas, suggestions, and effort
- Listen and responds appropriately to team member contributions
- Work collaboratively with people from other backgrounds/cultures
- Resolve differences for the benefit of the team
- Complete their share of tasks necessary to complete a project

Learning Objectives:

- Explain the functions of each department or unit within the larger organization
- Identify roles found in teams such as leader, facilitator, recorder, etc.
- List effective meeting management skills
- List techniques which show respect for others
- Describe how to effectively give and receive feedback
- Describe conflict resolution methods
- Discuss ways to participate within a team setting
- Explain how to interact appropriately with diverse ethnic, age, cultural, religious, and economic groups in different situations
- Describe how work teams coordinate work flow and help manage resources

Comments:



## Unit 1: Required Skills

### Core Skills

Competency

#### 9. Think critically

Performance Standard Condition

**Competence will be demonstrated**

- at the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Recognize the existence of a problem
- Define the problem
- Apply problem-solving steps
- Differentiate between fact and opinion
- Consider other viewpoints and perspectives
- Support viewpoints with evidence
- Apply the principles and strategies of organized thinking
- Evaluate information, ideas, and problems
- Collect information through probing questions and research
- Use techniques such as brainstorming to acquire alternative solutions
- Demonstrate comparison skills
- Make decisions based on analysis
- Present ideas for critical evaluation

Learning Objectives:

- Describe how to break a problem down in order to brainstorm, evaluate, and analyze possible solutions
- Discuss the difference between fact and opinion
- Discuss data collection techniques for the problem solving process
- Describe how to present a solution with evidence
- Explain ways to reach a decision by consensus
- Discuss methods to evaluate a solution that has been implemented

Comments:

## Unit 1: Required Skills

### Core Skills

Competency

#### 10. Exhibit regulatory and ethical responsibilities

Performance Standard Condition

**Competence will be demonstrated**

- at the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Follow all safety and worksite standards and regulations including those required by the Occupational Safety and Health Administration (OSHA) and the Environmental Protection Agency (EPA)
- Perform legally and ethically by all local, state, and national standards
- Use email, the Internet, printer, copier, scanner, and fax machine equipment appropriately and correctly as applicable
- Operate within scope of authority adhering to company rules, regulations, and policies as established in employee handbook/procedures
- Comply with legal requirements for documentation
- Document work processes as required
- Record and file appropriate documents in timely manner
- Maintain confidentiality of company, customer, and co-worker information
- Document reportable incidents to worksite personnel immediately, if applicable
- Receive, handle, package, and ship materials and products according to shipping laws and regulations if applicable

Learning Objectives:

**GENERAL**

- Explain the role of the government in regulating and managing the Architecture and Construction industry
- Discuss the purpose of building codes
- Compare national, state and local regulators that oversee the Architecture and Construction industry: Construction Specification Institute (CSI), American Institute of Architects (AIA), Wisconsin state building code, local building ordinances, Occupational Safety and Health Administration (OSHA), etc. as applicable
- Identify the management structure and employees' roles within your organization
- Describe common legal requirements that must be met in Architecture and Construction facilities
- Describe your legal responsibilities, limitations, and implications for action in your job role
- Identify the rules and regulations of the company as they relate to the employee
- Identify penalties for regulation non-compliance
- Compare and contrast behaviors and practices that could result in liability or negligence
- Explain legal issues faced by Architecture and Construction professionals
- Summarize the rights and responsibilities of Architecture and Construction workers
- Explain what situations are reportable in Architecture and Construction facilities

#### ETHICAL

- Explain the difference between an ethical practice and a legal responsibility
- Identify current ethical issues common to the Architecture and Construction field
- Describe ethical work values such as confidentiality, productivity during the day, following safety standards
- Define and discuss the concept of intellectual property
- Explain fundamentals of patents, trademarks, copyrights, and proprietary information

#### SAFETY

- Define legal and ethical responsibilities for safety procedures
- Describe the certification/license requirements to operate specific equipment or perform specific functions

#### RECORDS

- Identify the main functions of documents and documentation
- Identify the guidelines for retaining common documents
- Describe common contract language related to Architecture and Construction

Comments:

## Unit 1: Required Skills

### Core Skills

Competency

#### 11. Use basic technology

Performance Standard Condition

**Competence will be demonstrated**

- at the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Use communication technology (such as pagers, radios, phone, texting, fax, email and Internet) to access and distribute data and other information within the scope of the job
- Follow rules for proper computer and communication technology usage
- Use calculating tools such as a computer, calculator, and adding machine correctly
- Enter, edit, and stores data on computerized equipment according to worksite guidelines
- Verify data entry prior to data storage or equipment operation
- Use computer applications to solve problems

Learning Objectives:

- Identify the parts and functions of a computer system using correct terminology including the keyboard, monitor, mouse, printer
- Point out the storage device locations on the computer such as the Hard drive, CD-ROM drive, and Portable File Storage drive, etc.
- Show the appropriate connections and positioning of peripheral devices such as a mouse, keyboard, monitor, portable devices, and printer
- Discuss the importance of backing up computerized files
- Compare different forms of communications technology including email, texting, word processing, spreadsheets, database, presentation software, and use of the internet to communicate, search and display information
- Describe how to evaluate internet web sites and information for validity and reliability
- Explain appropriate and inappropriate uses of email and internet while at work
- Describe how to develop effective presentations using appropriate technologies (e.g., tables, charts, and visual graphics)
- Explain the use of writing/publishing/presentation applications
- Describe how database and spreadsheet technology is used at your worksite to manage worksite operations

Comments:

## Unit 1: Required Skills

### Core Skills

Competency

#### 12. Use resources wisely

Performance Standard Condition

**Competence will be demonstrated**

- at the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Follow the facility pollution/waste prevention plan
- Recycle whenever possible
- Dispose of materials appropriately
- Dispose of hazards legally and with regard to environmental impact

Learning Objectives:

- Identify current environmental issues affecting the Architecture and Construction industry
- Determine effects of environmental issues on the Architecture and Construction industry
- Define what is meant by making “green” choices
- Compare renewable and nonrenewable natural resources
- Explain the meaning of sustainable resources use
- Identify practices that contribute to sustainability
- Describe why wise use of resources at the worksite is important
- Give examples of wasteful uses of resources (unnecessary waste and duplication) at the worksite
- Explain how your choices of resources impact your department, your facility, your environment and the planet
- List materials that can be recycled
- Describe materials that require special disposal
- Explain purpose of pollution control systems
- Relate power generation to energy sources
- Compare environmental impact of energy sources (e.g., fuel cells, chemical, wind, hydro, nuclear, electric, mechanical, solar, biological)

Comments:

## **Unit 2: Required Skills**

### **Safety**

Competency

#### **1. Follow personal safety requirements**

Performance Standard Condition

##### **Competence will be demonstrated**

- at the worksite and classroom

Performance Standard Criteria

##### **Performance will be successful when learners:**

- Participate in all required safety training
- Follow all worksite guidelines for personal safety
- Apply principles of proper body mechanics when necessary
- Report any exposure, injuries, or accidents, personal or to others, immediately, if applicable
- Locate and can find key information on Material Safety Data Sheets (MSDS)
- Handle and disposes of any hazardous materials appropriately, if applicable
- Operate only equipment that he/she is trained on
- Adhere to equipment safety standards
- Visually inspect equipment to ensure safety compliance and function before operation
- Wear the required Personal Protective Equipment (PPE) at all times as required by the worksite for specific tasks

Learning Objectives:

- Discuss the regulatory purpose and responsibility of the Occupational Safety and Health Administration (OSHA)
- List your rights as a worker according to OSHA
- Explain the procedure to follow in case of an exposure, injury, or accident to self or to another
- Explain ways your company prevents accidents
- List engineering controls that are taken to protect workers from accidents
- Describe safe and unsafe work habits and their implications
- List safety hazards common in your facility
- Explain potential hazards associated with blood borne pathogens
- Explain the ergonomic impact of work techniques
- Describe proper techniques for lifting loads
- Describe the Material Safety Data Sheet (MSDS) and its purpose
- Discuss the procedures of handling and disposing of hazardous material
- List mechanical, chemical, electrical, compressed air, and equipment safety hazards at your facility
- Explain how Lock Out/Tag Out procedures prevent accidents
- Define the Personal Protective Equipment (PPE) required for specific tasks in your facility
- Explain the safe use of ladders
- Describe ways to prevent burns
- Explain how to safety use equipment

Comments:

## **Unit 2: Required Skills**

### **Safety**

Competency

#### **2. Maintain a safe work environment**

Performance Standard Condition

**Competence will be demonstrated**

- at the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Comply with posted safety warnings and symbols
- Identify unsafe conditions and/or work habits and reports them to the worksite professional immediately, if applicable
- Help maintain a clean and safe working environment free of debris and obstacles
- Clean, organize and put away items in the work area
- Safely identify, handle, store, and use hazardous materials according to company procedure, if applicable
- Report any indications of insects or pests

Learning Objectives:

- List the major components of a facility safety program
- List the different state and federal agencies that provide regulatory oversight at your facility for personal safety, environmental safety, and equipment safety
- List accident and fire prevention techniques
- Describe posted safety warnings and symbols and what they mean
- Describe safe and unsafe work habits and their implications
- Discuss the importance of keeping the work area and tools/equipment clean
- List mechanical, electrical, and equipment safety hazards at your facility
- Discuss how to identify and report unsafe conditions in your facility
- Discuss safety procedures to prevent accidents
- Describe the requirements at your facility for safety training and auditing
- Assess need for good housekeeping practices
- List accident and fire prevention techniques
- List hazards that contribute to injury due to slips, trips, or falls
- Outline compliance requirements of sanitation and health inspections

Comments:

## Unit 2: Required Skills

### Safety

Competency

#### 3. Demonstrate professional role to be used in an emergency

Performance Standard Condition

**Competence will be demonstrated**

- at the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Performance will be successful when learners:
- Participate in emergency safety simulations and drills
- Outline the company's policy and procedure for worksite incidents, accidents, electrical, fire, tornado, bomb threats, robbery, hostage situations, and other emergency situations
- Identify the closest fire alarms and emergency exits in the assigned worksite area
- Identify the fire extinguishers in the assigned worksite area
- Identify appropriate alarms and procedures for using alarms
- Contact emergency personnel according to company requirements in the event of an emergency
- Document any emergency incidents according to company requirements

Learning Objectives:

- Describe the procedures in your company to report an emergency
- Review your company procedures for responding to exposures, injuries, accidents, spills,
- fire, tornado, bomb threat, robbery, hostage situations, etc.
- Demonstrate how to use the fire blanket and/or fire extinguisher
- Explain the evacuation plan for the worksite
- Indicate the demeanor necessary during an emergency
- Identify methods to cope with emergency situations
- Name the resources for assistance in crimes or accidents
- Locate and explain use of first aid emergency care kits
- Detail steps to use in medical emergencies requiring First Aid, CPR, and/or Heimlich maneuver
- Locate and explain use of spill kits, if applicable to worksite
- Explain who in your facility can give first aid care in the event of an emergency

Comments:



## **UNIT 3: Certifications**

### **OSHA 10 Training**

#### Performance Standard Condition

##### **Competence will be demonstrated**

- at the worksite and classroom

#### Performance Standard Criteria

##### **Performance will be successful when learners:**

- Complete the 10 hour outreach course with a passing score and receives a wallet certification card
- Develop a safety mindset
- Articulate their worker rights and employer responsibilities
- Explain the process of how to file a complaint

#### Learning Objectives:

- Students will discuss various safety tips and procedures one should follow while in the workplace.
  - Introduction to OSHA (Part 1 and 2)
    - Explain why OSHA is important to workers
    - Explain worker rights under OSHA
    - Discuss employer responsibilities under OSHA
    - Discuss the use of OSHA Standards
    - Explain how OSHA inspections are conducted
    - Utilize helpful worker safety and health resources
    - Explain worker rights under OSHA
  - Start Safe / Stay Safe
    - Understand an overview of Personal Protective Equipment
  - Crane Operations
    - Identify the major causes of crane accidents
    - Describe the pre-planning that is required before using a crane
    - State the main precautions that need to be taken when working near power lines
    - Understand the importance of operator and personnel training
  - Materials Handling
    - List main injuries that occur during handling, storage, use, and disposal of materials
    - Name the ways to prevent injury when performing manual lifting
    - Identify ways to eliminate hazards that may lead to injury when using forklifts, cranes, or slings to handle materials
    - List actions that can reduce or eliminate hazards when storing, using, or disposing of materials
  - Welding and Cutting
    - Describe the requirements placed on employers by the General Duty Clause
    - Demonstrate a thorough knowledge of the safe use of equipment associated with gas welding and cutting
    - Demonstrate an understanding of the safe use of equipment associated with arc welding and cutting properly
    - Describe the various methods of ventilation and protection used in various working environments
    - Describe the dangers associated with both chemical and physical agents when welding and cutting
  - Hand and Power Tools
    - List the hand and power tool safety rules
    - Identify the precautions essential to the safe use of different types of tools

- Name the guarding techniques that apply to hand and power tools
- Scaffolds
  - List and define the basic types of scaffolds
  - List the five major hazards associated with working on scaffolds
  - Demonstrate a thorough understanding of the different kinds of fall protection equipment, as well as the different situations in which each type is required
  - Demonstrate an understanding of the regulations for safely working scaffolds
  - Describe the responsibilities of a competent person in relation to scaffolds
- Excavations
  - Identify the greatest risk present at an excavation site
  - Recognize the three methods of protecting employees from cave-ins
  - Name three hazards to people working in excavation areas and ways to eliminate them
  - Describe the function of a competent worker at an excavation site
- Hazardous Communications
  - Develop an awareness of the potential hazards of chemicals that you may encounter in the workplace
- Personal Protective Equipment (PPE)
  - Understand an overview of Personal Protective Equipment (PPE) designed to protect your head, face, eyes, ears, hands, feet, respiratory tract, and body from injury and discuss the importance of selecting the PPE that is right for the job you may perform.
- Struck-By Hazards
  - Identify and describe common struck-by hazards
  - Understand how to protect yourself from struck-by hazards
  - Recognize employer requirements to protect workers from struck-by hazards
- Fall Hazards (Part 1 and 2)
  - Understand an overview of common fall hazards on construction sites, ways to protect yourself from fall hazards, and actions employers must take to protect workers from fall hazards.
  - Understand an of the Occupational Safety and Health Administration's (OSHA's) guidelines and different protection methods.
- Caught-In or Between Hazards
  - Understand the information that helps students recognize common caught-in or caught between hazards in your work environment.
- Electrocutation Hazards
  - Identify and describe common electrocution hazards
  - Protect yourself from electrocution hazards
  - Recognize employer requirements to protect workers from electrocution hazards
- Health Hazards in Construction
  - List the four types of health hazards on construction sites
  - Distinguish between acute and chronic hazard exposure and illnesses
  - Describe the characteristics and effects of various chemical, physical, biological and ergonomic hazards

Comments:

Training can be delivered through Technical College partners, industry partners or on-line through various resources including: <http://www.careersafeonline.com> in partnership with SKILLS USA.

The complete training consists of a minimum of 18 interactive modules discussing various safety tips and procedures one should follow while in the workplace. Students can also take face to face training with hands-on application for OSHA training. The student will have 6 months to complete the course and receive their certification

### **Unit 3: Certifications**

## First Aid Training

### Performance Standard Condition

#### **Competence will be demonstrated**

- at the worksite and classroom

### Performance Standard Criteria

#### **Performance will be successful when learners:**

- Participate in emergency safety simulations and drills
- Demonstrate how to act in an emergency situation
- Demonstrate how to respond to common first aid emergencies, including burns; choking; cuts; head, neck and back injuries.
- Demonstrate how to prevent disease transmission
- Demonstrate how to assist, rescue and move victims
- Follow procedures for assisting with basic life support and responding to chest pain
- Identify causes and treatment options for allergic reactions
- Contact emergency personnel according to company requirements in the event of an emergency
- Document any emergency incidents according to company requirements
- Identify appropriate alarms and procedures for using alarms
- Identify the closest fire alarms, fire extinguishers and emergency exits in the assigned worksite area

### Learning Objectives:

- Explain what first aid is
- Locate and explain use of first aid emergency care kits
- Identify things that you should look for at the scene of an injury
- Explain what “universal precautions” are
- Understand the purpose and use of protective equipment
- Explain how to protect against blood or other body fluids
- Describe how to check if a victim is breathing
- Describe the signs of choking
- Identify the signs of a bad allergic reaction
- List the first aid actions for someone with a bad allergic reaction
- Describe first aid actions for a victim with chest pain or pressure
- Identify why it is important to stop bleeding quickly
- Describe types of injuries that are likely to result in a head injury
- Identify the first aid actions needed for injuries to the joints and muscles
- Describe the first aid actions for burns caused by heat
- Describe the procedures in your company to report an emergency
- Review your company procedures for responding to exposures, injuries, accidents, spills, fire, tornado, bomb threat, robbery, hostage situations, etc.
- Demonstrate how to use the fire blanket and/or fire extinguisher
- Explain the evacuation plan for the worksite
- Indicate the demeanor necessary during an emergency
- Identify methods to cope with emergency situations

### Comments:

## **Appendix K**

### **ARCHITECTURE AND CONSTRUCTION YOUTH APPRENTICESHIP**

#### **CONSTRUCTION PATHWAY CARPENTRY FUNDAMENTALS (UNIT 4)**

## **UNIT 4: Construction Pathway Carpentry Fundamentals Unit**

Competency

### **1. Read blueprints, plans and specifications**

Performance Standard Condition

#### **Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

#### **Performance will be successful when learners:**

- Learn the functionality of blueprints, plans and specifications
- Interpret technical drawings accurately as needed for job task
- Use appropriate carpentry terminology
- Identify basic elements of technical drawings
- Identify lines, views, symbols, and representations on the drawings as applicable
- Interpret dimensions and scale on the drawings as applicable
- Utilize an architect/engineers scale to properly read a drawing

Learning Objectives:

- Identify basic design principles
- Explain where a design professional finds basic Architectural/Structural design codes
- Demonstrate basic drafting skills (AutoCAD)
- Demonstrate blueprint reading skills
- Explain why precision in interpretation is critical
- Demonstrate knowledge of fundamentals of statistics, trigonometry, and algebra and explain their relevance
- Discuss different types of architectural technical drawings
- Define and explain the use of lines, views, symbols, dimensions, and scale on architectural technical drawings
- Compare pictorial format, orthographic projection, sectional views, and detail schedules
- Describe the standard usage of linear units in architectural drafting
- Identify a section cut through the drawing and explain how the carpenter would use this detail.

Comments:

## **UNIT 4: Construction Pathway Carpentry Fundamentals Unit**

Competency

### **2. Interpret symbols and procedures**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Explain the role of drawings and specifications
- Identify drawings and symbols used on a construction drawing
- Apply information from drawings in construction activities
- Interpret specifications appearing on construction drawings
- Interpret and convert measurements in terms of actual dimensions
- Explain specifications in terms of work requirements

Learning Objectives:

- Explain the role of drawings in relation to quantities, project specifications, and contract documentation
- Explain the role of specifications in relation to quantities, quality of work, contract documentation and payment to contractors
- State the difference between general and project specifications
- Identify drawings in terms of type and application for a construction process
- Explain the key functions of the drawing in terms of the finished product
- Identify the key users of the drawing in terms of work responsibility
- Interpret symbols and abbreviations in terms of their functions and meanings
- Interpret the layout in terms of the different views shown
- Explain the purpose of each view in terms of the result of the end product

Comments:

## **UNIT 4: Construction Pathway Carpentry Fundamentals Unit**

Competency

### **3. Identify job prep needs and develop job task plan**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learner:**

- Set up and prepare tool/equipment for safe operation:
  - Lubrication and fluid level checks
  - Air and pressure supplies
  - Power supply
- Determine the scope of work:
  - Timetable
  - Work schedule
  - Cleanup process
  - Safety measures
  - Acceptable noise levels
- Demonstrate an understanding of contractual relationships between all parties involved in the building process
- Apply scheduling practices to ensure the successful completion of a construction project

Learning Objectives:

- Explain the process to prepare the site and working with other construction professionals
- Strategize the scope of work for successful project completion
- Identify the importance of planning ahead to prevent problems on site before they occur
- Describe safety inspections to ensure regulations relating to health safety and the environment are adhered to
- Prepare sample project schedule that incorporates sequencing of events
- Prepare a flow chart explaining shop drawing review process
- Describe the approval procedures required for successful completion of a construction project

Comments:

## **UNIT 4: Construction Pathway Carpentry Fundamentals Unit**

Competency

### **4. Execute job prep needs as a coordinated effort**

Performance Standard Condition

#### **Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

#### **Performance will be successful when learners:**

- Review the scope and phases of the project with a worksite professional
- Illustrate how to control the main resources of a job including
  - Materials
  - Tools
  - Equipment
  - labor

Learning Objectives:

- Identify the components of building systems needed to complete a construction project
- Define planning and describe what it involves
- Explain why it is important to plan
- Explain the importance of documenting one's work
- Explain the sequence of events for project completion
- Explain how schedules are developed and used
- Define the terms production and productivity and explain why they are important
- Describe how efficiency can affect costs associated with the project
- Explain the supervisors role in controlling costs
- Describe the estimating process and classification of costs (e.g., direct and indirect, fixed and variable, methods and standards)
- Identify the steps to overseeing the running of several projects
- Demonstrate a working knowledge of communicating with a range of people including the client, subcontractor, supplier, the public and the workforce
- Describe how work teams coordinate work flow and help manage resources

Comments:



## **UNIT 4: Construction Pathway Carpentry Fundamentals Unit**

Competency

### **5. Select tools and materials**

Performance Standard Condition

#### **Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

#### **Performance will be successful when learners:**

- Choose the tools they are going to work with taking into consideration the usefulness and portability of the tool.
- Choose the appropriate tools and materials to minimize cost while meeting product performance goals.

Learning Objectives:

- Identify the hand tools commonly used by carpenters and describe their uses
- Use hand tools in a safe and appropriate manner
- State the general rules for properly maintaining all power tools, regardless of type
- Explain importance of equipment and tool tracking
- Describe ways that a contractor can manage materials
- Compare the value of renting versus purchasing equipment

Comments:

## **UNIT 4: Construction Pathway Carpentry Fundamentals Unit**

Competency

### **6. Use hand tools and light duty tools**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Use correct hand tools in a safe and appropriate manner
- Demonstrate the general safety rules for operating all power tools, regardless of type
- Use portable power tools in a safe and appropriate manner
- Use stationary power tools in a safe and appropriate manner
- Demonstrate proper handling and storage of tools.

Learning Objectives:

- Identify the hand tools commonly used by carpenters and describe their uses
- Identify the portable power tools commonly used by carpenters and describe their uses
- Identify the stationary power tools commonly used by carpenters and describe their uses
- Describe the proper handling and storage of hand and power tools.
- Identify trends in power tool use
- Describe battery time and voltage in various power tools.

Comments:

## **UNIT 4: Construction Pathway Carpentry Fundamentals Unit**

Competency

### **7. Operate tools and equipment safely**

Performance Standard Condition

#### **Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

#### **Performance will be successful when learners:**

- Operate only equipment that he/she is trained on
- Choose correct tool(s) or equipment for the task
- Follow and complete a tool check list
- Inspect tool/equipment and work area for safety considerations
- Verify tool/equipment is available for use and in working order
- Verify tool/equipment is current for preventative maintenance and/or calibration
- Verify safety equipment and any Personal Protective Equipment (PPE) needed for tool/equipment use
- Wear the required Personal Protective Equipment (PPE) at all times as required for the operation of the tool/equipment
- Operate tools/equipment safely with guarding devices in the manner required for the job task
- Investigate and promptly report abnormal tool/equipment conditions
- Properly shut down and label any tool/equipment that is not operating as expected
- Follow Lock Out/Tag Out procedures as applicable
- Document use and maintenance as required

Learning Objectives:

- Distinguish between common hand tools (e.g., hammers, wrenches, pliers, taps, and dies, etc.)
- Outline applications of each tool and equipment
- Describe and demonstrate the safety requirements for each tool and equipment
- Discuss start up and shut down procedures for each tool/equipment you will operate
- Explain the purpose of preventative maintenance
- Describe emergency shutdown procedures for the tool/equipment you will operate
- Explain how to recognize and address malfunctions for the tool/equipment you will operate
- Describe how to recognize wear and tear on equipment components
- Describe how to select lubricants and coolants as applicable
- List which tools and equipment require safety certification

Comments:

## **UNIT 4: Construction Pathway Carpentry Fundamentals Unit**

Competency

### **8. Assist with the installation of materials per job specifications**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Articulate the scope of work
- Retrieve the correct material(s) for the job
- Plan sequencing, tools, and equipment needed for the installation
- Identify set up needed
- Consult with worksite professional to verify production schedule, deadlines, and timeframes
- Assist with loading unloading of materials, tools, equipment and supplies
- Assist in lifting, position, and securing of materials and work pieces during installation
- Demonstrate the application of measuring knowledge
- Demonstrate the ability to identify labels and read labels on products
- Demonstrate the ability to read and follow directions
- Demonstrate the ability to listen and take direction well

Learning Objectives:

- Define the needed materials associated with the various jobs
- Determine effective and active listening skills
- Use acceptable language in the classroom
- Demonstrate writing legibly for all assignments
- Determine technical reading strategies
- Determine proper measuring techniques and explain how to use measuring tools.
- Demonstrate the ability to follow directions from the teacher/mentor in the classroom
- Explain the functions or collaborative nature of each department or unit within the larger organization

Comments:

## **UNIT 4: Construction Pathway Carpentry Fundamentals Unit**

Competency

### **9. Demonstrate accuracy in measuring using various instruments**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Choose appropriate instrument(s) or aid(s) for measuring task
- Verify instrument(s) are accurate for calibration if applicable
- Use instrument(s) and/or measure as required
- Read measuring instrument accurately
- Scale proportions accurately
- Apply appropriate formula and units for measurements
- Confirm measurement to given specification
- Record measurements using proper symbols
- Calibrate, clean, and store measuring instrument(s) properly as required

Learning Objectives:

- List drafting aids and measuring devices commonly used by carpenters
- List common measurements used by carpenters
- Discuss how to convert standard English measures to metric and vice versa
- Explain architectural and engineer scale and identify where each is used
- Explain the impact of error in measurement
- Add, subtract, multiply, and divide whole numbers, fractions, decimals and percent's
- Calculate averages, ratios, proportions, and rates
- Compare accuracy and precision when using measuring equipment
- Identify various calipers, micrometer instruments, and layout tools and their applications
- Identify digital measuring gages and instruments and their applications
- Describe how to read and interpret gages
- Understand the use of angles and how they assist in creating square corners

Comments:

## **UNIT 4: Construction Pathway Carpentry Fundamentals Unit**

Competency

### **10. Maintain clean and safe work environment**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Inspect tool(s) and work area for safety considerations
- Comply with posted safety warnings and symbols
- Identify unsafe conditions and/or work habits and reports them to the worksite professional immediately, if applicable
- Help maintain a clean and safe working environment free of debris and obstacles
- Clean, organize, put away items in the work area
- Safely identify, handle, store, and use hazardous materials according to company procedure, if applicable
- Report any indications of insects or pests

Learning Objectives:

- List the major components of a facility safety program
- List the different state and federal agencies that provide regulatory oversight at your facility for personal safety, environmental safety, and equipment safety
- List accident and fire prevention techniques
- Describe posted safety warnings and symbols and what they mean
- Describe safe and unsafe work habits and their implications
- Discuss the importance of keeping the work area and tools/equipment clean
- List mechanical, electrical, and equipment safety hazards at your facility
- Discuss how to identify and report unsafe conditions in your facility
- Discuss safety procedures to prevent accidents
- Describe the requirements at your facility for safety training and auditing
- Assess need for good housekeeping practices
- List hazards that contribute to injury due to slips, trips, or falls
- Outline compliance requirements of sanitation and health inspections

Comments:

## **UNIT 4: Construction Pathway Carpentry Fundamentals Unit**

Competency

### **11. Clean up work area**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Follow directions based on foreman scope of work plans.
- Clean and maintain materials and tools as required
- Store materials and tools properly
- Follow facility procedures for clean-up and shut down after use

Learning Objectives:

- Explain the basic clean up procedures at the end of classroom or project build
- Explain the proper storage of tools and materials
- Articulate how a clean work environment supports safety
- Articulate how a clean work environment support efficiency

Comments:

## **UNIT 4: Construction Pathway Carpentry Fundamentals Unit**

Competency

### **12. Practice quality craftsmanship**

Performance Standard Condition

#### **Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

#### **Performance will be successful when learners:**

- Inspect and/or test materials/piece/product at all stages of production to determine quality or condition
- Monitor materials, processes, equipment, tools, and products throughout the production process for safety and quality specifications
- Inspect final product/piece to ensure it meets specifications
- Promptly identify and segregate materials and/or product that do not meet specification
- Communicate with worksite professional if materials and/or product do not meet requirements
- Document all quality checks

Learning Objectives:

- Explain and analyze the quality approval process used in the Construction industry
- Describe the roles and responsibilities for quality in your facility
- List the major stages involved in producing products
- Explain the procedures for rejecting sub-standard products
- Define terms used in quality assurance
- Describe the impact of quality standards in construction
- Describe how materials are selected and tested for product requirements
- Articulate the importance of getting the job done correctly the first time
- Explain the financial implications of poor craftsmanship

Comments:



**UNIT 4: Construction Pathway  
Carpentry Fundamentals Unit**

Competency

**13. Assist with rough framing or forming**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when the learner is able to perform one or more of the standards below in accordance with the employer site, based on scope of work:**

- Demonstrate proper techniques for framing floor systems
- Demonstrate proper techniques for framing roofs
- Demonstrate proper techniques for stair layout
- Demonstrate proper techniques for framing walls

**Learning Objectives:**

<p><b>Floor Systems:</b></p> <ul style="list-style-type: none"> <li>• Identify the different types of joists and framing systems</li> <li>• Given specific floor load and span data, select the proper girder/beam or joist size from a list of available girders/beams</li> <li>• List and recognize different types of floor joists</li> <li>• Given specific floor and span data, select the proper joist size from a list of available girders/beams</li> <li>• Explain the purposes of subflooring and underlayment</li> <li>• Match selected fasteners used in floor framing to their correct use</li> <li>• Estimate the amount of material needed to frame a floor assembly</li> <li>• Lay out and construct a floor assembly with bridging</li> <li>• Explain how to install a subfloor using butt-joint plywood/OSB panels</li> <li>• Explain how to install a single floor system using tongue and groove plywood/OSB panels</li> </ul>	<p><b>Roofing:</b></p> <ul style="list-style-type: none"> <li>• Define the terms associated with roof framing and roofing</li> <li>• Identify the roof framing members used in gable and hip roofs</li> <li>• Identify the methods used to calculate the length of a rafter</li> <li>• Identify the various types of trusses used in roof framing</li> <li>• Use a rafter framing square, speed square, and calculator in laying out a roof</li> <li>• Identify various types of sheathing and types of roofing used in roof construction</li> <li>• Explain the safety requirements with roofing</li> <li>• Frame a gable roof with vent openings</li> <li>• Frame a roof opening</li> <li>• Construct a frame roof, including hips, valleys, commons, jack rafters, sheathing, and shingling</li> <li>• Erect a gable roof using trusses</li> <li>• Estimate the materials used in framing, sheathing and shingling a roof</li> </ul>
<p><b>Walls and Ceiling Framing:</b></p> <ul style="list-style-type: none"> <li>• Identify the components of a wall and ceiling layout</li> <li>• Describe and perform laying out interior and exterior wood frame walls, including plates, corner posts, door and window openings, partition T's, bracing, fire stops, and sheathing</li> <li>• Describe wall framing techniques used in masonry construction</li> <li>• Explain the use of metal studs in wall framing</li> <li>• Describe the correct procedure for laying out a ceiling</li> <li>• Cut and install ceiling joists on a wood frame building</li> <li>• Estimate the materials required to frame walls &amp; ceilings.</li> </ul>	<p><b>Stairs:</b></p> <ul style="list-style-type: none"> <li>• Identify the various types and parts of stairs</li> <li>• Interpret construction drawings of stairs</li> <li>• Explain the methods of construction various types of stairs</li> <li>• Demonstrate how to lay out and cut stringers</li> <li>• Determine the number of sizes of risers and treads required for a stairway</li> <li>• Demonstrate how to build a small stair unity with a handrail</li> <li>• Demonstrate how to lay out a skirt board</li> </ul>

Comments:

**UNIT 4: Construction Pathway  
Carpentry Fundamentals Unit**

Competency

**14. Assist with finish framing or forming**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

***Performance will be successful when the learner is able to perform the standard below in accordance with the employer site that the student is employed with based on separate trade specialties:***

- Demonstrate proper techniques for stair and railing construction per the job specification
- Demonstrate proper techniques for installing insulation per the job specification
- Demonstrate proper techniques for installation of flooring per the job specification
- Demonstrate proper techniques for installation of plaster, drywall and/or painting
- Demonstrate proper techniques for assisting with the installation and/or building of cabinets.

Learning Objectives:

<p>Stairs and Railings:</p> <ul style="list-style-type: none"> <li>• Identify and explain construction methods for the various types of stairs, railings and their parts.</li> <li>• Identify the materials used in the construction of stairs</li> <li>• Interpret construction drawings of stairs</li> <li>• Determine the number of sizes of risers and tread required for a stairway</li> <li>• Identify the proper layout and cutting of a stair stringers along with the layout of the skirt board.</li> </ul>	<p>Insulation:</p> <ul style="list-style-type: none"> <li>• Identify the various types of insulation</li> <li>• Explain the proper use of various types of insulation</li> <li>• Calculate the R factor of insulation</li> <li>• Explain how to properly install insulation</li> <li>• Describe the use and purpose of vapor barriers</li> </ul>
<p>Flooring:</p> <ul style="list-style-type: none"> <li>• Identify the various types of flooring based on design and/or usage factor</li> <li>• Identify proper storage before installation</li> <li>• Explain the various types of floor installation techniques</li> <li>• Explain the various type of finishes that may be needed on flooring</li> <li>• Calculate and estimate flooring material required and costs for the type of flooring being used</li> </ul>	<p>Plaster/Drywall and Painting:</p> <ul style="list-style-type: none"> <li>• Identify the various types of drywall</li> <li>• Describe the various installation techniques based on selected drywall</li> <li>• Explain taping and topping techniques used in drywall</li> <li>• Explain the various techniques used for plaster and painting finishes</li> <li>• Identify the various types and amount of paints needed for the job</li> </ul>
<p>Cabinets:</p> <ul style="list-style-type: none"> <li>• Identify the basic cabinet construction based style for installation purposes</li> <li>• Calculate cabinet dimensions and cabinet installation schematics</li> <li>• Explain various types of countertops and installation techniques required</li> </ul>	

Comments:

**UNIT 4: Construction Pathway**  
**Carpentry Fundamentals Unit**  
 Competency

**15. Assist with interior finishing**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Demonstrate proper techniques for window and door trim regardless of material
- Demonstrate proper techniques for installation of doors and fire doors
- Demonstrate proper techniques for the installation of windows and fire windows
- Demonstrate proper techniques for completion of trim work
- Demonstrate proper techniques for the installation of specialty items

Learning Objectives:

<p>Doors:</p> <ul style="list-style-type: none"> <li>• Identify the proper techniques for the installation of windows and doors</li> <li>• Articulate the installation techniques for various types of interior doors.</li> <li>• Explain the proper installation of a lockset</li> </ul>	<p>Trim Work:</p> <ul style="list-style-type: none"> <li>• Describe how to properly install baseboards to the specifications</li> <li>• Describe how to properly install windows, doors and/or other trims to specifications</li> <li>• Estimate the amount of materials and costs associated to complete the job</li> </ul>
<p>Other:</p> <ul style="list-style-type: none"> <li>• Describe the proper installation and placement of fire extinguishers</li> <li>• Describe the proper installation techniques for bathroom partitions and accessories</li> <li>• Estimate the amount of paint needed for the job</li> <li>• Identify the type of paint best suited for the job</li> </ul>	

Comments:

## **UNIT 4: Construction Pathway Carpentry Fundamentals Unit**

Competency

### **16. Assist with exterior finishing**

Performance Standard Condition

#### **Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

#### **Performance will be successful when learners:**

- Demonstrate proper techniques for application of vapor barriers, flashing and siding
- Demonstrate proper installation of various types of windows
- Demonstrate proper installation of various exterior doors and/or garage doors
- Demonstrate proper techniques for exterior trims (e.g., cornices, soffits, downspouts and/or gutters.)

Learning Objectives:

- Describe the various types of siding
- Describe how to properly install various types of siding
- Identify the types and styles of gutters and downspouts and their accessories
- Describe how to install selected types of metal or vinyl gutters and downspouts
- Identify types of window options
- Explain techniques for window installation based on type
- Explain proper ventilation techniques of soffits
- Identify proper placement of attic ventilation
- Identify the various types of locksets used on exterior doors and explain how they are installed

Comments:

**Appendix L**

**ARCHITECTURE AND CONSTRUCTION  
YOUTH APPRENTICESHIP**

**CONSTRUCTION PATHWAY  
ELECTRICAL FUNDAMENTALS (UNIT 5)**

## **UNIT 5: Construction Pathway**

### **Electrical Fundamentals Unit**

Competency

#### **1. Read blueprints, plans and specifications**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Articulate the functionality of blueprints, plans and specifications
- Interpret technical drawings accurately as needed for job task
- Use appropriate terminology for electrical careers
- Interpret electrical drawings, including the site plans, floor plans, and detail drawings
- Identify basic elements of electrical drawings, including site plans, floor plans and detail drawings
- Identify lines, views, symbols, and representations on the drawings as applicable
- Interpret dimensions and scale on the drawings as applicable
- Utilize a metric scale to properly read a drawing

Learning Objectives:

- Articulate the basic design principles
- Explain where a design professional finds basic Architectural/Structural design codes
- Demonstrate basic drafting skills (AutoCAD)
- Demonstrate blueprint reading skills
- Explain why precision in interpretation is critical
- Demonstrate knowledge of fundamentals of statistics, trigonometry, and algebra and explain their relevance
- Define and explain the use of lines, views, symbols, dimensions, and scale on architectural technical drawings
- Identify different lines by name, type, order of usage, and application such as object, hidden, center, section, dimension, extension, cutting plane, short break, long break, phantom
- Describe standard view placement practices
- Compare pictorial format, orthographic projection, sectional views, and detail schedules
- Describe the standard usage of metric (SI) linear units in architectural drafting
- Using an architect's scale, state the actual dimensions of a given drawing component

Comments:

## **UNIT 5: Construction Pathway**

### **Electrical Fundamentals Unit**

Competency

#### **2. Interpret symbols and procedures**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Read and Identify drawings and symbols used on a construction drawing
- Demonstrate the ability to translate the symbols and procedures into the specifications of the work requirements to complete the building process
- Interpret and apply information from drawings to the scope of work
- Demonstrate the ability to interpret scales and measurements and convert them in terms of actual dimensions

Learning Objectives:

- Explain the role of drawings in relation to quantities, project specifications, and contract documentation
- Explain the role of specifications in relation to quantities, quality of work, contract documentation and payment to contractors
- State the difference between general and project specifications
- Identify drawings in terms of type and application for an electrical job task
- Identify the key users of the drawing in terms of work responsibility
- Interpret symbols and abbreviations in terms of their functions and meanings
- Interpret and explain the purpose of each view in terms of the result of the end product

Comments:

## **UNIT 5: Construction Pathway**

### **Electrical Fundamentals Unit**

Competency

#### **3. Identify job prep needs and develop job task plan**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Set up and prepare tool/equipment for safe operation
- Determine the scope of work:
  - Timetable
  - Work schedule
  - Cleanup process
  - Safety measures
- Demonstrate an understanding of contractual relationships between all parties involved in the building process
- Apply scheduling practices to ensure the successful completion of a construction project
- Develop a task plan and a hazard assessment for a given task and select the appropriate PPE and work methods to safely perform the task.

Learning Objectives:

- Explain the process to prepare the site
- Describe the process for collaboration with other construction professionals
- Strategize the scope of work for successful project completion
- Identify the importance of planning ahead to prevent problems on site before they occur
- Explain safety inspections to ensure regulations relating to health safety and the environment are adhered to.
- Prepare sample project schedule that incorporates sequencing of events
- Prepare a flow chart explaining shop drawing review process
- Describe the approval procedures required for successful completion of a construction project

Comments:



## **UNIT 5: Construction Pathway**

### **Electrical Fundamentals Unit**

Competency

#### **4. Execute job prep needs as a coordinated effort**

Performance Standard Condition

##### **Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

##### **Performance will be successful when learners:**

- Review the scope and phases of the project with a worksite professional
- Illustrate how to control the main resources of a job:
  - Materials
  - Tools
  - Equipment
  - labor

Learning Objectives:

- Identify the components of building systems needed to complete a construction project
- Define planning and describe what it involves
- Explain why it is important to plan
- Explain the importance of documenting one's work
- Explain the sequence of events for project completion
- Explain how schedules are developed and used
- Define the terms production and productivity and explain why they are important
- Describe how efficiency can affect costs associated with the project
- Explain the supervisors role in controlling costs
- Describe the estimating process and classification of costs (e.g., direct and indirect, fixed and variable, methods and standards)
- Identify the steps to overseeing the running of several projects
- Demonstrate a working knowledge of communicating with a range of people including the client, subcontractor, supplier, the public and the workforce

Comments:

## **UNIT 5: Construction Pathway Electrical Fundamentals Unit**

Competency

### **5. Select tools and materials**

Performance Standard Condition

#### **Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

#### **Performance will be successful when learners:**

- Choose the tools they are going to work with taking into consideration the usefulness and portability of the tool.
- Choose the appropriate tools and materials to minimize cost while meeting product performance goals.

Learning Objectives:

- Identify the hand tools commonly used by electricians and describe their uses
- Use hand tools in a safe and appropriate manner
- State the general rules for properly maintaining all power tools, regardless of type
- Explain importance of equipment and tool tracking
- Describe ways that a contractor can manage materials
- Compare the value of renting versus purchasing equipment

Comments:

## **UNIT 5: Construction Pathway**

### **Electrical Fundamentals Unit**

Competency

#### **6. Use hand tools and light duty tools**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Use correct hand tools in a safe and appropriate manner
- Demonstrate the general safety rules for operating all power tools, regardless of type
- Use portable power tools in a safe and appropriate manner
- Use stationary power tools in a safe and appropriate manner
- Demonstrate proper handling and storage of tools.

Learning Objectives:

- Identify the hand tools commonly used by electricians and describe their uses
- Identify the power tools commonly used by electricians and describe their uses
- Describe the proper handling and storage of hand and power tools.
- Identify trends in power tool use
- Identify battery time and voltage in various power tools.

Comments:

## **UNIT 5: Construction Pathway**

### **Electrical Fundamentals Unit**

Competency

#### **7. Operate tools and equipment safely**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Operate only equipment that he/she is trained on
- Choose correct tool(s) or equipment for the task
- Follow and complete any tool check list
- Verify tool/equipment is available for use and in working order
- Verify tool/equipment is current for preventative maintenance and/or calibration
- Verify safety equipment and any Personal Protective Equipment (PPE) needed for tool/equipment use
- Inspect tool/equipment and work area for safety considerations
- Wear the required Personal Protective Equipment (PPE) at all times as required for the operation of the tool/equipment
- Operate tool/equipment safely with guarding devices in the manner required for the job task
- Investigate and promptly report abnormal tool/equipment conditions
- Properly shut down and label any tool/equipment that is not operating as expected
- Follow Lock Out/Tag Out procedures as applicable
- Document use and maintenance as required

Learning Objectives:

- Distinguish between common hand tools (e.g., hammers, wrenches, pliers, taps, wire strippers, voltage detector, level, allen wrenches, utility knife, screw drivers, and wire crimpers, etc.)
- Outline applications of each tool and equipment
- Describe and demonstrate the safety requirements for each tool and equipment
- Discuss start up and shut down procedures for each tool/equipment you will operate
- Explain the purpose of preventative maintenance
- Describe emergency shutdown procedures for the tool/equipment you will operate
- Explain how to recognize and address malfunctions for the tool/equipment you will operate
- Describe how to recognize wear and tear on equipment components
- Describe how to select lubricants and coolants as applicable
- List which tools and equipment require safety certification

Comments:

## **UNIT 5: Construction Pathway**

### **Electrical Fundamentals Unit**

Competency

#### **8. Assist with the installation of materials per job specifications**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Articulate the scope of work
- Retrieve the correct material(s) for the job
- Demonstrate the application of measuring knowledge
- Demonstrate the ability to identify labels and read labels on products
- Demonstrate the ability to read and follow directions
- Demonstrate the ability to listen and take direction well
- Assist with loading unloading of materials, tools, equipment and supplies
- Assist in lifting, position, and securing of materials and work pieces during installation
- Plan sequencing, tools, and equipment needed for the installation
- Identify set up needed
- Consult with worksite professional to verify production schedule, deadlines, and timeframes

Learning Objectives:

- Define the needed materials associated with the various jobs
- Determine effective and active listening skills
- Use acceptable language in the classroom
- Demonstrate writing legibly for all assignments
- Determine technical reading strategies
- Determine proper measuring techniques and explain how to use measuring tools.
- Demonstrate the ability to follow directions from the teacher/mentor in the classroom
- Explain the functions and collaborative nature of each department or unit within the larger organization

Comments:

## **UNIT 5: Construction Pathway**

### **Electrical Fundamentals Unit**

Competency

#### **9. Demonstrate accuracy in measuring using various instruments**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Accurately measure the frequency of the current voltage and resistance
- Verify instrument is accurate for calibration if applicable
- Read measuring instruments accurately (ammeter and voltmeter)
- Define the units of measurement that are used to measure the properties of electricity
- Confirm measurements to given specification
- Record measurements using proper symbols
- Calibrate, clean, and store measuring instruments properly as required

Learning Objectives:

- List measuring aids and devices commonly used by Electricians
- Add, subtract, multiply, and divide whole numbers, fractions, decimals and percent's
- Discuss how to convert standard English measures to metric and vice versa
- Explain architectural scale
- Explain the impact of error in measurement
- Use the proper instrument to measure voltage in an energized circuit
- Use the proper instrument to measure current in an energized circuit
- Use the proper instrument to measure resistance
- Compare accuracy and precision when using measuring equipment
- Measure and accurately report measurements of time, temperature, distance, length, width, height, width, perimeter, area, volume, weight, velocity and speed

Comments:

## **UNIT 5: Construction Pathway**

### **Electrical Fundamentals Unit**

Competency

#### **10. Maintain clean and safe work environment**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Inspect tools and work area for safety considerations
- Comply with posted safety warnings and symbols
- Identify unsafe conditions and/or work habits and reports them to the worksite professional immediately, if applicable
- Help maintain a clean and safe working environment free of debris and obstacles
- Clean, organize, put away items in the work area
- Safely identify, handle, store, and use hazardous materials according to company procedure, if applicable
- Report any indications of insects or pests

Learning Objectives:

- List the major components of a facility safety program
- List the different state and federal agencies that provide regulatory oversight at your facility for personal safety, environmental safety, and equipment safety
- Describe posted safety warnings and symbols and what they mean
- Describe safe and unsafe work habits and their implications
- Discuss the importance of keeping the work area and tools/equipment clean
- List mechanical, electrical, and equipment safety hazards at your facility
- Discuss how to identify and report unsafe conditions in your facility
- Discuss safety procedures to prevent accidents
- Describe the requirements at your facility for safety training and auditing
- Assess need for good housekeeping practices
- List accident and fire prevention techniques
- List hazards that contribute to injury due to slips, trips, or falls
- Outline compliance requirements of sanitation and health inspections

Comments:

## **UNIT 5: Construction Pathway**

### **Electrical Fundamentals Unit**

Competency

#### **11. Clean up work area**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Follow directions based on foreman scope of work plans
- Clean and maintain materials and tools as required
- Store materials and tools properly
- Follow facility procedures for clean-up and shut down after use

Learning Objectives:

- Explain the basic clean up procedures at the end of classroom or project build
- Explain the proper storage of tools and materials
- Articulate how a clean work environment supports safety
- Articulate how a clean work environment support efficiency

Comments:



## **UNIT 5: Construction Pathway**

### **Electrical Fundamentals Unit**

Competency

#### **12. Practice quality craftsmanship**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Inspect and/or test materials/pieces/products at all stages of production to determine quality or condition
- Monitor materials, processes, equipment, tools, and products throughout the production process for safety and quality specifications
- Inspect final product/piece to ensure it meets specifications
- Promptly identify and segregate materials and/or product that do not meet specification
- Communicate with worksite professional if materials and/or product do not meet requirements
- Document all quality checks

Learning Objectives:

- Explain and analyze the quality approval process used in the Electrical industry
- Describe the roles and responsibilities for quality in your facility
- List the major stages involved in producing products
- Explain the procedures for rejecting sub-standard products
- Define terms used in quality assurance
- Describe the impact of quality standards in construction
- Describe how materials are selected and tested for product requirements

Comments:

## **Unit 5: Construction Pathway Electrical Fundamentals Unit**

Competency

### **13. Assist with cutting wire, cable, conduit and raceway, cording and cutting chasses**

Performance Standard Condition

**Competence will be demonstrated**

- at the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Select the proper raceway of cable for the conditions
- Select the proper raceway size, depending on the conductors to be installed
- Properly size outlet(s), pull, and junction boxes

Learning Objectives:

- Identifies electrical hazards and how to avoid or minimize them in the workplace
- Identify the installation requirements for a raceway of cable
- Lists and describes electrical circuit overcurrent protective devices
- Explain how to use a wire stripper to strip insulation from a wire
- Use math formulas to determine conduit bends
- Identify the methods of hand bending conduit
- Identify the various methods used to install conduit
- Cut, ream, and thread conduit

Comments:

## **Unit 5: Construction Pathway Electrical Fundamentals Unit**

Competency

### **14. Assist with pulling wires and attaching wires**

Performance Standard Condition

**Competence will be demonstrated**

- at the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Demonstrate the knowledge and ability to assist with wiring
- Demonstrate the ability to connect wires to circuit breakers, transformers, and or other components

Learning Objectives:

- Explain the various sizes and gauges of wire in accordance with American Wire Gauge standards
- Describe voltage ratings of conductors and cables
- Describe the procedure for pulling wire through conduit
- Pull conductors in a conduit system
- Describe instrumentation control wiring
- Explain how wiring devices are selected and installed

Comments:

## **Unit 5: Construction Pathway Electrical Fundamentals Unit**

Competency

### **15. Assist with connecting conductors to switches, receptacles or appliances**

Performance Standard Condition

#### **Competence will be demonstrated**

- at the worksite and classroom

Performance Standard Criteria

#### **Performance will be successful when learners:**

- Demonstrate the knowledge and ability to assist with connections
- Demonstrate two and three way switches
- Demonstrate normal and ground fault receptacles
- Demonstrate appliance reciprocals

Learning Objectives:

- Plan and install electrical components according to circuit layouts which include single-pole, three-way, four-way, and dimmer switches duplex and GFCI receptacles, boxes, covers, lamps, wire, solderless connectors, and conduit accurately
- Identify and state the functions and ratings of straight blade, twist lock, and pin and sleeve receptacles
- Identify and define receptacle terminals and disconnects
- Identify and define ground fault circuit interrupters
- Identify insulation and jacket types according to conditions and applications
- Explain the types and purposes of equipment grounding conductors

Comments:

## **Unit 5: Construction Pathway Electrical Fundamentals Unit**

Competency

### **16. Assist with installation of switches, outlet boxes and fixture boxes**

Performance Standard Condition

**Competence will be demonstrated**

- at the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Demonstrate the ability to identify and install the various types of electrical boxes
- Plan and install electrical components according to duplex and GFCI receptacles, boxes, covers, lamps, wire, solderless connectors, and conduit accurately
- Properly use color coding for electrical installations

Learning Objectives:

- Describe the purpose of conduit bodies.
- Identify and state the functions of limit switches, relays, and switchgear
- Explain the various types of outlet boxes and select the proper type for different wiring methods
- Calculate the required box size for any number and size of conductors.
- Properly locate, install, and support boxes of all types.
- Install the different types of fittings used in conjunction with boxes.

Comments:

## **Unit 5: Construction Pathway Electrical Fundamentals Unit**

Competency

### **17. Assist with installation of feeders and circuits**

Performance Standard Condition

**Competence will be demonstrated**

- at the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Select the correct feeder size, type and overcurrent protection for the application
- Layout electrical systems using materials and devices labeled and listed for project(s)
- Demonstrates the ability to rough-in and properly secure cables or conduits for branch circuits
- Connect circuits to circuit breaker panels
- Demonstrate the ability to compute the appropriate load calculations and power requirements for the job
- Follows all grounding and bonding requirements

Learning Objectives:

- Identify the feeder and branch circuits portion of a distribution system
- Describe the various types of branch circuits
- Define the functions of a feeder and the functions of branch-circuit connectors
- Calculate lighting and receptacle loads using code requirements
- Size branch circuits in accordance with the code
- Determine branch circuits over current protection required by code
- Use the code to size feeder conductors

Comments:

**Appendix M**

**ARCHITECTURE AND CONSTRUCTION  
YOUTH APPRENTICESHIP**

**CONSTRUCTION PATHWAY  
MASONRY/CONCRETE FUNDAMENTALS (UNIT 6)**

## **UNIT 6: Construction Pathway**

### **Masonry/Concrete Fundamentals Unit**

Competency

#### **1. Read blueprints, plans and specifications**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Learn the functionality of blueprints, plans and specifications
- Interpret technical drawings accurately as needed for job task
- Use appropriate masonry terminology
- Identify basic elements of technical drawings
- Identify lines, views, symbols, and representations on the drawings as applicable
- Interpret dimensions and scale on the drawings as applicable
- Utilize a metric scale to properly read a drawing

Learning Objectives

- Identify basic design principles
- Explain where a design professional finds basic Architectural/Structural design codes
- Demonstrate basic drafting skills (AutoCAD)
- Demonstrate blueprint reading skills
- Explain why precision in interpretation is critical
- Demonstrate knowledge of fundamentals of statistics, trigonometry, and algebra and explain their relevance
- Discuss different types of architectural technical drawings
- Define and explain the use of lines, views, symbols, dimensions, and scale on architectural technical drawings
- Identify different lines by name, type, order of usage, and application such as object, hidden, center, section, dimension, extension, cutting plane, short break, long break, phantom
- Compare pictorial format, orthographic projection, sectional views, and detail schedules
- Describe the standard usage of metric (SI) linear units in architectural drafting

Comments:



## **UNIT 6: Construction Pathway Masonry/Concrete Fundamental Unit**

Competency

### **2. Interpret symbols and procedures**

Performance Standard Condition

#### **Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

#### **Performance will be successful when learners:**

- Explain the role of drawings and specifications
- Identify drawings and symbols used on a drawing
- Apply information from drawings in activities
- Interpret specifications appearing on drawings
- Interpret and convert measurements in terms of actual dimensions requires
- Explain specifications in terms of work requirements

Learning Objectives

- Explain the role of drawings in relation to quantities, project specifications, and contract documentation
- Explain the role of specifications in relation to quantities, quality of work, contract documentation and payment to contractors
- State the difference between general and project specifications
- Identify drawings in terms of type and application for a masonry process
- Explain the key functions of the drawing in terms of the finished product
- Identify the key users of the drawing in terms of work responsibility
- Interpret symbols and abbreviations in terms of their functions and meanings
- Interpret the layout in terms of the different views shown
- Explain the purpose of each view in terms of the result of the end product

Comments:

## **UNIT 6: Construction Pathway**

### **Masonry/Concrete Fundamentals Unit**

Competency

#### **3. Identify job prep needs and develop job task plan**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Set up and prepare tool/equipment for safe operation:
- Determine the scope of work:
  - Timetable
  - Work schedule
  - Cleanup process
  - Safety measures
  - Acceptable noise levels
- Articulate how the contractual relationships between all parties involved in the building process are connected to the job plan
- Apply scheduling practices to ensure the successful completion of a construction project
- Show a basic understanding of the planning process, scheduling, and cost and resource control
- Inspect job site after wind or adverse weather conditions

Learning Objectives

- Explain the process to prepare the site and work with other construction professionals
- Strategize the scope of work for successful project completion
- Identify the importance of planning ahead to prevent problems on site before they occur
- Understand safety inspections to ensure regulations relating to health safety and the environment are adhered to
- Prepare sample project schedule that incorporates sequencing of events
- Prepare a flow chart explaining shop drawing review process
- Describe the approval procedures required for successful completion of a masonry project

Comments:

## **UNIT 6: Construction Pathway**

### **Masonry/Concrete Fundamentals Unit**

Competency

#### **4. Execute job prep needs as a coordinated effort**

Performance Standard Condition

##### **Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

##### **Performance will be successful when learners:**

- Review the scope and phases of the project with a worksite professional
- Illustrate how to control the main resources of a job:
  - Materials
  - Tools
  - Equipment
  - labor

Learning Objectives

- Identify the components of building systems needed to complete a construction project
- Define planning and describe what it involves
- Explain why it is important to plan
- Explain the importance of documenting one's work
- Explain the sequence of events for project completion
- Explain how schedules are developed and used
- Define the terms production and productivity and explain why they are important
- Describe how efficiency can affect costs associated with the project
- Explain the supervisors role in controlling costs
- Describe the estimating process and classification of costs (e.g., direct and indirect, fixed and variable, methods and standards)
- Identify the steps to overseeing the running of several projects
- Demonstrate a working knowledge of communicating with a range of people including the client, subcontractor, supplier, the public and the workforce

Comments:

## **UNIT 6: Construction Pathway Masonry/Concrete Fundamentals Unit**

Competency

### **5. Select tools and materials**

Performance Standard Condition

#### **Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

#### **Performance will be successful when learners:**

- Choose the tools they are going to work with taking into consideration the usefulness and portability of the tool
- Choose the appropriate tools and materials to minimize cost while meeting product performance goals

Learning Objectives

- Identify the hand tools commonly used by carpenters and describe their uses
- Use hand tools in a safe and appropriate manner
- State the general rules for properly maintaining all power tools, regardless of type
- Explain importance of equipment and tool tracking
- Describe ways that a contractor can manage materials
- Compare the value of renting versus purchasing equipment

Comments:

## **UNIT 6: Construction Pathway Masonry/Concrete Fundamentals Unit**

Competency

### **6. Use hand tools and light duty tools**

Performance Standard Condition

#### **Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

#### **Performance will be successful when learners:**

- Use correct hand tools in a safe and appropriate manner
- Demonstrate the general safety rules for operating all power tools, regardless of type
- Use portable power tools in a safe and appropriate manner
- Use stationary power tools in a safe and appropriate manner
- Demonstrate proper handling and storage of tools.

Learning Objectives

- Identify the hand tools commonly used and describe their uses
- Identify the stationary power tools commonly used by carpenters and describe their uses
- Describe the proper handling and storage of hand and power tools.
- Identify trends in power tool use
- Explain the battery time and voltage in various power tools

Comments:

## **UNIT 6: Construction Pathway**

### **Masonry/Concrete Fundamentals Unit**

Competency

#### **7. Operate tools and equipment safely**

Performance Standard Condition

##### **Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

##### **Performance will be successful when learners:**

- Operate only equipment that he/she is trained on
- Choose correct tool or equipment for the task
- Follow and complete a tool check list
- Inspect tool/equipment and work area for safety considerations
- Verify tool/equipment is available for use and in working order
- Verify tool/equipment is current for preventative maintenance and/or calibration
- Verify safety equipment and any Personal Protective Equipment (PPE) needed for tool/equipment use
- Wear the required Personal Protective Equipment (PPE) at all times as required for the operation of the tool/equipment
- Operate tool/equipment safely with guarding devices in the manner required for the job task
- Investigate and promptly report abnormal tool/equipment conditions
- Properly shut down and label any tool/equipment that is not operating as expected
- Document use and maintenance as required

Learning Objectives

- Distinguish between common hand tools including trowel, mason hammer, chisel, mashing hammer, masonry power saw, level, steel squares, jointers, chalk lines, and brushes
- Outline applications of each tool and equipment
- Describe and demonstrate the safety requirements for each tool and equipment
- Discuss start up and shut down procedures for each tool/equipment you will operate
- Explain the purpose of preventative maintenance
- Describe emergency shutdown procedures for the tool/equipment you will operate
- Explain how to recognize and address malfunctions for the tool/equipment you will operate
- Describe how to recognize wear and tear on equipment components
- List which tools and equipment require safety certification

Comments:

## **UNIT 6: Construction Pathway Masonry/Concrete Fundamentals Unit**

Competency

### **8. Assist with the installation of materials per job specifications**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Articulate the scope of work
- Retrieve the correct material(s) for the job
- Apply measuring knowledge to procure the material(s)
- Identify labels and read labels on products
- Take direction well
- Assure solid footing
- Lay a dry bond
- Spread and furrow a bed joint, and butter masonry unit
- Cut brick and block accurately
- Lay masonry units in a true course
- Plan sequencing, tools, and equipment needed for the installation
- Identify set up needed
- Consult with worksite professional to verify production schedule, deadlines, and timeframes

Learning Objectives

- Define the needed materials associated with the various jobs
- Determine effective and active listening skills
- Use acceptable language in the classroom
- Demonstrate writing legibly for all assignments
- Determine technical reading strategies
- Determine proper measuring techniques and explain how to use measuring tools.
- Demonstrate the ability to follow directions from the teacher/mentor in the classroom
- Explain the functions or collaborative nature of each department or unit within the larger organization
- Describe the most common types of masonry units
- Describe and demonstrate how to set up a wall

Comment:

## **UNIT 6: Construction Pathway**

### **Masonry/Concrete Fundamentals Unit**

Competency

#### **9. Demonstrate accuracy in measuring using various instruments**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Choose appropriate instrument(s) or aid for measuring task
- Verify instrument is accurate for calibration if applicable
- Use and/or measure as required
- Read measuring instrument(s) accurately
- Scale proportions accurately
- Apply appropriate formula and units for measurements
- Confirm measurement to given specification
- Record measurements using proper symbols
- Calibrate, clean, and store measuring instruments properly as required

Learning Objectives

- List drafting aids and measuring devices commonly used by architects
- List common measurements used by architects
- Discuss how to convert standard English measures to metric and vice versa
- Explain architectural scale
- Explain the impact of error in measurement
- Add, subtract, multiply, and divide whole numbers, fractions, decimals and percent's
- Calculate averages, ratios, proportions, and rates
- Compare accuracy and precision when using measuring equipment
- Identify various calipers, micrometer instruments, and layout tools and their applications
- Identify digital measuring gages and instruments and their applications
- Describe how to read and interpret gages

Comments:



## **UNIT 6: Construction Pathway Masonry/Concrete Fundamentals Unit**

Competency

### **10. Maintain clean and safe work environment**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Inspect tools and work area for safety considerations
- Comply with posted safety warnings and symbols
- Identify unsafe conditions and/or work habits and reports them to the worksite professional immediately, if applicable
- Help maintain a clean and safe working environment free of debris and obstacles
- Clean, organize, put away items in the work area
- Safely identify, handle, store, and use hazardous materials according to company procedure, if applicable
- Report any indications of insects or pests

Learning Objectives

- List the major components of a facility safety program
- List the different state and federal agencies that provide regulatory oversight at your facility for personal safety, environmental safety, and equipment safety
- List accident and fire prevention techniques
- Describe posted safety warnings and symbols and what they mean
- Describe safe and unsafe work habits and their implications
- Discuss the importance of keeping the work area and tools/equipment clean
- List mechanical, electrical, and equipment safety hazards at your facility
- Discuss how to identify and report unsafe conditions in your facility
- Discuss safety procedures to prevent accidents
- Describe the requirements at your facility for safety training and auditing
- Assess need for good housekeeping practices
- List hazards that contribute to injury due to slips, trips, or falls
- Outline compliance requirements of sanitation and health inspections

Comments:

**UNIT 6: Construction Pathway**  
**Masonry/Concrete Fundamentals Unit**

Competency

**11. Clean up work area**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Follow directions based on foreman scope of work plans
- Clean and maintain materials and tools as required
- Store materials and tools properly
- Follow facility procedures for clean-up and shut down after use

Learning Objectives

- Explain the basic clean up procedures at the end of classroom or project build
- Explain the proper storage of tools and materials
- Articulate how a clean work environment supports safety
- Articulate how a clean work environment support efficiency

Comments:

## **Unit 6: Construction Pathway Masonry/Concrete Fundamentals Unit**

Competency

### **12. Practice quality craftsmanship**

Performance Standard Condition

#### **Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

#### **Performance will be successful when learners:**

- Inspect and/or test materials/piece/product at all stages of production to determine quality or condition
- Monitor materials, processes, equipment, tools, and products throughout the production process for safety and quality specifications
- Inspect final product/piece to ensure it meets specifications
- Promptly identify and segregate materials and/or product that do not meet specification
- Communicate with worksite professional if materials and/or product do not meet requirements
- Document all quality checks

Learning Objectives

- Explain and analyze the quality approval process used in the Masonry/Concrete/Brick and Block industry
- Describe the roles and responsibilities for quality in your facility
- List the major stages involved in producing products
- Explain the procedures for rejecting sub-standard products
- Define terms used in quality assurance
- Describe the impact of quality standards in within the Masonry/Concrete/Brick and Block industry
- Describe how materials are selected and tested for product requirements
- Emphasize the importance of getting the job done correctly the first time
- Explain the financial implications of poor craftsmanship

Comments:

**Unit 6: Construction Pathway**  
**Masonry/Concrete Fundamentals Unit**

Competency

**13. Assist with cutting brick and block**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Demonstrate the ability to work with brick and block for application
- Demonstrate use of proper tools in cutting brick and block
- Accurately cut brick and block
- Demonstrate the ability to accurately prepare joints
- Assure proper techniques for bonding

Learning Objectives

- Describes and demonstrates the basic techniques for working with concrete block and brick
- Understand how to apply head joints
- Explain how to spread mortar for bed joints
- Explain how to appropriately lay brick and block to line
- Explain the curing process

Comments:

**Unit 6: Construction Pathway**  
**Masonry/Concrete Fundamentals Unit**

Competency

**14. Assist with depositing, spreading, consolidating, and striking of concrete in a form**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Assist with masonry and installation techniques

Learning Objectives

- Explain how the properties of concrete are used in construction
- Describe the most common types of masonry units
- Describe how to set up a wall
- Explain how to lay a dry bond
- Describe how to spread and furrow a bed joint
- Explain how to butter masonry units
- Describe the different types of masonry bonds
- Describe how to lay masonry units in a true course
- Describe quality-control tests on concrete influence mix, placement, finishing, durability and performance
- Describe how the wind, heat, or cold affect the curing of the concrete throughout the entire process.

Comments:

## **Unit 6: Construction Pathway Masonry/Concrete Fundamentals Unit**

Competency

### **15. Lay masonry units to job specification**

Performance Standard Condition

#### **Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

#### **Performance will be successful when learners:**

- Assist with building a concrete footer
- Assist with setting and aligning forms that hold concrete to the desired pitch and depth
- Assist with preparing units for placement
- Verify the proper construction of forms
- Ensure proper placement onto spacers
- Assist with placing concrete

Learning Objectives

- Describe basic site layout using levels and measuring tools
- Discuss how to properly locate, grade and build forms and horizontal placement
- Discuss compaction activities on subgrades
- Describe various joints and where to locate them
- Describe various reinforcements and how to place them when ordering concrete
- Describe how concrete is conveyed and placed
- Determine an appropriate pre-placement checklist
- Describe how to use the equipment and tools for placing concrete
- Describe the process of depositing, spreading, consolidating, and striking off concrete in a form
- Define the trade terms to the appropriate processes and equipment

Comments:

## **Unit 6: Construction Pathway Masonry/Concrete Fundamentals Unit**

Competency

### **16. Assist with selecting the correct types of materials for the job.**

Performance Standard Condition

#### **Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

#### **Performance will be successful when learners:**

- Assist with the use of mortar applications in a project
- Assist with mixing mortar to the proper consistency for the application
- Assist with selecting the various types of mortar for the specific jobs

Learning Objectives

- Name and describe the primary ingredients in mortar and their properties
- Identify the various types of mortar used in masonry work
- Describe the common admixtures and their uses
- Identify the common problems found in mortar application and their solutions
- Describe how to properly set up the mortar mixing area
- Describe how to properly mix mortar by hand
- Describe how to properly mix mortar with a mechanical mixer
- Describe the properties of concrete
- Determine how the ingredients of concrete influence mix, placement, finishing, durability and performance
- Mix a test batch on concrete
- Describe how the wind, heat, or cold affect the curing of the concrete throughout the entire process
- Explain the importance of wall bracing
- Identify when and where the materials should be applied
- Describe scaffold basics

Comments:

## **Unit 6: Construction Pathway Masonry/Concrete Fundamentals Unit**

Competency

### **17. Perform volume estimates for concrete quantity requirements**

Performance Standard Condition

#### **Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

#### **Performance will be successful when learners:**

- Assist with applying measurements, drawings, and specifications to a project
- Perform a slump test
- Successfully mix a batch of concrete

Learning Objectives

- Work with denominate numbers
- Read a mason's measure
- Convert measurements in the English system into metric equivalents
- Recognize, identify, and calculate areas, circumferences, and volumes of basic geometric shapes
- Identify the basic parts of a set of drawings
- Discuss the different types of specifications used in the building industry and the sections that pertain to masonry.
- Describe the basic finishing process
- Describe quality-control tests on concrete influence mix, placement, finishing, durability and performance
- Mix a test batch on concrete

Comments:



**Appendix N**

**ARCHITECTURE AND CONSTRUCTION  
YOUTH APPRENTICESHIP**

**CONSTRUCTION PATHWAY  
MECHANICAL/HEATING, VENTILATION AND AIR CONDITIONING (HVAC) (UNIT 7)**

## **UNIT 7: Construction Pathway Mechanical/HVAC Fundamentals Unit**

Competency

### **1. Read blueprints, plans and specifications**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Articulate the functionality of blueprints, plans and specifications
- Interpret technical drawings accurately as needed for job task
- Use appropriate terminology for mechanical/HVAC careers
- Identify the types of schedules/drawings used in the HVAC trade
- Identify basic elements of technical drawings
- Identify lines, views, symbols, and representations on the drawings as applicable
- Interpret dimensions and scale on the drawings as applicable
- Utilize a metric scale to properly read a drawing

Learning Objectives:

- Identify basic design principles
- Explain where a design professional finds basic Architectural/Structural design codes
- Demonstrate basic drafting skills (AutoCAD)
- Demonstrate blueprint reading skills
- Explain why precision in interpretation is critical
- Demonstrate knowledge of fundamentals of statistics, trigonometry, and algebra and explain their relevance
- Discuss different types of architectural technical drawings
- Define and explain the use of lines, views, symbols, dimensions, and scale on architectural technical drawings
- Identify different lines by name, type, order of usage and application such as object, hidden, center, section, dimension, extension, cutting plane, short break, long break, phantom
- Compare pictorial format, orthographic projection, sectional views, and detail schedules
- Describe the standard usage of metric (SI) linear units in architectural drafting
- Interpret the following within an HVAC drawing
  - Piping
  - Air-handling equipment
  - AC system(s)
  - HVAC component diagram
  - Schematics

Comments:

## **UNIT 7: Construction Pathway Mechanical/HVAC Fundamentals Unit**

Competency

### **2. Interpret symbols and procedures**

Performance Standard Condition

#### **Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

#### **Performance will be successful when learners:**

- Explain the role of drawings and specifications
- Identify drawings and symbols used on a drawing
- Apply information from drawings in activities
- Interpret specifications appearing on drawings
- Interpret and convert measurements in terms of actual dimensions requires
- Explain specifications in terms of work requirements
- Interpret the welding process plan from a technical drawing which includes tools, equipment, speeds, feeds, fixtures and holders as applicable.

Learning Objectives:

- Explain the role of drawings in relation to quantities, project specifications, and contract documentation
- Explain the role of specifications in relation to quantities, quality of work, contract documentation and payment to contractors
- State the difference between general and project specifications
- Identify drawings in terms of type and application for a construction process
- Explain the key functions of the drawing in terms of the finished product
- Identify the key users of the drawing in terms of work responsibility
- Interpret symbols and abbreviations in terms of their functions and meanings
- Interpret the layout in terms of the different views shown
- Explain the purpose of each view in terms of the result of the end product

Comments:

## **UNIT 7: Construction Pathway**

### **Mechanical/HVAC Fundamentals Unit**

Competency

#### **3. Identify job prep needs and develop job task plan**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Set up and prepare tool/equipment for safe operation:
- Determine the scope of work:
  - Timetable
  - Work schedule
  - Cleanup process
  - Safety measures
  - Acceptable noise levels
- Describe contractual relationships between all parties involved in the building process
- Apply scheduling practices to ensure the successful completion of a construction project

Learning Objectives:

- Articulate the process to prepare the site and work with other construction professionals
- Strategize the scope of work for successful project completion
- Learn the importance of planning ahead to prevent problems on site before they occur
- Understand safety inspections to ensure regulations relating to health safety and the environment are adhered to
- Prepare sample project schedule that incorporates sequencing of events
- Prepare a flow chart explaining shop drawing review process
- Describe the approval procedures required for successful completion of a construction project

Comments:

## **UNIT 7: Construction Pathway**

### **Mechanical/HVAC Fundamentals Unit**

Competency

#### **4. Execute job prep needs as a coordinated effort**

Performance Standard Condition

##### **Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

##### **Performance will be successful when learners:**

- Illustrate how to control the main resources of a job:
  - Materials
  - Tools
  - Equipment
  - Labor
- Read and comply with dispatch orders
- Write a service report

Learning Objectives:

- Identify the components of building systems needed to complete a construction project
- Define planning and describe what it involves
- Explain why it is important to plan
- Explain the importance of documenting one's work
- Explain the sequence of events for project completion
- Explain how schedules are developed and used
- Define the terms production and productivity and explain why they are important
- Describe how efficiency can affect costs associated with the project
- Explain the supervisors role in controlling costs
- Describe the estimating process and classification of costs (e.g., direct and indirect, fixed and variable, methods and standards)
- Identify the steps to overseeing the running of several projects
- Demonstrate a working knowledge of communicating with a range of people including the client, subcontractor, supplier, the public and the workforce

Comments:

## **UNIT 7: Construction Pathway Mechanical/HVAC Fundamentals Unit**

Competency

### **5. Select tools and materials**

Performance Standard Condition

#### **Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

#### **Performance will be successful when learners:**

- Choose the tools they are going to work with taking into consideration the usefulness and portability of the tool
- Choose the appropriate tools and materials to minimize cost while meeting product performance goals

Learning Objectives:

- Identify the hand tools commonly used by mechanical/HVAC technicians and describe their uses
- Use hand tools in a safe and appropriate manner
- State the general rules for properly maintaining all power tools, regardless of type
- Explain importance of equipment and tool tracking
- Describe ways that a contractor can manage materials
- Compare the value of renting versus purchasing equipment

Comments:

**UNIT 7: Construction Pathway**  
**Mechanical/HVAC Fundamentals Unit**

Competency

**6. Use hand tools and light duty tools**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Use correct hand tools in a safe and appropriate manner
- Demonstrate the general safety rules for operating all power tools, regardless of type
- Use portable power tools in a safe and appropriate manner
- Use stationary power tools in a safe and appropriate manner
- Demonstrate proper handling and storage of tools.

Learning Objectives:

- Identify the hand tools commonly used and describe their uses
- Identify the portable power tools commonly used and describe their uses
- Identify the stationary power tools commonly used and describe their uses
- Describe the proper handling and storage of hand and power tools.
- Identify trends in power tool use
- Explain battery time and voltage in various power tools.

Comments:

## **UNIT 7: Construction Pathway Mechanical/HVAC Fundamentals Unit**

Competency

### **7. Operate tools and equipment safely**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Operate only equipment that he/she is trained on
- Choose correct tool(s) or equipment for the task
- Follow and complete a tool check list
- Inspect tool/equipment and work area for safety considerations
- Verify tool/equipment is available for use and in working order
- Verify tool/equipment is current for preventative maintenance and/or calibration
- Verify safety equipment and any Personal Protective Equipment (PPE) needed for tool/equipment use
- Wear the required Personal Protective Equipment (PPE) at all times as required for the operation of the tool/equipment
- Operate tools/equipment safely with guarding devices in the manner required for the job task
- Investigate and promptly report abnormal tool/equipment conditions
- Properly shut down and label any tool/equipment that is not operating as expected
- Follow Lock Out/Tag Out procedures as applicable
- Document use and maintenance as required

Learning Objectives:

- Distinguish between common hand tools including battery operated tools, sawzall, screw drivers and hex nut drivers, caulking gun, electrical testers, wire strippers and pliers, and pipe wrenches
- Outline applications of each tool and equipment
- Describe and demonstrate the safety requirements for each tool and equipment
- Discuss start up and shut down procedures for each tool/equipment you will operate
- Explain the purpose of preventative maintenance
- Describe emergency shutdown procedures for the tool/equipment you will operate
- Explain how to recognize and address malfunctions for the tool/equipment you will operate
- Describe how to recognize wear and tear on equipment components
- Describe how to select lubricants and coolants as applicable
- List which tools and equipment require safety certification

Comments:



## **UNIT 7: Construction Pathway Mechanical/HVAC Fundamentals Unit**

Competency

### **8. Assist with the installation of materials per job specifications**

Performance Standard Condition

#### **Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

#### **Performance will be successful when learners:**

- Articulate the scope of work
- Retrieve the correct material(s) for the job
- Demonstrate the application of measuring knowledge
- Demonstrate the ability to identify labels and read labels on products
- Demonstrate the ability to read and follow directions
- Demonstrate the ability to listen and take direction well
- Assist with loading/unloading of materials, tools, equipment and supplies
- Assist in lifting, positioning, and securing of materials and work pieces during installation
- Plan sequencing, tools, and equipment needed for the installation
- Identify set up needed
- Consult with worksite professional to verify production schedule, deadlines, and timeframes

Learning Objectives:

- Define the needed materials associated with the various jobs
- Determine effective and active listening skills
- Use acceptable language in the classroom
- Demonstrate writing legibly for all assignments
- Determine technical reading strategies
- Determine proper measuring techniques and explain how to use measuring tools.
- Demonstrate the ability to follow directions from the teacher/mentor in the classroom
- Explain the functions or collaborative nature of each department or unit within the larger organization

Comments:

## **UNIT 7: Construction Pathway Mechanical/HVAC Fundamentals Unit**

Competency

### **9. Demonstrate accuracy in measuring using various instruments**

Performance Standard Condition

#### **Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

#### **Performance will be successful when learners:**

- Choose the appropriate instrument or aid for measuring task
- Verify instrument is accurate for calibration if applicable
- Use and/or measure as required
- Read measuring instrument accurately
- Scale proportions accurately
- Apply appropriate formula and units for measurements
- Confirm measurement to given specification
- Record measurements using proper symbols
- Calibrate, clean, and store measuring instruments properly as required

Learning Objectives:

- List drafting aids and measuring devices commonly used by HVAC Technicians
- List common measurements used by HVAC Technicians
- Discuss how to convert standard English measures to metric and vice versa
- Explain architectural scale
- Explain the impact of error in measurement
- Add, subtract, multiply, and divide whole numbers, fractions, decimals and percent's
- Calculate averages, ratios, proportions, and rates
- Compare accuracy and precision when using measuring equipment
- Identify various calipers, micrometer instruments, and layout tools and their applications
- Identify digital measuring gages and instruments and their applications
- Describe how to read and interpret gages

Comments:

**UNIT 7: Construction Pathway  
Mechanical/HVAC Fundamentals Unit**

Competency

**10. Maintain clean and safe work environment**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Inspect tools and work area for safety considerations
- Comply with posted safety warnings and symbols
- Identify unsafe conditions and/or work habits and reports them to the worksite professional immediately, if applicable
- Help maintain a clean and safe working environment free of debris and obstacles
- Clean, organize, put away items in the work area
- Safely identify, handle, store, and use hazardous materials according to company procedure, if applicable
- Report any indications of insects or pests

Learning Objectives:

- List the major components of a facility safety program
- List the different state and federal agencies that provide regulatory oversight at your facility for personal safety, environmental safety, and equipment safety
- List accident and fire prevention techniques
- Describe posted safety warnings and symbols and what they mean
- Describe safe and unsafe work habits and their implications
- Discuss the importance of keeping the work area and tools/equipment clean
- List mechanical, electrical, and equipment safety hazards at your facility
- Discuss how to identify and report unsafe conditions in your facility
- Discuss safety procedures to prevent accidents
- Describe the requirements at your facility for safety training and auditing
- Assess need for good housekeeping practices
- List hazards that contribute to injury due to slips, trips, or falls
- Outline compliance requirements of sanitation and health inspections

Comments:

**UNIT 7: Construction Pathway**  
**Mechanical/HVAC Fundamentals Unit**

Competency

**11. Clean up work area**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Follow directions based on foreman scope of work plans.
- Clean and maintain materials and tools as required
- Store materials and tools properly
- Follow facility procedures for clean-up and shut down after use

Learning Objectives:

- Demonstrate basic clean up procedures at the end of classroom or project build
- Demonstrate the proper storage of tools and materials
- Explain how a clean work environment supports safety
- Explain how a clean work environment support efficiency

Comments:

## **UNIT 7: Construction Pathway Mechanical/HVAC Fundamentals Unit**

Competency

### **12. Practice quality craftsmanship**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Inspect and/or test materials/piece/product at all stages of production to determine quality or condition
- Monitor materials, processes, equipment, tools, and products throughout the production process for safety and quality specifications
- Inspect final product/piece to ensure it meets specifications
- Promptly identify and segregate materials and/or product that do not meet specification
- Communicate with worksite professional if materials and/or product do not meet requirements
- Document all quality checks

Learning Objectives:

- Explain and analyze the quality approval process used in the Mechanical/HVAC industry
- Describe the roles and responsibilities for quality in your facility
- List the major stages involved in producing products
- Explain the procedures for rejecting sub-standard products
- Define terms used in quality assurance
- Describe the impact of quality standards within the HVAC industry
- Describe how materials are selected and tested for product requirements

Comments:

**Unit 7: Construction Pathway**  
**Mechanical/HVAC Fundamentals Unit**

Competency

**13. Assist with basic equipment problem identification and diagnosis for heating and cooling systems**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Assist with preventive maintenance procedures on heating and cooling units
- Demonstrate knowledge of the electrical components of a cooling system
- Under supervision, use temperature and pressure measuring instruments to make readings at key points in the refrigeration cycle
- Measure temperatures in an operating air conditioning system
- Demonstrate knowledge of cylinder color codes to identify refrigerants
- Demonstrate knowledge of compressors, condensers, evaporators, metering devices, controls, and accessories

Learning Objectives:

- Construct a structure to evaluate conduction, convectional and radiant heating methods
- Explain principles of matter and energy
- Determine the temperature rise across the condenser
- Explore and analyze alternative heating and cooling methods
- Explain proper heating and cooling methods for residential and commercial structures
- Explain how heat transfer occurs in a cooling system and the concepts in the refrigeration cycle
- Identify the major components of a heating and cooling system and explain how each type works
- Identify the control devices used in heating and cooling systems and explain how each works
- Identify the components of various commercial heating systems
- Explain the operational principles of various commercial heating systems
- Identify the components of an induced draft and condensing gas furnace, and state their purpose
- Identify commonly used refrigerants and explain the proper procedures for handling these refrigerants

Comments:

**Unit 7: Construction Pathway**  
**Mechanical/HVAC Fundamentals Unit**

Competency

**14. Assist with basic equipment repair for heating systems and cooling systems**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Apply critical thinking to troubleshooting operational problems
- With supervision, provide preventive maintenance procedures such as: including filter replacement, cleaning of components, and temperature measurements
- Demonstrate proper use of testing equipment

Learning Objectives:

- Demonstrate a practical knowledge of basic electricity and of the electrical components of heating, air-conditioning, and refrigeration equipment
- Identify electrical generation and distribution components for commercial heating and air conditioning systems
- Explain the properties of matter and heat behavior
- Demonstrate knowledge of retail refrigeration and heating systems
- Demonstrate knowledge of commercial and industrial refrigeration and heating systems
- Explain how to maintain, test, and troubleshoot electrical motors and their components for commercial heating and air-conditioning systems
- Explain proper repair procedures when working with pressurized systems, electrical energy, heat, cold, and chemicals

Comments:

**Unit 7: Construction Pathway**  
**Mechanical/HVAC Fundamentals Unit**

Competency

**15. Set up and fabricate metals**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Complete general set up for fabrication
- Layout and plan work
- Perform safety checks
- Assemble tools and equipment as required
  - Place parts and assemblies into fixtures
  - Demonstrate how to fabricate metal to meet the specific project requirements.

Learning Objectives:

- Identify the physical properties of metal and how they are used
- Describe how to produce and assemble structural metal products for machinery, ovens, tanks, pipes, stacks and parts for buildings
- Demonstrate how to read job orders and blueprints
- Explain how to set up and use equipment to cut, shear and saw, form, roll and bend metals
- Identify the physical properties of metal and be able to figure the stock allowances for thickness
- Adjust safety guards and holding devices as needed
- Select correct tip size and type
- Set regulator for tip, fuel gas and material
- Measure corner and align track mechanism
- Set appropriate travel speeds
- Identify main parts of ac system, heating system, range vent system and spot ventilation system
- Identify general building codes for ac, heat, and duct runs

Comments:



**Unit 7: Construction Pathway**  
**Mechanical/HVAC Fundamentals Unit**

Competency

**16. Assist with the installation of fabricated parts**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Verify that the metal is fabricated to meet the specific project requirements
- Assist with the installation of various duct shapes to allow for proper flow
- Assist with loading unloading of materials, tools, equipment and supplies
- Assist in lifting, position, and securing of materials and work pieces during installation
- Examine how to create and install in the most efficient manner possible (Shop versus site installation)
- Perform minor maintenance or cleaning of tools and equipment
- Identify the different strategies to procure materials for fabrication vs. construction.

Learning Objectives:

- Determine how to fabricate sheet metal duct work components
- Demonstrate different fastening techniques for sheet metal components
- Define sheet metal components for proper air flow
- Describe the various types of materials for the proper process
- Interpret drawings so that duct work can be constructed to specification
- Determine boots, bends and finish grates for job

Comments:

**Unit 7: Construction Pathway**  
**Mechanical/HVAC Fundamentals Unit**

Competency

**17. Transfer measurements into a workable drawing**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Verify measurements of ducts in the drawings
- Ensure duct shapes selected will allow proper flow of materials
- Develop a shop drawing for HVAC fittings
- Turn drawings into Computer Aided Machining (CAM) or Computer Aided Design (CAD) instructions that drive the sheet metal cutting devices used to produce fittings.
- Determine a plan for installation prior to going to the site

Learning Objectives:

- Explain scaling of dimensional drawings for a particular component
- Explain how various metals are used for different types of HVAC operations
- Explain how flow is affected by various design types
- Demonstrate the various HVAC fittings using CAM and CAD
- Demonstrate different bending processes at the right degrees and measurements
- Determine correct mechanical units based on airflow for heat/AC units

**Comments:**

## **Appendix O**

### **ARCHITECTURE AND CONSTRUCTION YOUTH APPRENTICESHIP**

#### **CONSTRUCTION PATHWAY PLUMBING/SPRINKLER FITTING (UNIT 8)**

## **UNIT 8: Construction Pathway**

### **Plumbing/Sprinkler Fitting Fundamentals Unit**

Competency

#### **1. Read blueprints, plans and specifications**

Performance Standard Condition

##### **Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

##### **Performance will be successful when learners:**

- Explain the functionality of blueprints, plans and specifications
- Interpret technical drawings accurately as needed for job task
- Use appropriate plumbing terminology
- Identify basic elements of technical drawings
- Identify lines, views, symbols, and representations on the drawings as applicable
- Interpret dimensions and scale on the drawings as applicable
- Utilize a metric scale to properly read a drawing

Learning Objectives:

- Explain basic design principles
- Explain where a design professional finds basic plumbing codes
- Demonstrate blueprint reading skills
- Explain why precision in specification interpretation is critical
- Apply the fundamentals of statistics, trigonometry, and algebra and explain their relevance
- Discuss different types of architectural technical drawings
- Define the basic types of lines
- Define and explain the use of lines, views, symbols, dimensions, and scale on architectural technical drawings
- Identify different lines by name, type, order of usage and application such as object, hidden, center, section, dimension, extension, cutting plane, short break, long break, phantom
- Demonstrate standard view placement practices
- Compare pictorial format, orthographic projection, sectional views, and detail schedules

Comments:

## **UNIT 8: Construction Pathway**

### **Plumbing/Sprinkler Fitting Fundamentals Unit**

Competency

#### **2. Interpret symbols and procedures**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Identify drawings and symbols used on a drawing
- Apply information from drawings in activities
- Interpret specifications appearing on drawings
- Interpret measurements and dimensions in terms of site requirements

Learning Objectives:

- Explain the role of drawings in relation to project specifications, contract documentation, quantities and construction
- Explain the role of specifications in relation to quantities, quality of work, contract documentation and payment to contractors
- State the difference between general and project specifications
- Identify drawings in terms of type and application for a construction process
- Explain the key functions of the drawing in terms of the finished product
- Identify the key users of the drawing in terms of work responsibility
- Interpret symbols and abbreviations in terms of their functions and meanings
- Interpret the layout in terms of the different views shown
- Explain the purpose of each view in terms of the result of the end product

Comments:

## **UNIT 8: Construction Pathway**

### **Plumbing/Sprinkler Fitting Fundamentals Unit**

Competency

#### **3. Identify job prep needs and develop job task plan**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Set up and prepare tool/equipment for safe operation:
- Determine the scope of work:
  - Timetable
  - Work schedule
  - Cleanup process
  - Safety measures
  - Acceptable noise levels
- Describe contractual relationships between all parties involved in the building process
- Apply scheduling practices to ensure the successful completion of a construction project

Learning Objectives:

- Explain the process to prepare the site and working with other construction professionals
- Strategize the scope of work for successful project completion
- Articulate the importance of planning ahead to prevent problems on site before they occur
- Explain the process of safety inspections to ensure regulations relating to health safety and the environment are adhered to
- Prepare sample project schedule that incorporates sequencing of events
- Prepare a flow chart explaining shop drawing review process
- Describe the approval procedures required for successful completion of a construction project

Comments:

## **UNIT 8: Construction Pathway Plumbing/Sprinkler Fitting Fundamentals Unit**

Competency

### **4. Execute Job prep needs as a coordinated effort**

Performance Standard Condition

#### **Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

#### **Performance will be successful when learners:**

- Review the scope and phased of the project with a worksite professional
- Demonstrate how to control the main resources of a job:
  - Materials
  - Tools
  - Equipment
  - Labor

Learning Objectives:

- Define planning and describe what it involves
- Explain why it is important to plan
- Explain the importance of documenting one's work
- Describe the estimating process
- Explain how schedules are developed and used
- Define the terms production and productivity and explain why they are important
- Describe how efficiency can affect costs associated with the project
- Explain the supervisors role in controlling costs
- Identify the steps to overseeing the running of several projects
- Demonstrate a working knowledge of communicating with a range of people including the client, subcontractor, supplier, the public and the workforce
- Describe how work teams coordinate work flow and help manage resources

Comments:

## **UNIT 8: Construction Pathway**

### **Plumbing/Sprinkler Fitting Fundamentals Unit**

Competency

#### **5. Select tools and materials**

Performance Standard Condition

##### **Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

##### **Performance will be successful when learners:**

- Choose the tools they are going to work with taking into consideration the usefulness and portability of the tool.
- Choose the appropriate tools and materials to minimize cost while meeting product performance goals
- Select the appropriate materials, fittings, grades and types of pipe

Learning Objectives:

- Identify the hand tools commonly used by plumbers and describe their uses
- Use hand tools in a safe and appropriate manner
- State the general rules for properly maintaining all power tools, regardless of type
- Explain importance of equipment and tool tracking
- Describe ways that a contractor can manage materials
- Compare the value of renting versus purchasing equipment

Comments:



## **UNIT 8: Construction Pathway**

### **Plumbing/Sprinkler Fitting Fundamentals Unit**

Competency

#### **6. Use hand tools and light duty tools**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when the learners:**

- Use correct hand tools in a safe and appropriate manner
- Demonstrate the general safety rules for operating all power tools, regardless of type
- Use portable power tools in a safe and appropriate manner
- Use stationary power tools in a safe and appropriate manner
- Demonstrate proper handling and storage of tools.

Learning Objectives:

- Identify the hand tools commonly used by plumbers and describe their uses
- Identify the portable power tools commonly used by plumbers and describe their uses
- Describe the proper handling and storage of hand and power tools.
- Identify trends in power tool use
- Describe battery time and voltage in various power tools.

Comments:

## **UNIT 8: Construction Pathway Plumbing/Sprinkler Fitting Fundamentals Unit**

Competency

### **7. Operate tools and equipment safely**

Performance Standard Condition

#### **Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

#### **Performance will be successful when learners:**

- Operate only equipment that he/she is trained on
- Choose correct tool or equipment for the task
- Follow and complete a tool check list
- Inspect tool/equipment and work area for safety considerations
- Verify tool/equipment is available for use and in working order
- Verify tool/equipment is current for preventative maintenance and/or calibration
- Verify safety equipment and any Personal Protective Equipment (PPE) needed for tool/equipment use
- Wear the required Personal Protective Equipment (PPE) at all times as required for the operation of the tool/equipment
- Operate tool/equipment safely with guarding devices in the manner required for the job task
- Investigate and promptly reports abnormal tool/equipment conditions
- Properly shut down and label any tool/equipment that is not operating as expected
- Follow Lock Out/Tag Out procedures as applicable
- Document use and maintenance as required
- Document use and maintenance as required

Learning Objectives:

- Distinguish between common hand tools including hack saw, pliers, compression sleeve puller, screw driver, and allen, basin, pipe and adjustable wrenches
- Give examples of manufacturing processes that use fixtures
- Outline applications of each tool and equipment
- Describe and demonstrate the safety requirements for each tool and equipment
- Discuss start up and shut down procedures for each tool/equipment you will operate
- Explain the purpose of preventative maintenance
- Describe emergency shutdown procedures for the tool/equipment you will operate
- Explain how to recognize and address malfunctions for the tool/equipment you will operate
- Describe how to recognize wear and tear on equipment components
- Describe how to select lubricants and coolants as applicable
- List which tools and equipment require safety certification

Comments:

## **UNIT 8: Construction Pathway**

### **Plumbing/Sprinkler Fitting Fundamentals Unit**

Competency

#### **8. Assist with the installation of materials per job specifications**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Articulate the scope of work
- Retrieve the correct material(s) for the job
- Apply measuring knowledge to procure the material
- Demonstrate the ability to identify labels and read labels on products
- Demonstrate the ability to take direction well
- Assist with install of valves
- Assist with install of toilets
- Demonstrate how to solder pipes
- Assist with cutting, threading and reaming

Learning Objectives:

- Understand all of the materials associated with the various trades
- Demonstrate proper listening techniques
- Demonstrate the ability to read directions
- Demonstrate the ability to properly use measuring tools
- Demonstrate how to determine the appropriate types of fittings, valves, hangers, and supports needed for plastic piping
- Demonstrate how to properly measure, cut, and join plastic piping
- Demonstrate the ability to follow directions from the supervisor/mentor
- Identify types of fittings and valves and their uses
- Select the appropriate personal protective equipment
- Properly measure, cut, and join piping
- Select the correct support and spacing for the application
- Identify the material properties, storage, and handling requirements of copper tube

Comments:

## **UNIT 8: Construction Pathway**

### **Plumbing/Sprinkler Fitting Fundamentals Unit**

Competency

#### **9. Demonstrate accuracy in measuring using various instruments**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Choose appropriate instrument or aid for measuring task
- Verify instrument is accurate for calibration if applicable
- Use and/or measure as required
- Read measuring instrument accurately
- Scale proportions accurately
- Apply appropriate formula and units for measurements
- Confirm measurement to given specification
- Record measurements using proper symbols
- Calibrate, clean, and store measuring instruments properly as required

Learning Objectives:

- List drafting aids and measuring devices commonly used by architects
- List common measurements used by plumbers
- Discuss how to convert standard English measures to metric and vice versa
- Explain architectural scale
- Explain the impact of error in measurement
- Add, subtract, multiply, and divide whole numbers, fractions, decimals and percent's
- Calculate averages, ratios, proportions, and rates
- Compare accuracy and precision when using measuring equipment
- Identify various calipers, micrometer instruments, and layout tools and their applications
- Identify digital measuring gages and instruments and their applications
- Describe how to read and interpret gages

Comments:

## **Unit 8: Construction Pathway Plumbing/Sprinkler Fitting Fundamentals Unit**

Competency

### **10. Maintain clean and safe work environment**

Performance Standard Condition

#### **Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

#### **Performance will be successful when learners:**

- Inspect tools and work area for safety considerations
- Comply with posted safety warnings and symbols
- Identify unsafe conditions and/or work habits and reports them to the worksite professional immediately, if applicable
- Help maintain a clean and safe working environment free of debris and obstacles
- Clean, organize, put away items in the work area
- Safely identify, handle, store, and use hazardous materials according to company procedure, if applicable
- Report any indications of insects or pests

Learning Objectives:

- List the major components of a facility safety program
- List the different state and federal agencies that provide regulatory oversight at your facility for personal safety, environmental safety, and equipment safety
- List accident and fire prevention techniques
- Describe posted safety warnings and symbols and what they mean
- Describe safe and unsafe work habits and their implications
- Discuss the importance of keeping the work area and tools/equipment clean
- List mechanical, electrical, and equipment safety hazards at your facility
- Discuss how to identify and report unsafe conditions in your facility
- Discuss safety procedures to prevent accidents
- Describe the requirements at your facility for safety training and auditing
- Assess need for good housekeeping practices
- List hazards that contribute to injury due to slips, trips, or falls
- Outline compliance requirements of sanitation and health inspections

Comments:

**Unit 8: Construction Pathway**  
**Plumbing/Sprinkler Fitting Fundamentals Unit**

Competency

**11. Clean up work area**

Performance Standard Condition

**Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Follow directions based on foreman scope of work plans
- Clean and maintain materials and tools as required
- Store materials and tools properly
- Follow facility procedures for clean-up and shut down after use

Learning Objectives:

- Explain the basic clean up procedures at the end of classroom or project build
- Explain proper storage of tools and materials
- Articulate how a clean work environment supports safety
- Articulate how a clean work environment support efficiency

Comments:

## **Unit 8: Construction Pathway**

### **Plumbing/Sprinkler Fitting Fundamentals Unit**

Competency

#### **12. Practice quality craftsmanship**

Performance Standard Condition

##### **Competence will be demonstrated**

- At the worksite and classroom

Performance Standard Criteria

##### **Performance will be successful when learners:**

- Inspect and/or test materials/piece/product at all stages of production to determine quality or condition
- Monitor materials, processes, equipment, tools, and products throughout the production process for safety and quality specifications
- Inspect final product/piece to ensure it meets specifications
- Promptly identify and segregate materials and/or product that do not meet specification
- Communicate with worksite professional if materials and/or product do not meet requirements
- Document all quality checks

Learning Objectives:

- Explain and analyze the quality approval process used in the Plumbing industry
- Describe the roles and responsibilities for quality in your facility
- List the major stages involved in producing products
- Explain the procedures for rejecting sub-standard products
- Define terms used in quality assurance
- Describe the impact of quality standards in plumbing
- Describe how materials are selected and tested for product requirements
- Explain the financial implications of poor craftsmanship

Comments:

## **Unit 8: Construction Pathway Plumbing/Sprinkler Fitting Fundamentals Unit**

Competency

### **13. Assist with testing and maintenance of fixtures**

Performance Standard Condition

**Competence will be demonstrated**

- at the worksite and classroom

Performance Standard Criteria

**Performance will be successful when learners:**

- Identify the basic types of materials used in the manufacture of plumbing fixtures
- Demonstrate knowledge of testing plumbing fixtures
- Demonstrate knowledge of maintaining plumbing fixtures
- Assist with common repair and maintenance requirements for fixtures, valves and faucets such as:
  - sinks, lavatories, and faucets
  - bathtubs and showers
  - toilets, urinals, and bidets
  - drinking fountains and water coolers
  - appliances connected by a plumber
- Assist with the preparation of blocking and supports
- Assist with cutting and patching of walls

Learning Objectives:

- Explain selected plumbing and aligning tasks
- Identify job-site hazardous work specific to plumbers
- Describe and demonstrate the importance of the lockout/tagout process
- Identify the basic types of materials used in the manufacture of plumbing fixtures
- Identify the basic types of valves and various pressure ratings
- Identify common types of sinks, lavatories, faucets, bathtubs, shower stalls, drinking fountains, garbage disposals and dishwashers
- Identify parts of a fitting and use common pipe measuring techniques
- Calculate end to end measurements using fitting allowances and thread makeup.

Comments:



**Appendix P**

**ARCHITECTURE AND CONSTRUCTION  
YOUTH APPRENTICESHIP**

**DESIGN/PRE-CONSTRUCTION PATHWAY  
ARCHITECTURAL DRAFTING (UNIT 9)**

## **Unit 9: Design/Pre-Construction Pathway**

### **Architectural Drafting Unit**

Competency

#### **1. Interpret technical drawings**

Performance Standard Condition

##### **Competence will be demonstrated**

- at the worksite

Performance Standard Criteria

##### **Performance will be successful when learners:**

- Interpret technical drawings accurately as needed for job task
- Use appropriate terminology
- Identify basic elements of technical drawings
- Identify lines, views, symbols, and representations on the drawings as applicable
- Interpret dimensions and scale on the drawings as applicable
- Utilize a metric scale to properly read a drawing

Learning Objectives:

- Discuss different types of architectural technical drawings
- Define the basic types of lines
- Define and explain the use of lines, views, symbols, dimensions, and scale on architectural technical drawings
- Identify different lines by name, type, order of usage and application such as object, hidden, center, section, dimension, extension, cutting plane, short break, long break, phantom
- Demonstrate standard view placement practices
- Compare pictorial format, orthographic projection, sectional views, and detail schedules
- Discuss the ANSI and AIA standards for architectural document lines
- Describe the standard usage of metric (SI) linear units in architectural drafting

Comments:

## **Unit 9: Design/Pre-Construction Pathway**

### **Architectural Drafting Unit**

Competency

#### **2. Use measuring devices accurately**

Performance Standard Condition

##### **Competence will be demonstrated**

- at the worksite

Performance Standard Criteria

##### **Performance will be successful when learners:**

- Choose appropriate instrument or aid for measuring task
- Verify instrument is accurate for calibration if applicable
- Use and/or measure as required
- Read measuring instrument accurately
- Scale proportions accurately
- Apply appropriate formula and units for measurements
- Record measurements using proper symbols
- Clean and maintain instrument(s) as required
- Store instrument(s) properly

Learning Objectives:

- List drafting aids and measuring devices commonly used by architects
- List common measurements used by architects
- Add and subtract measurements
- Discuss how to convert standard English measures to metric and vice versa
- Explain architectural scale
- Explain the impact of error in measurement
- Predict the effect of error propagation in calculations
- Explain the link between measurement, calculation and data with the correct number of significant digits

Comments:

## **Unit 9: Design/Pre-Construction Pathway**

### **Architectural Drafting Unit**

Competency

#### **3. Organize databases, files and drawings**

Performance Standard Condition

**Competence will be demonstrated**

- at the worksite

Performance Standard Criteria

**Performance will be successful when learners:**

- Select appropriate documents
- Code documents as required
- Save and store drawings and files to appropriate database
- Sort and retrieve drawings and data from databases
- Enter data and edit fields and documents
- Query to extract information from files and documents
- Create reports from queries
- Use appropriate computer codes, formatting, macros, charts, spreadsheets, etc.
- Verify data prior to entry/storage

Learning Objectives:

- Define basic database terms such as database, field, record, query, table, etc.
- Identify the various types of data and documents stored in your companies database management system
- Discuss the access and responsibilities you will have for managing architectural records and documents

Comments:

## **Unit 9: Design/Pre-Construction Pathway**

### **Architectural Drafting Unit**

Competency

#### **4. Reproduce documents and plans**

Performance Standard Condition

**Competence will be demonstrated**

- at the worksite

Performance Standard Criteria

**Performance will be successful when learners:**

- Obtain documents or plans
- Remove any staples if hard copy
- Save copies to computer storage devices
- Operate copy machines
- Operate printers, plotters, and scanners
- Number copies as required
- Document copies made

Learning Objectives:

- Explain the purpose of copy control and plan numbering systems
- Explain the size of drawings to standards
- Define U.S. customary architectural drawing sizes
- Define aspect ratio and how it applies to drawing sizes and copying
- Describe how to operate the computer database storage system, copy machine, printer, scanner, etc. at your facility

Comments:

## Unit 9: Design/Pre-Construction Pathway

### Architectural Drafting Unit

Competency

#### 5. Compile site measurements and other data

Performance Standard Condition

**Competence will be demonstrated**

- at the worksite

Performance Standard Criteria

**Performance will be successful when learners:**

- Obtain survey information on building site from documented resources and survey measurements for architectural plans, specifications, cost estimates, reports, etc.
- **Assist to research codes and site requirements**
- Identify the boundaries of a property based on its legal description
- Visit site to gather information pertinent to the viability of a project on the site
- Assist to measure building or lot if required
  - Take measurements of structures, distances, length, width, height, perimeter, and area
  - Determine elevations and contour lines
  - Establish a point of known elevation for a project
  - Read gauges and measurement instruments accurately
  - Document measurements accurately
- Identify measurements and elevations
- Use and report measurements correctly
- Schedule or conduct land/utility surveys
  - Arrange for evaluation of basic service and utility systems available including service capacity, service entrance, meter base, and distribution panel locations
  - Arrange for geological and geophysical investigations
  - Obtain soil samples and send for analysis
  - Arrange studies of water and utility needs
  - Arrange studies of air, water and solid waste pollution impact
  - Conduct studies of traffic patterns or environmental conditions to assess the potential impact of projects
  - Arrange for plant location surveys
  - Arrange for topographical surveys

Learning Objectives:

- Explain how to identify the boundaries of a property based on legal description
- Discuss the impact of zoning in site selection
- Explain how maps and aerial photos are used in site determination and measurement
- Explain how property lines, utilities, building line, setback, building corners, and elevation are indicated in land maps
- Explain general survey methods used to obtain site measurements
- Describe how elevation reference points and footing grades are established
- Discuss how GIS (Geographic Information Systems), GPS (Global Positioning Systems), and lasers are used to measure sites
- Describe criteria for building site selection

- List soil characteristics important to the design and construction of a building according to the United Soil Classification System designation
- Describe the impact of passive energy, sustainability and landscaping on site selection
- Discuss hazards specific to building sites
- Discuss common methods for site preparation
- Explain the process for demolition of old structures prior to repair or new construction

Comments:

## Unit 9: Design/Pre-Construction Pathway Architectural Drafting Unit

Competency

### 6. Use architectural drafting software

Performance Standard Condition

#### **Competence will be demonstrated**

- at the worksite

Performance Standard Criteria

#### **Performance will be successful when learners:**

- Obtain and use appropriate reference materials
- Access and use appropriate file management to search, create, copy, edit, and save drawing files
- Execute application software
- Demonstrate view use in CAD
- Retrieve or create
  - Access predefined drawing setup
  - Import/export drawings from/to various graphic formats
  - Convert an existing hard copy drawing to an electronic format
- Draw or modify drawings
  - Utilize drawing management standards
  - Set up plot parameter
  - Select appropriate scale
  - Utilize various coordinate systems
  - Apply appropriate naming conventions, line types, and object management to drawing
  - Apply appropriate notes and/or leaders to drawing
  - Apply appropriate lettering, fonts, line thickness and type
- Check drawing
- Maintain drawings in appropriate project family in the file management system

Learning Objectives:

- Explain the purpose, principle, and advantages of Computer-Aided Drawing (CAD)
- Compare cost, advantages, and disadvantages of CAD versus Manual drawing
- Compare types of CAD used in Architecture, such as Revit
- Identify drafting references, handbooks, vendor's product catalog, and other related appropriate standards and how they are used in architectural drafting
- List appropriate architectural design standards used by your facility
- Describe the hardware components commonly found in a CAD workstation- the computer, the digitizer, and plotters and printers
- Compare architectural symbols, text based information, and libraries in the CAD software used in your facility
- Describe the feature manager design tree schematic for the CAD software you will use
- Discuss CAD plotting guidelines
- Define BIM and BIM features in architectural software, such as Revit

Comments:



## Unit 9: Design/Pre-Construction Pathway Architectural Drafting Unit

Competency

### 7. Develop 2D (orthographic) view drawings

Performance Standard Condition

**Competence will be demonstrated**

- at the worksite

Performance Standard Criteria

**Performance will be successful when learners:**

- Obtain & use appropriate reference materials
- **Use architectural drafting software** OR draw manually
- Select proper views
- Identify types of lines to be used
- Determine and utilize line precedence
- Draw geometric shapes such as circles, polygons, ellipses, parabola, triangles of various angles, tangent lines, and arcs as needed
- Construct an orthographic drawing
- Show hidden features and centerlines as required
- Complete title block by selecting lettering style and size
- Apply proper thickness to all lines
- Check drawing
- Label and save to appropriate project family

Learning Objectives:

- Explain the alphabet of lines for drawing
- Explain the three dimensions and how they are represented for width, depth, and height
- Describe projection rules to create 2D sketches of 3D objects
- Define orthographic view
- Explain the purpose of orthographic views
- Compare types of 2D views
- Discuss the line types used in orthographic views
- Explain how orthographic projections are used in architecture
- Explain how to draw orthographic views and geometric constructions
- Identify common geometric shapes and forms by name
- List formulas used in geometric constructions

Comments:

## Unit 9: Design/Pre-Construction Pathway Architectural Drafting Unit

Competency

### 8. Develop 3D view models

Performance Standard Condition

**Competence will be demonstrated**

- at the worksite

Performance Standard Criteria

**Performance will be successful when learners:**

- Obtain & use appropriate reference materials
- **Use architectural drafting software** OR draw manually
- Select proper view
- Lay out view corner
- Identify types of lines to be used
- Determine and utilize line precedence
- Draw 3D view models
- Show hidden features and centerlines as required
- Complete title block by selecting lettering style and size
- Apply proper thickness to all lines
- Check drawing
- Label and save to appropriate project family

Learning Objectives:

- Compare 2D (orthographic) views to 3D model views
- Explain how the viewing direction for a 3D model is chosen
- Explain how to draw 3D models
- Explain the purpose of 3D model views
- Discuss the line types used in 3D model views

Comments:

## Unit 9: Design/Pre-Construction Pathway Architectural Drafting Unit

Competency

### 9. Dimension drawings

Performance Standard Condition

**Competence will be demonstrated**

- at the worksite

Performance Standard Criteria

**Performance will be successful when learners:**

- Obtain & use appropriate reference materials
- **Use architectural drafting software** OR draw manually
- Select views to be dimensioned
- Dimension views
  - Draw dimension lines
  - Dimension views using appropriate style of dimensioning
- Continue until all features have been dimensioned
- Dimension complex shapes when appropriate (e.g., spheres, cylinders, tapers, pyramids)
- Apply appropriate line thickness and type to dimension, extension, and center lines
- Check drawing

Learning Objectives:

- Define proportion
- Explain architectural scale
- Describe how scales are indicated on technical drawings
- Define dimensioning in architecture
- Discuss the common rules for architectural dimensioning
- Discuss the basic parts of a dimension
- List common symbols used in dimensioning
- State the standard height of dimension numerals
- Specify common metric scales used in architectural drafting

Comments:

## Unit 9: Design/Pre-Construction Pathway Architectural Drafting Unit

Competency

### 10. Apply lettering and basic annotation to drawings

Performance Standard Condition

**Competence will be demonstrated**

- at the worksite

Performance Standard Criteria

**Performance will be successful when learners:**

- Obtain & use appropriate reference materials
- **Use architectural drafting software** OR draw manually
- Add lettering
- **Draw dimension** and extension lines
- Apply adequate drawing notations
- Use appropriate abbreviations
- Apply finish marks
- Check drawing

Learning Objectives:

- Explain the importance of standardized lettering on architectural documents
- List types of architectural lettering
- Discuss common standards to use in lettering
- Discuss when to use dashed lines
- Describe general rules of the use of line weights
- Define annotation
- Explain the purpose of architectural annotations on technical drawings
- List common abbreviations used in annotations in architecture
- Distinguish specific (local) notes and general notes and placement in the drawing

Comments:

## Unit 9: Design/Pre-Construction Pathway Architectural Drafting Unit

Competency

### 11. Prepare working drawings

Performance Standard Condition

**Competence will be demonstrated**

- at the worksite

Performance Standard Criteria

**Performance will be successful when learners:**

- Obtain & use appropriate reference materials
- **Compile site measurements & other data**
- **Use architectural drafting software** OR draw manually
- Draw required view(s) of structures, site layouts, elevations, &/or sections
- Follow guidelines for good drawing techniques
- Draw lines, angles, arcs, circles, and ellipses
- Draw in proportion
- **Dimension drawing**
- **Apply lettering & annotation**
- Check drawing

Learning Objectives:

- Describe the purpose of working drawings
- Compare working drawings to final drafts
- Describe the function of bubble drawings and scaled sketches
- Differentiate between the types of working drawings
- Explain the typical sequence in which drawings are created

Comments:

## Unit 9: Design/Pre-Construction Pathway

### Architectural Drafting Unit

Competency

#### 12. Assist to research building codes and site requirements

Performance Standard Condition

**Competence will be demonstrated**

- at the worksite
- while assisting a worksite professional

Performance Standard Criteria

**Performance will be successful when learners:**

- Review the architectural plan with the worksite professional
- Identify site location, building systems, and structures designated in the architectural plan
- Consult with customers, engineers, construction professionals, landscape architects, environmental scientists and/or government officials
- Determine categories of applicable codes required by site, systems, and structures
- Locate resources to conduct code and site research
- Look up codes, zoning ordinances and regulations to determine the applicable requirements for a project
  - Research Land Use regulations to identify zoning designations and allowable uses of property
- Review research with worksite professional

Learning Objectives:

- Describe the resources and processes to be followed to research required codes and site restrictions at your facility
- Explain the purpose of building codes
- Recognize the potential dangers of built structures, particularly residences that do not follow code
- Identify the national codes typically used in the United States and know who is responsible for determining which code is applied to the design process
- Explain what an occupancy type is
- Classify a building according to its use, occupancy, and construction type using International Building Codes
- Discuss the Wisconsin energy code and code requirements
- Explain the general criteria for domestic light, ventilation, heating, and sanitation requirements
- Delineate the dimensional requirements for doors, halls, stairs, and rooms

Comments:

## Unit 9: Design/Pre-Construction Pathway

### Architectural Drafting Unit

Competency

#### 13. Participate on an architectural design project

Performance Standard Condition

**Competence will be demonstrated**

- at the worksite

Performance Standard Criteria

**Performance will be successful when learners:**

- Review the scope and phases of the design project with worksite professional
- Participate in the following project team activities to develop and implement the architectural plan as able
  - Identify customer requirements
  - Identify contractors and stakeholders required for the project
  - Develop preliminary sketches
  - Develop schedules
  - Investigate the legal, physical, and financial requirements of a project and consider the needs of the community to determine project viability
  - Estimate required resources and budget
  - Estimate supply quantities needed from plans
  - Estimate time requirements
  - Identify interdependencies
  - Identify critical milestones
  - Review contractor licenses
  - Establish and review contracts with contractors
  - Obtain permits and licenses
  - Coordinate work between trades
  - Track critical milestones
  - Track changes to architectural plans and costs
  - Report project status
- Periodically review architectural plan activities completed and their results

Learning Objectives:

- Explain the sequence of events for constructing buildings
- List the phases of the architectural planning process- initial contact, preliminary design studies, initial working drawings, final design considerations, completion of working drawings, permit procedures, and job supervision
- Explain the role of the engineer in an architectural planning process
- Describe how a building plan is developed from a technical drawing for schedule, materials and equipment
- Determine how construction activities interface with architectural planning
- Explain factors that need to be considered when estimating costs and budget
- Classify costs (e.g., direct and indirect, fixed and variable, methods and standards)
- Apply basic math skills to calculate the quantity and cost of materials needed
- Explain the process for applying for a building permit
- Identify the components of building systems needed to complete a construction project

Comments:

## **Appendix Q**

### **ARCHITECTURE AND CONSTRUCTION YOUTH APPRENTICESHIP**

#### **DESIGN/PRE-CONSTRUCTION PATHWAY ARCHITECTURAL PLANNING (UNIT 10)**



## Unit 10: Design/Pre-Construction Pathway

### Architectural Planning Unit

Competency

#### 1. Draw a site plan

Performance Standard Condition

##### **Competence will be demonstrated**

- at the worksite

Performance Standard Criteria

##### **Performance will be successful when learners:**

- **Compile site measurements and other data**
- Review design data and dimensions of site layout
- Analyze measurement, service, utility, zoning & coding, and ecosystem data with worksite professional
- Select size and scale for plan
- **Use architectural drafting software** OR draw manually
- Identify parcel features
  - Indicate existing ground features on drawing (e.g., utilities, contours, landscape features, etc.)
  - Indicate boundaries, easement, buffer areas, and established setbacks of site
  - Draw existing structures
  - Locate and identify bench mark and elevation level
- Indicate modifications of any existing site elements
  - Draw proposed contour lines and indicate any new grade elevations
- Place proposed structure on site with favorable orientation considering site-specific information
  - Draw utility lines and connections
  - Draw additional construction extending beyond exterior walls of structure (e.g., driveways, sidewalks, patios, decks, proposed utilities, etc.)
  - Draw landscaping elements
- Estimate the amount of cut and/or fill necessary to build a structure
- Estimate the increase in storm water runoff from a site
  - Apply Low Impact Development techniques to reduce the impact of development on the storm water runoff quantity and quality
- Indicate scale of drawing and view title
- Indicate north arrow
- Check drawing

Learning Objectives:

- Explain the purpose of a site plan
- Describe the process to draw a site plan
- Explain the purpose of contour lines
- Define easement, buffer area and setback as they relate to local codes and construction sites
- Describe how choice of structure placement on site relates to energy, utility, sanitation, and drainage requirements
- Explain how to locate and identify an elevation level

- Discuss issues of storm water run-off and methods to reduce
- Identify site factors which affect the design of a house, including neighborhood property values, review board controls, and access to the site
- Classify roadways according to level of use
- Describe additional features to be considered for commercial properties such as pedestrian access, vehicular access, parking, storm water runoff storage/collectors
- Define cut and fill
- Explain how to calculate cut or fill needed
- Discuss the need to prevent/control wind or water erosion in land development and construction

Comments:

## Unit 10: Design/Pre-Construction Pathway

### Architectural Planning Unit

Competency

#### 2. Draw sectional and elevation views

Performance Standard Condition

**Competence will be demonstrated**

- at the worksite

Performance Standard Criteria

**Performance will be successful when learners:**

- Review design data and layouts
- **Use architectural drafting software** OR draw manually

**EXTERIOR**

- Draw grade line
- Project construction lines from plans
- Indicate finished floor level(s)
- Indicate finished ceiling level(s)
- Draw and detail windows and doors
- Draw roof outline
- Letter wall and roof finishes, roof pitch, chimney, decks, and porches
- Add dimensions, scale, notes, labels and view title
- Check drawing

**INTERIOR**

- Indicate true width of walls
- Indicate all openings in interior or exterior walls
- Indicate typical sections of standard built-in features
- Note wall materials or finish
- Indicate fixtures, built-ins, trim and molding, and utilities
- Add dimensions, scale, notes, labels and view title
- Darken finish lines
- Check drawing

Learning Objectives:

- Explain how to draw exterior elevations from one and two point perspectives
- Describe how the grade line is determined
- Distinguish between the characteristics of various exterior styles
- Explain how to draw interior elevations from one and two point perspectives
- List common abbreviations and symbols for interior fixtures, built ins and utilities
- List standard built ins in common residential and commercial structures

Comments:

## Unit 10: Design/Pre-Construction Pathway

### Architectural Planning Unit

Competency

#### 3. Draw a floor plan

Performance Standard Condition

**Competence will be demonstrated**

- at the worksite

Performance Standard Criteria

**Performance will be successful when learners:**

- Review preliminary sketches, notes and specifications
- **Use architectural drafting software** OR draw manually
- Lay out exterior limits of structure
- Block out exterior and interior walls with appropriate thickness
- Indicate openings in exterior and interior walls
- Draw door and window sizes
  - Use a manual to reference basic door types, sizes, ADA requirements, and drawing conventions
  - Use a manual to reference basic window types, sizes, extent openable, and drawing conventions
- Draw other floor plan features
  - Draw cabinetry, appliances, plumbing fixtures, fireplaces and stairs
  - Draft basic electrical symbols, including switches, duplex receptacle outlets, ceiling and wall-mounted lights, and circuit lines
  - Draft second-floor and basement plans
- Use appropriate leads and line weights for both construction and finish lines
- Add dimensions, notes and room labels
- Draw material symbols
- Indicate scale of drawing and view title
- Indicate north arrow
- Check drawing

Learning Objectives:

- Describe how detail schedules are written from a floor plan
- Discuss how dimensions of materials/fixtures impact a floor plan and vice versa
- State the ideal orientation, location relative to traffic patterns and plumbing, and egress requirements of bedrooms
- Describe the process of overlay drafting
- Describe the role of layers in CAD floor plan drafting
- Identify the general sizes and drawing conventions of cabinets, fixtures and appliances found in kitchens, bathrooms, and utility rooms
- Identify the finish material semiology use on floor plans
- Differentiate between types of fireplaces
- Delineate miscellaneous floor-plan symbols, including those for hose bibs, concrete slabs, attic crawl space access, floor drains, and cross-section symbols
- Articulate how CAD floor-plan symbols are stored, placed and moved, and how attributes are used

- Discern when it is appropriate to place electrical symbols on a floor plan and when they should be placed on a separate sheet
- Define basic electrical terms
- Identify basic service specification requirements, including service capacity, service entrance, meter base, and distribution panel locations

Comments:

## Unit 10: Design/Pre-Construction Pathway

### Architectural Planning Unit

Competency

#### 4. Develop a stair section drawing

Performance Standard Condition

**Competence will be demonstrated**

- at the worksite

Performance Standard Criteria

**Performance will be successful when learners:**

- Review floor plan and stair specifications
- **Use architectural drafting software** OR draw manually
- Confirm floor to floor heights
- Draw finished floor and finished ceiling lines heights
- Calculate and layout risers, treads and landings
- Draw stringer
- Indicate framing around stairs
- Identify materials used to construct stairs
- Draw trim features (e.g., handrail(s), tread covers, etc.)
- Dimension total rise and run
- Indicate headroom clearance and stairwell opening
- Add dimensions, notes and labels
- Check drawing

Learning Objectives:

- Explain how to divide any length into an equal number of sections
- Define basic terms and requirements used in stair design and construction
- Explain how to calculate rise and run dimensions for stairs
- Compare construction of open and closed stair designs
- List minimum stair width, tread, riser, landing, and head clearance requirements, as well as known drafting criteria for straight-run, winding, and spiral stairs
- Discuss how to calculate and incorporate headroom clearance and stairwell opening
- Distinguish between requirements for straight, u-shaped, and exterior stairs

Comments:

## Unit 10: Design/Pre-Construction Pathway

### Architectural Planning Unit

Competency

#### 5. Draw a floor system and foundation plan

Performance Standard Condition

**Competence will be demonstrated**

- at the worksite

Performance Standard Criteria

**Performance will be successful when learners:**

- Review floor plan, sketches, notes, and specifications
- **Use architectural drafting software** OR draw manually
- Copy common features from floor plan
- Draw the exterior outline of the foundation wall
- Draw the inside wall of the foundation after scaling the wall thickness
- Lay out the footings and structural information
- Draw foundation, structural supports and footing outline
  - Draw floor/joist foundations
  - Draw post-and-beam foundations
  - Draw foundations for columns, chimneys, etc.
- Draw in the floor framing plan showing the layout of girders and joists
- Indicate floor drains, bridges or plates
- Add dimensions, scale, notes, labels and view title
- Indicate symbols and references
- Indicate north arrow
- Check drawing

Learning Objectives:

#### FOUNDATIONS

- Compare the various foundation types and describe their use
- List common materials used for foundations
- Discuss requirements for foundations based on load requirements
- Compare types of foundation construction methods
- Identify how and why slabs may require protection from ground moisture

#### FLOOR FRAMING

- Distinguish between control, construction, and isolation joints
- Identify basic components, sizes and spacing for joist (stick) and post-and-beam framing
- Compare and contrast the three common framing systems used with wood construction: balloon, platform, and post-and beam
- Discuss how the shape of the ground affects the framing method
- Identify conventional floor framing components and know their typical sizes and spacing
- Explain the function of wood posts and steel columns in floor framing
- Compare and contrast conventional floor joists, open web floor joists, I-joists, and laminate veneer lumber (LVL)
- Define cantilever
- State methods of bracing floor joists

Comments:

## Unit 10: Design/Pre-Construction Pathway

### Architectural Planning Unit

Competency

#### 6. Draw a framing plan

Performance Standard Condition

##### **Competence will be demonstrated**

- at the worksite

Performance Standard Criteria

##### **Performance will be successful when learners:**

- Review floor plan, foundation plans and construction specifications
- **Use architectural drafting software** OR draw manually
- Draw footing and foundation walls
- Draw supporting girders and joists
- Indicate dimensions of the bearing walls
- Draw in locations of beams and columns with direction of span and size
- Draw waterproofing and ground control for foundation walls, around footings (drain tiles) and under basement floor slabs
- Draw termite protection
- Draw external stud wall construction
- Draw floor and ceiling construction
- Draw wall and ceiling insulation
- Add labels, notes and dimensions
- Indicate material symbols
- Indicate scale of drawing and view title
- Indicate north arrow
- Check drawing

Learning Objectives:

##### FRAMING

- Compare and contrast the three common framing systems used with wood construction: balloon, platform, and post-and beam
- Cite the advantages & disadvantages of steel framing
- Describe the classifications of concrete masonry unit (CMU) construction
- Define basic brick-laying terms and describe insulation and reinforcement options
- Define footing
- Compare types of footings

##### LOADS

- Distinguish between bearing and non-bearing walls
- Identify categories of loads acting on structures
- Explain how load-bearing factors are considered in structural design
- Describe the physics of structures to bear loads via walls, columns, and beams
- Explain the characteristics of structural beams, cables, trusses, and other structural forms
- Determine loads applied during the design of a structure using load tables and appropriate mathematics



## WALLS

- Name the basic components of wall framing, and know their typical sizes and spacing
- Differentiate between double- and single-wall constructions
- Compare external and internal wall construction
- Describe methods for termite control in building design
- Differentiate between three phases of electrical installation: temporary, rough-in, and finish

Comments:

## Unit 10: Design/Pre-Construction Pathway

### Architectural Planning Unit

Competency

#### 7. Draw a roof framing plan

Performance Standard Condition

**Competence will be demonstrated**

- at the worksite

Performance Standard Criteria

**Performance will be successful when learners:**

- Review floor plan, foundation plans and construction specifications
- **Use architectural drafting software** OR draw manually
- Draw exterior wall outline from floor plan
- Confirm roof style (e.g., gable, shed, hip, etc.) and cornice overhang size
- Draw center ridge board(s)
- Draw all rafters, jack rafters, intersecting pieces, etc., with specified on-center spacing
- Indicate any special construction (e.g., around chimney, etc.)
- Draw gutter and method of roof ventilation
- Add labels, notes and dimensions
- Indicate material symbols
- Indicate scale of drawing and view title
- Indicate north arrow
- Check drawing

Learning Objectives:

- Define roof pitch
- Outline common components and their function required in roof framing
- Identify and explain framing terms common to both conventional and trussed roofs
- Define the basic members of conventionally framed roofs, as well as know typical sizes and spacing
- Contrast vaulted roof framing from standard roof/ceiling systems
- Define truss and basic truss terminology
- Identify basic truss types
- Describe how trusses are secured to bearing points
- Explain the role of metal hangers
- Identify the functions of the roof overhang and gutter
- Explain the basic flow of heat, air and moisture through a facility and methods used to control them
- Explain the need for air flow and ventilation in structures

Comments:

## Unit 10: Design/Pre-Construction Pathway

### Architectural Planning Unit

Competency

#### 8. Develop sustainable/conservation elements into a design

Performance Standard Condition

**Competence will be demonstrated**

- at the worksite

Performance Standard Criteria

**Performance will be successful when learners:**

- Review roof framing, floor plan, foundation plans and construction specifications
- Apply the principles of conservation to design plan
- Evaluate construction techniques for energy conservation in framing, caulking, use of vapor retardants, and insulation procedures
- Evaluate the insulation value for walls, floors, vaulted and flat ceilings
- Evaluate the common building products containing formaldehyde-based resins and solvents, as well as appliances for causes indoor pollution
- Calculate the heat loss through one wall of a conditioned building
- Calculate the heat loss for a building envelope with given conditions appropriate for the project

Learning Objectives:

- Discuss architectural design and building practices that impact the environment
- Describe the building elements covered by the model energy code
- Explain the Green Building program and Sustainable Building design
- Identify climatic and geographic design criteria, which will have bearing on the design of a structure
- Identify light source types
- Identify daylight design strategies
- Identify energy design strategies
- Explain how window and door details can be designed to provide energy efficiency
- Define R value factors in building
- Explain why caulking is effective, and identify places where caulking is best used
- Explain why vapor barriers help save energy, and name locations where vapor retarders should be installed
- Identify the venting requirements of garages
- Compare types of insulation
- Identify R value information for common types of insulation
- Calculate the recommended roof overhang for different latitudes, as well as specify other methods of achieving alternative overhang protection
- Articulate how the idea of envelope design works, cite its principle components, and discuss the disadvantages of the concept, including safety concerns
- Identify methods of reducing indoor pollution

Comments:

## **Unit 10: Design/Pre-Construction Pathway**

### **Architectural Planning Unit**

Competency

#### **9. Review completed architectural plans and documents**

Performance Standard Condition

##### **Competence will be demonstrated**

- at the worksite

Performance Standard Criteria

##### **Performance will be successful when learners:**

- Compare completed plan with architectural/engineering notes/data, manufacturers' catalogs and construction specifications
- Check drawing for accuracy (e.g., wall placement and size, feature sizes, door/window placement, etc.)
- Check and verify dimensions
- Check and verify notes, lettering, symbols and references
- Check and verify title block information
- Check plan for line quality and type for feasibility, thoroughness, accuracy, code compliance
- Submit completed plans to worksite professional for approvals

Learning Objectives:

- Discuss the various systems components of building structures including lighting, heating, ventilation, air conditioning, mechanical, electrical, plumbing, communication and vertical transport on completed plans
- Explain how detailed technical construction documents, schedules, and plans are created from the architectural plan

Comments:

## Unit 10: Design/Pre-Construction Pathway Architectural Planning Unit

Competency

### 10. Revise drawings

Performance Standard Condition

**Competence will be demonstrated**

- at the worksite

Performance Standard Criteria

**Performance will be successful when learners:**

- Review drawing revision (change) procedures
- Identify drawing to be modified
- **Use architectural drafting software** OR draw manually
- Make modifications to drawing
- Construct a revision table on drawing
- Record changes properly on revision table
- Apply appropriate line thickness and type
- Check drawing

Learning Objectives:

- Compare how drawing changes are made and tracked on CAD and/or manual drawings
- Explain how drawing revisions are tracked to other connected technical documents and materials specifications documents
- Discuss the impact on resources of revisions to completed plans

Comments:

## **Unit 10: Design/Pre-Construction Pathway**

### **Architectural Planning Unit**

Competency

#### **11. Construct a Bill of Materials**

Performance Standard Condition

**Competence will be demonstrated**

- at the worksite

Performance Standard Criteria

**Performance will be successful when learners:**

- Review architectural plan with worksite professional, engineering notes/data, manufacturers' catalogs and construction specifications
- Utilize appropriate reference handbooks
- Convert architectural drawing scale to full dimensions for a construction project
- Calculate the required materials needed
- Select building materials and assemblies upon evaluation that meet project specifications
- Use appropriate combinations of building materials and components that satisfy the requirements of building programs

Learning Objectives:

- Explain how to assign numbers to materials required for construction
- Explain how to calculate materials needed from an architectural plan
- Explain criteria used for building materials selection
- Discuss the use of sustainable construction materials and products
- Explain how factors such as force, torque, and shear impact choice of structural materials
- Describe applications and restrictions pertaining to the use of construction materials

Comments:

## Unit 10: Design/Pre-Construction Pathway

### Architectural Planning Unit

Competency

#### 12. Assist to develop architectural detail schedules

Performance Standard Condition

**Competence will be demonstrated**

- at the worksite
- while assisting a worksite professional

Performance Standard Criteria

**Performance will be successful when learners:**

- Collect notes and format(s) pertaining to schedules
- **Use architectural drafting software** OR draw manually
- Interior finish schedule
  - Lay out schedule to fit given format
  - Lay out lettering guidelines
  - Make headings for each schedule
  - Define details for interior finish
  - Letter information into finish schedule
  - Check drawing
- Door and window schedules
  - Lay out schedules on floor plan
  - Make headings for window schedule
  - Make headings for door schedule
  - Define details
  - Letter schedules
  - Check drawing
- Door details
  - Review wall section, floor plan, construction specifications and manufacturers' catalogs
  - Draw head, jamb and sill details, including interior and exterior trim finishes
  - Add dimensions, notes and labels
- Window details
  - Review wall section, floor plan, construction specifications, and manufacturers' catalogs
  - Draw head, jamb and sill details, including interior and exterior trim finishes
  - Add dimensions, notes and labels

Learning Objectives:

- Articulate the need for schedules, identify information described within it, and how to configure and place schedules on a sheet
- Describe the difference between water supply, distribution, sanitary and storm drainage systems
- Identify structural symbols on technical drawings
- Identify plumbing, piping and drainage symbols on technical drawings
- Identify electrical & wiring symbols on technical drawings

Comments:

## **Unit 10: Design/Pre-Construction Pathway**

### **Architectural Planning Unit**

Competency

#### **13. Assist to coordinate architectural project activities**

Performance Standard Condition

##### **Competence will be demonstrated**

- at the worksite
- while assisting a worksite professional

Performance Standard Criteria

##### **Performance will be successful when learners:**

- Review plans and schedules for work to be completed
- Note timeframes, overlaps, and allowances for work completion
- Compile contracts, permits, and licenses as needed
- Coordinate work between trades based on plan
- Schedule contractor work dates
- Plan and route materials shipments
- Follow up to ensure movement of materials and equipment needed to meet established deadlines
- Monitor work completion deadlines
- Track and report any construction issues to worksite professional
- Communicate in a timely and accurate manner to correct parties

Learning Objectives:

- Explain how to read architectural schedules and work plans
- List methods of productivity measurement for architectural projects
- Discuss how to schedule contract work and delivery functions with respect to project schedule and requirements
- Compare contracts, licenses and permits uses and the information required on them

Comments: