



# Model Curriculum Guide

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For Apprenticeship Preparation Programs

January 2005

Prepared by  PORT JOBS

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Pacific Northwest Regional Council of Carpenters  
Western Washington Cement Masons  
Puget Sound Electrical Apprenticeship and Training Trust  
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# Table of Contents

I. Introduction.....	Page 1
II. Core Competencies for Apprenticeship Preparation.....	Pages 2-14
a. Employability.....	3-4
b. Industrial Safety.....	5-6
c. Physical Strength and Aptitude.....	7-8
d. Trades Math.....	9-10
e. Basic Construction Trades.....	11-12
f. Construction Practical Applications.....	13-14
III. Competency Achievement Checklist.....	Pages 15-18
IV. Program Resources and Samples.....	Pages 19-28
a. Sample Course Outline.....	20-21
b. Tools, Safety Equipment and Facilities Suggestions.....	22
c. Student Self-Assessment.....	23-24
d. Employability Evaluation Sheet.....	25
e. Individual Employment and Training Plan.....	26-28
V. Survey of Apprenticeship Coordinators.....	Pages 29-33

# Introduction

King County is home to a number of Apprenticeship Preparation Programs (APPs) that train young people and adults to enter the building and construction trades. These programs vary in length, ranging from 12 weeks to one year. Each uses its own curriculum to teach a combination of trades-related skills, strength building, and job readiness<sup>1</sup>. APPs serve a dual purpose by helping create a pipeline of workers for the industry, and helping disadvantaged individuals gain access to good jobs.

Over the past few years, industry stakeholders have come together to address various construction workforce issues. One focus has been exploring ways to create a more unified system of apprenticeship preparation training in King County<sup>2</sup>. Some Apprenticeship Coordinators have also expressed an interest in increasing the consistency among APPs, so that graduates have a similar set of skills regardless of what training program they complete. From these efforts emerged the idea to create a “model curriculum” that could be used across APPs. Port Jobs, with assistance from the Seattle Jobs Initiative, took the lead in developing a model framework to guide APP curriculum.

## Purpose of this guide

This guide identifies the core competencies that applicants need to be competitive for building and construction trades apprenticeship programs. It is designed for APP providers – both those already providing training and those starting new programs. The intent is to provide a common framework for APPs to align their curriculum to the needs of apprenticeship programs. It also leaves flexibility for addressing the needs of students who may face employment barriers or need extra help successfully preparing for apprenticeship or other construction-related jobs.

This project, developed during 2004, is based on:

- *Guidance from apprenticeship programs* in Western Washington that volunteered to be part of an advisory team, including the Carpenters, Cement Masons, Construction Industry Training Council, Electricians, Heat Frost Insulators, Ironworkers, Laborers, Painters, Plumbers/Steamfitters/Refrigeration, and Sheet Metal Workers. Apprenticeship Coordinators participated in an interview covering recruitment sources and selection procedures. They also completed a “skill ranking sheet” to identify the skills that are most important for applicants to be competitive for apprenticeship openings (see pages 29-33 for skills ranking by trade).
- *A review of curricula and feedback from Apprenticeship Preparation Programs in King County*, including Apprenticeship and Non-Traditional Employment for Women and Men, Apprenticeship and Construction Exploration, Career-Workplace Exploration in Skilled Trades, King County Youthbuild, Renton Technical College, and Seattle Vocational Institute.
- *A review of other apprenticeship preparation materials*, such as the Chicago Women in Trades’ “In for a Change” curriculum.

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<sup>1</sup> For a profile, see *King County Apprenticeship Preparation Programs: Update 2003*. Contact Port Jobs at 206-728-3883.

<sup>2</sup> For example, the *Construction Industry Workforce Advisory Committee*, convened by the City of Seattle, Port of Seattle, Sound Transit and King County, looked at increasing funding for and coordination between APPs. In 2003, a group of APPs and service providers formed the *Apprenticeship Preparation Training Consortium* for joint planning and fundraising.

# Core Competencies

## Areas of Focus

The *Model Curriculum Guide* consists of six areas of focus, including:

1. Employability
2. Industrial Safety
3. Physical Strength and Aptitude
4. Trades Math
5. Construction Introduction and Overview
6. Construction Practical Applications and Certifications

Areas 1 through 5 should be included in all apprenticeship preparation programs. APP providers may choose to include competencies from the sixth focus area – Practical Applications and Certifications – to prepare students for certifications or additional trade-specific training.

## Structure of guide

Each focus area includes the following information:

- **Competencies:** These competencies should be mastered by all students upon completion of an apprenticeship preparation program.
- **Instructional Resources:** These reflect some of the resources – including texts, videos, websites and other materials – used by APPs and recommended by apprenticeship programs. Each resource includes ordering information, such the publisher, web address and/or phone number. The list is not all-inclusive, but rather a few suggestions.
- **Sample Learning Activities:** These activities provide a starting point for teaching to the competencies<sup>3</sup>.
- **Standards for Achievement:** The standards detail the minimum number of instructional hours to be provided within each focus area (for a total of 305 hours across areas 1 to 5 for adult programs, and 229 hours for high school programs, plus additional training for practical applications and certifications). The standards also include the level of proficiency expected for the competencies<sup>4</sup>.

The Guide also includes:

- A **Competency Achievement Record** which provides students with documentation of the skills they achieved through training.
- A few **resources and samples** for APP providers, such as a sample course outline.
- A **survey of Apprenticeship Coordinators**, which provides a breakout of the skills needed to be competitive for different apprenticeship programs.

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<sup>3</sup> Some of the sample activities are suggestions from *In for a Change: A Curriculum Guide for Pre-apprenticeship Training* from Chicago Women in Trades, Chicago, Illinois ([www.chicagowomenintrades.org](http://www.chicagowomenintrades.org)).

<sup>4</sup> After much discussion, 80% was determined to be a reasonable proficiency level to ensure that students had adequately mastered the competencies. It is also a common cut-off point for assessment within apprenticeship programs.

# Employability

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## Competencies

*Upon completing an apprenticeship preparation program, students will master the following competencies at the level of proficiency detailed below.*

1. Demonstrate a work ethic that supports employment in the trades, with a particular focus on attendance, punctuality, and attitude.
2. Demonstrate effective workplace communication skills, including listening, following verbal and written instructions, and asking/answering questions.
3. Work individually and as part of a team.
4. Understand the nature of construction employment, including the expectations and requirements of apprenticeship programs and employers for drug testing, reliable transportation and driver's license.
5. Explain worker rights and responsibilities and know how to deal with discrimination, racism and harassment on the job.
6. Understand the procedures of each trade for applying for apprenticeship and/or finding work.
7. Master job search techniques for apprenticeship application procedures and/or trades employment, including interviewing and completing an application/resume packet.



## Standards for Achievement

- APPs will provide a minimum of 45 hours of dedicated *Employability* instruction.
- APPs will develop attendance and disciplinary policies and will track student attendance. It is recommended that students use a time clock.
- To receive a recommendation or referral to apprenticeship, students must demonstrate excellent attendance (Recommended: no more than 1 unexcused absence).
- All students in adult training programs will secure a driver's license. Students in youth training programs will either secure a driver's license or develop a driver's license plan.
- Students will pass a drug test, if this is part of an agency's training program.
- The employability competencies must be evaluated for all students. It is recommended that students achieve at least 80% proficiency in all written assessments and demonstrations/activities.

# Employability

Through reading, lecture, speakers, group discussions, and activities, students will explore the range of personal and interpersonal skills required to secure and retain construction employment. Some instructional resources and learning activities to help teach employability include:

## Texts:

- *Apprenticeship Past and Present*. Department of Labor, Employment & Training Administration. Washington D.C. (1991, 30 pg). [www.doleta.gov](http://www.doleta.gov)
- *Core Curriculum: Introductory Craft Skills*. Modules: Basic Communication Skills (5 hours); Basic Employability Skills (15 hours). National Center for Construction Education and Research. (2004). [www.nccer.org](http://www.nccer.org).
- *Workplace Violence: Awareness and Prevention for Employers and Employees*. WA Department of Labor & Industries. (2000, 68 pg). [www.lni.wa.gov](http://www.lni.wa.gov)
- *Your Attitude is Showing: A Primer of Human Relations*. Elwood Chapman. Prentice Hall. (2002, 242 pg). [www.prenhall.com](http://www.prenhall.com). Self-paced exercise guide sold separately.

## Other Materials and Websites:

- *All about Unions*. AFL-CIO website. [www.aflcio.org](http://www.aflcio.org)
- *Construction Assessment Workbook*. Port Jobs (2001). [www.portjobs.org](http://www.portjobs.org) or 206-728-3883.
- *New Realities: Breaking Employment Barriers Individual Learning Kit*. Gordon Graham and Company. [www.ggco.com](http://www.ggco.com) or 425-637-9992.
- *On-line Practice Driver License Test*. WA State Department of Licensing. [www.dol.wa.gov/ds/test/qbeg.htm](http://www.dol.wa.gov/ds/test/qbeg.htm)
- *WA State Apprenticeship Programs Catalog*. WA Department of Labor and Industries. #F100-041-000. (2004, 122 pgs). [www.lni.wa.gov](http://www.lni.wa.gov)

## Other Resources:

- The *Apprenticeship Opportunities Project* helps people learn about different trades, entry and application requirements, and provides financial assistance for employment needs. 206-381-1384.
- *Working Wheels* sells cars to low-income workers who live in King County. Must be employed; priority goes to parents. [www.working-wheels.org](http://www.working-wheels.org) or 206-694-6833.

- Complete interest inventory and self-assessment to evaluate aptitude for trades work.
- Discuss the importance of positive attitude and demonstrate a positive attitude in the classroom.
- Maintain a calendar of classes and appointments.
- Practice following verbal and written instructions to complete a task, and ask questions for clarification.
- Develop a “Construction Readiness Plan” to deal with personal employment obstacles, such as transportation, child care, or securing a driver’s license.
- Discuss and role-play a positive physical presence (e.g. appropriate posture, stance, appearance) that is critical on the job site.
- Role-play harassment situations and discuss ways to handle them.
- Participate in mock interviews with students or apprenticeship coordinators.
- Practice hands-on activities in pairs or small teams to develop teamwork skills.



## Instructional Resources



## Sample Learning Activities

# Industrial Safety

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## Competencies

*Upon completing an apprenticeship preparation program, students will master the following competencies at the level of proficiency detailed below.*

1. Demonstrate the safe and correct use of hand and power tools by applying proper handling, use, and storage techniques.
2. Demonstrate injury prevention knowledge through proper lifting and carrying techniques.
3. Identify common jobsite safety hazards and preventive measures for injuries, particularly those caused by falls, electrical shock, falling objects, and being pinned between objects.
4. Identify and use standard personal protective equipment (PPE), including hard hats, eye protection, hearing protection, boots, and gloves. Demonstrate awareness of respiratory protection equipment.
5. Demonstrate awareness of scaffold and ladder safety, including fall protection/fall arrest equipment.
6. Demonstrate awareness of confined spaces, including potential hazards, and safety standards.
7. Demonstrate awareness of alarms and evacuation procedures.

*Note: Students will learn jobsite- and craft-specific safety requirements after entering an apprenticeship program.*

## Standards for Achievement

- Apprenticeship preparation programs must provide a minimum of 40 hours of dedicated *Industrial Safety* instruction.
- The industrial safety competencies listed above must be evaluated for all students. It is recommended that students achieve at least 80% proficiency in all written assessments and demonstrations/activities.

# Industrial Safety

Through reading, lecture, speakers, group discussions, and activities, students will achieve the safety competencies above. Some instructional resources and learning activities to help teach industrial safety include:

## Texts:

- *Construction Safety Manual*. Dave Heberle. McGraw Hill. (1998, 508 pg). [www.books.mcgraw-hill.com](http://www.books.mcgraw-hill.com)
- *Core Curriculum: Introductory Craft Skills*. Module: Basic Safety (15 hours). National Center for Construction Education and Research. (2004). [www.nccer.org](http://www.nccer.org).
- *Workers Guide to Hazardous Chemicals: Understanding the "Right to Know" Law*. WA Department of Labor and Industries. (2003, 16 pg). [www.lni.wa.gov](http://www.lni.wa.gov)

## Videos:

- *Construction Back Safety*. Coastal Training Technologies Corp. (10 min). [www.coastal.com](http://www.coastal.com).
- *Fall Protection in the Workplace*. LearnCom, Inc. (15 min). [www.learncom.com](http://www.learncom.com) or 800-622-3610.
- *Hand and Power Tool Safety*. Nimco, Inc. (15 min). [www.nimcoinc.com](http://www.nimcoinc.com) or 800-962-6662.
- *Scaffold Safety: It's No Joke*. Moxie Media. (17 min). [www.moxietraining.com](http://www.moxietraining.com) or 800-346-6943.
- *Safety and Health Videos* can be checked out from WA Department of Labor and Industries. See "video library" at [www.lni.wa.gov](http://www.lni.wa.gov) or (360) 902-5453.

## Other Materials:

- *Personal Protective Equipment*. Free on-line safety course provided by OSHA. [www.free-training.com/osha/ppp/ppemenu.htm](http://www.free-training.com/osha/ppp/ppemenu.htm)
- *Quick Tips for Lifting*. WA Department of Labor and Industries. (2003, 1 pg). [www.lni.wa.gov](http://www.lni.wa.gov).
- *Safety posters*, such as eye protection, fork lifts, hard hats, etc. are available from WA Department of Labor and Industries. Call 800-4BE-SAFE.
- *Hand Tool Safety materials* from the Hand Tools Institute. [www3.hti.org](http://www3.hti.org) or 914-332-0040.

## Health and Safety Websites:

- *Occupational Safety and Health Administration* (OSHA). [www.osha.gov](http://www.osha.gov)
- *Center to Protect Workers Rights* (CPWR). [www.cpwr.com](http://www.cpwr.com)
- *National Institute for Occupational Safety & Health* (NIOSH). [www.cdc.gov/niosh](http://www.cdc.gov/niosh)
- *WA Department of Labor and Industries*, Workplace Safety and Health. [www.lni.wa.gov/Safety/](http://www.lni.wa.gov/Safety/)



## Instructional Resources



## Sample Learning Activities

- Demonstrate and/or observe safe and proper use of various hand and power tools.
- Safely lift and move various construction materials, such as pipes, piles of 2x4s, or sandbags.
- Tour a jobsite to identify potential safety hazards and discuss the injury prevention measures that are in place.
- Discuss hazardous conditions that can be encountered on a jobsite and match appropriate PPE.
- Wear standard PPE during all hands-on activities.
- Carry, set up, and secure ladders; practice climbing ladders safely.
- Discuss the main hazards encountered when working on scaffolds and describe various methods for preventing each hazard.
- Practice getting harnessed and entering a confined space in a lab or classroom setting.

# Physical Strength and Aptitude

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## Competencies

*Upon completing an apprenticeship preparation program, students will master the following competencies at the level of proficiency detailed below.*

1. Demonstrate the strength and stamina needed to work in construction jobs.
2. Demonstrate manual dexterity, balance, and hand-eye coordination.
3. Demonstrate proper stretching techniques prior to work or exercise.
4. Build strength and conditioning through structured activities such as construction-related physical tasks and/or use of exercise equipment.
5. Demonstrate proper lifting and carrying of heavy construction materials and objects.
6. Learn the basics of nutrition and its impact on physical performance.



## Standards for Achievement

- Apprenticeship preparation programs must provide a minimum of 40 hours of dedicated *Physical Strength and Aptitude* instruction.
- It is recommended that students supplement classroom instruction with strength building and conditioning on their own, such as through a local YMCA or weight training classes in school.
- The physical strength and aptitude instruction competencies listed above must be evaluated for all students. Students must achieve at least 80% proficiency in demonstrated assessments of physical strength and aptitude.

# Physical Strength and Aptitude

*Through reading, lecture, speakers, group discussions, and activities, students will demonstrate the mastery of physical strength and aptitude for the construction trades. Some instructional resources and learning activities to help build physical strength and aptitude include:*

## Texts:

- *Ten Minute Workouts*. Chrissie Gallagher-Mundy. Cassell Illustrated, a division of Octopus Publishing Group Ltd. (2003, 128 pg). [www.octopus-publishing.co.uk](http://www.octopus-publishing.co.uk)
- *Genefit Nutrition: Nutrition Designed by Life*. Roman Devivo & Antje Spors. Ten Speed Press. (224 pg). [www.genefitnutrition.com](http://www.genefitnutrition.com)

## Videos:

- *Pre-Work Stretching Program*. EMP International & Cascade Medical Associates. (Item 1027; 10 minutes). [www.medicfirstaid.com](http://www.medicfirstaid.com) or 800-800-7033.

## Other Materials:

- *Pre-Work Stretching Wall Chart and Wallet Cards*. (Items 5033 and 5034). [www.medicfirstaid.com](http://www.medicfirstaid.com) or 800-800-7033.



## Instructional Resources



## Sample Learning Activities

- Complete individual fitness profiles to identify strength building and training goals.
- Safely lift and carry 70-pound buckets of primer and taping compound.
- Shovel and fill a wheelbarrow with sand or gravel, with a goal of moving ½ yard of sand/gravel in less than 10 minutes; push wheelbarrow through an obstacle course.
- Lift a 20 lb. block and carry it across a plank that is on the ground.
- Lift planks (8' to 12') and carry them across an uneven surface, such as gravel.
- Stand on a plank (on the ground) while doing an activity at shoulder height, such as hammering nails into a horizontal beam.
- Climb a ladder carrying bulky material, put on shelf, and carry back down ladder.
- Move concrete blocks with goal of 50 blocks in less than 10 minutes.
- Carry two metal curb and gutter forms as a team, with a goal of moving 50 yards.
- Pound metal stakes with a four to six pound double jack hammer.
- Move and stack lumber and/or bricks with increasing speed.
- Carry materials of progressively heavier weight (such as sand bags).
- Dig a ditch and backfill it within a timed period.
- Discuss nutritional content of popular foods and have students record and evaluate one week's diet.
- Discuss ways to pace activity on the jobsite to maintain stamina for an entire shift.
- Practice these learning activities in teams to build teamwork skills.

# Trades Math

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## Competencies

*Upon completing an apprenticeship preparation program, students will master competencies 1-6 at the level of proficiency detailed below. Competencies 7 and 8 should be addressed, but may not be mastered by all students.*

1. Use and accurately read a tape measure.
2. Demonstrate an understanding of addition, subtraction, multiplication and division, and perform basic math operations in applications common to the trades.
3. Demonstrate an understanding of whole numbers, fractions, decimals and percents, and use/ convert them in applications common to the trades.
4. Demonstrate an understanding of perimeter, area, and volume and calculate them in applications common to the trades.
5. Demonstrate an understanding of ratio, proportion, and scale and use them in applications common to the trades.
6. Demonstrate an understanding of basic geometry, including the Pythagorean Theorem, and use in trades applications.
7. Demonstrate an understanding of basic algebra and solve for unknowns in applications common to the trades.
8. Demonstrate an ability to use mathematical skills to estimate and identify mathematical functions required in the trades.

*Note: Some trades require more math skills than others. The Laborers, for example, have identified that Competencies 4 to 8 are not as critical for that trade.*



## Standards for Achievement

- Apprenticeship preparation programs must provide a minimum of 60 hours of dedicated *Trades Math* instruction.
- APPs should assess math ability at beginning of class to identify students who already have adequate math skills and those who need additional tutoring or assistance to master math skills.
- The trades math competencies listed above must be evaluated for all students. Students must achieve at least 80% proficiency in all written assessments and hands-on/demonstrated assessments.

# Trades Math

Through reading, lecture, speakers, group discussions, and activities, students will demonstrate a conceptual understanding of basic mathematics and will apply mathematical functions required in the construction trades. Some instructional resources and learning activities to help teach trades math include:

## Texts:

- *Applied Mathematics*, Units A, B, C, and 1 to 33. Center for Occupational Research and Development. [www.cordcommunications.com](http://www.cordcommunications.com) or 800-231-3015.
- *Core Curriculum: Introductory Craft Skills*. Module: Intro to Construction Math (15 hours). National Center for Construction Education and Research. (2004). [www.nccer.org](http://www.nccer.org).
- *Mastering Math for the Building Trades*. James Gerhart. McGraw Hill. (2000, 368pg). [www.books.mcgraw-hill.com](http://www.books.mcgraw-hill.com) or 877-833-5524.
- *Mathematics for the Trades: A Guided Approach*. Robert Carman and Hal Saunders. Prentice Hall. 7th edition. (2005, 688 pg.). [www.prenhall.com](http://www.prenhall.com)
- *Measuring, Marking and Layout: A Builder's Guide*. John Carroll. Taunton Press. (1999, 224 pg). [www.taunton.com](http://www.taunton.com) or 800-888-8286.
- *Number Power Addition, Subtraction, Multiplication, and Division*. Jerry Howett. McGraw Hill. (2001, 172 pg). [www.books.mcgraw-hill.com](http://www.books.mcgraw-hill.com) or 877-833-5524.
- *Number Power Fractions, Decimals, and Percents*. Jerry Howett. McGraw Hill. (2001, 179 pg). [www.books.mcgraw-hill.com](http://www.books.mcgraw-hill.com) or 877-833-5524

## Videos:

- *Applied Mathematics*, Units A, B, C, and 1 to 33, Center for Occupational Research and Development (accompanies text above). [www.cordcommunications.com](http://www.cordcommunications.com) or 800-231-3015.

## Other Materials:

- *Skills Bank: Basic Skills Remediation and Enrichment Software*. Achievement Technologies. Available on CD-rom or Online. [www.skillstutor.com](http://www.skillstutor.com) or 888-391-3245.



## Instructional Resources



## Sample Learning Activities

- Use a tape measure to measure pre-cut blocks, lumber ends, and other materials to  $1/16^{\text{th}}$  of an inch. Provide timed activities to help students increase speed and meet the accuracy standard.
- Use a tape measure to measure two distances and add/subtract them to practice using fractions.
- Use a tape measure to measure lines and convert to a decimal rounded to the nearest hundredth.
- Solve trades-related story problems using a variety of math operations.
- Find examples of right triangles and measure angles in the classroom.
- Encourage students to develop a glossary of mathematical terms and keep a journal of personal strategies for mastering math competencies.
- Measure the length and width of spaces in the classroom, such as walls and floors.
- Calculate the amount of paint needed to paint a wall.

# Basic Construction Trades

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## Competencies

*Upon completing an apprenticeship preparation program, students will master the following competencies at the level of proficiency detailed below.*

1. Understand the function and scope of the various building and construction trades, including general work processes, skills, working conditions, and aptitudes needed.
2. Identify types of building construction and phases of a construction project.
3. Identify common building materials used in construction, such as concrete, lumber, angle iron, beams, rebar, brick, concrete, sheetgoods, and plywood.
4. Identify processes in building construction, including site preparation, foundation and form work, floors, wall framing, floor framing, ceilings and metal framing.
5. Recognize basic hand and power tools and identify their use, such as hammers, saws, paint and glazing industry tools, trowels, grinders, drills, and airless sprayers.
6. Recognize basic fasteners and identify their use, such as nails, screws and bolts.
7. Recognize basic machinery and identify its use, such as extension forklift, man lift, scissor lift, hydraulic crane, boom truck, and pallet jacks.



## Standards for Achievement

- Apprenticeship preparation programs must provide a minimum of 120 hours of dedicated *Construction Introduction and Overview* instruction.
- The competencies listed above must be evaluated for all students. Students must achieve at least 80% proficiency in all written assessments and hands-on/demonstrated assessments.

# Basic Construction Trades

Through reading, lecture, speakers, group discussions, and activities, students will explore a broad range of basic construction-related skills used within the industry. Some instructional resources and learning activities to help teach a construction skills overview include:

## Texts:

- *Carpentry, including CD-Rom.* Leonard Koel. American Technical Publishers. (4th ed., 818 pg.). [www.go2atp.com](http://www.go2atp.com) or 800-323-3471.
- *Core Curriculum: Introductory Craft Skills.* Modules: Introduction to Hand Tools (10 hours). Introduction to Power Tools (5 hours). National Center for Construction Education and Research. (2004). [www.nccer.org](http://www.nccer.org).
- *Exploring Construction.* Richard Henak. Goodheart-Willcox Publisher. (2000, 247 pg.). [www.goodhearwillcox.com](http://www.goodhearwillcox.com) or 800-323-0440. A student activity manual is available separately.

## Videos:

- *Carpentry, Electrical, Plumbing, Roofing videos.* Hometime Video Publishing. (length varies, ave = 60 minutes). [www.hometime.com](http://www.hometime.com) or 800-992-4888.
- *Made with the Trades.* Video series profiles 21 construction trades, plus the Tour of the Trades video, which shows them all on one. Shopware. Lawrenceville, NJ. (12-25 min each; 2003). [www.shopware-usa.com](http://www.shopware-usa.com) or 800-487-3392.
- *Residential Building Trades.* Video series includes framing, electrical, wiring, OSHA job safety. Earth Communications. (30 min each). [www.leys.com/earthcom/index.html](http://www.leys.com/earthcom/index.html) or 434 973-7277.

## Other Materials:

- *Careers in Construction Trades.* An interactive CD-Rom. Shopware. (2000). [www.shopware-usa.com](http://www.shopware-usa.com) or 800-487-3392.



## Instructional Resources



## Sample Learning Activities

- Visit apprenticeship training centers to learn about different construction trades and participate in trade-specific hands-on learning activities.
- Students identify trades that they are interested in and interview trades people about their work.
- Visit construction sites to identify trades, materials, tools, and machinery used.
- Keep a running list of tools, safety equipment and clothing suitable for the student's trade of choice.
- Provide practice opportunities for students to improve skills in ladder climbing, rebar tying, stake driving, nailing.
- Provide hands-on practice opportunities for students to safely use common hand and power tools.
- Complete simple carpentry projects such as tool boxes, saw horses or picnic tables.
- Present a 10-minute oral report identifying the trades and materials used in the construction of a building or structure, like Safeco Field, Sea-Tac Airport concourse, etc.
- Have a group discussion about the working environment of different trades.

# Practical Applications and Certifications

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## Competencies

*The following competencies are designed to help guide additional instruction that may vary depending on several factors, including: 1) students' interests and skill levels; 2) the structure and length of the training – including the opportunities for on-the-job training or internships, and 3) the current apprenticeship or employment opportunities available in the construction trades.*

1. Identify and recognize basic blueprint terms and symbols and follow the plan in construction applications.
2. Demonstrate knowledge and operation of a forklift, per government and industry standards.
3. Demonstrate establishing and maintaining traffic flow in a construction zone, per government and industry standards.
4. Demonstrate first aid and CPR skills, per American Red Cross standards.
5. Demonstrate basic trades-specific skills by observing trades people, doing classroom projects and/or on-the-job training, such as:
  - a) Carpentry skills, including simple framing, building forms, installing wallboard and sheeting, and/or,
  - b) Electrical skills, including identifying tools and materials, identifying live and de-energized electrical circuits, WISHA guidelines for using extension cords, understanding basic circuitry and Ohm's Law, and/or,
  - c) Ironworker skills, including rod packing, rod tying, welding, oxy-fuel cutting, and/or,
  - d) Masonry trades skills, including working with materials like concrete, taping mud, brick grout, and/or,
  - e) Mechanical and heavy equipment skills, including completing pre-inspections, safe operation of gas, air, hydraulic and electrically powered equipment, and troubleshooting problems, and/or,
  - f) Painting skills, including surface preparation techniques, basic clean-up techniques for brushes, rollers, high pressure pumps, and/or,
  - g) Plumbing, steamfitting, and refrigeration/HVAC skills, including identifying tools and pipes, pipe measurement and cutting, describing how water systems function, and/or,
  - h) Sheet metal skills, including laying out and fabricating a metal tray, completing basic soldering, and using a oxyacetylene welding torch.

# Practical Applications and Certifications

Through reading, lecture and practice students will demonstrate conceptual understanding of the requirements of the trades and be able to apply basic construction skills in selected areas. Some instructional resources and learning activities include:

## Texts:

- *Core Curriculum: Introductory Craft Skills*. Module: Introduction to Blueprints (7.5 hours). National Center for Construction Education and Research. (2004). [www.nccer.org](http://www.nccer.org).
- *First Aid/CPR/AED Program Participant's Booklet*. American Red Cross. Available in English & Spanish. (80 pg). [www.shopstaywell.com](http://www.shopstaywell.com)
- *Print Reading for Construction*. Walter Brown. Goodheart-Willcox Publisher. (2005, 352 pg). [www.goodhearwillcox.com](http://www.goodhearwillcox.com) or 800-323-0440.
- *Ugly's Electrical References*. George V. Hart. Burleson Distributing Corporation. (2002, 162 pg). [www.uglyelectrical.com](http://www.uglyelectrical.com) or 800-531-1660.
- *Understanding Construction Drawings*. 4th edition. Mark Huth. Thomson Delmar Learning. (2005, 378 pg). [www.delmarlearning.com](http://www.delmarlearning.com) or 800-347-7707.



## Instructional Resources



## Sample Learning Activities

- Use sample blueprints to recognize electrical, plumbing, heating, finish schedules for painting, and other symbols.
- Work with sample drawings in small groups to answer questions posed by the instructor.
- Draw a small room to scale and include basic blueprint symbols.
- Practice safe and proper operation of a forklift.
- Practice properly moving a victim in an emergency situation.
- Practice emergency signals and discuss how to care for them.
- Practice using flagging signals.
- Observe demonstrations by trades representatives and practice trade-specific skills at different apprenticeship program training centers.
- Complete more complex projects, such as building, painting and wiring a shed.
- Have students participate in trades-related internships.
- Volunteer to help build a house for Habitat for Humanity.



## Standards for Achievement

- Hours of instruction dedicated to *Construction Practical Applications and Certifications* will vary by program, student interest and current apprenticeship/employment opportunities.
- Students who pursue forklift, flagging and first aid/CPR must receive sufficient instruction to achieve certification.
- Those competencies that are addressed through program instruction must be evaluated and students must achieve at least 80% proficiency in all written assessments and hands-on/demonstrated assessments.

# Competency Achievement Record

## Student Information

Name:

Address:

Phone:

Apprenticeship Preparation Program Completed:

APP Contact:

APP Phone:

Program Length:

Number of absences:

General Comments:

APP Program Manager Signature: \_\_\_\_\_

Date: \_\_\_\_\_

# Competency Achievement Record

*Student:*

Employability	Met	Not met	Reviewed by	Date	How evaluated and Comments
1. Demonstrate a work ethic that supports employment in the trades, i.e. attendance, punctuality and attitude.					Number of unexcused absences:
2. Demonstrate effective workplace communication skills.					
3. Work individually and as part of a team.					
4. Understand the nature of construction employment and expectations for drug testing, transportation & driver's license.					
5. Explain worker rights and responsibilities and know how to deal with discrimination, racism and harassment.					
6. Understand the procedures of each trade for applying for apprenticeship and/or finding work.					
7. Master job search techniques for apprenticeships and/or trades employment.					

Industrial Safety	Met	Not met	Reviewed by	Date	Comments
1. Demonstrate the safe and correct use of tools by applying proper handling, use, and storage techniques.					
2. Demonstrate injury prevention knowledge through proper lifting and carrying techniques.					
3. Identify common jobsite safety hazards and preventive measures for injuries.					
4. Identify and use standard personal protective equipment. Demonstrate awareness of respiratory protection equipment.					
5. Demonstrate awareness of scaffold and ladder safety, including fall protection/fall arrest equipment.					
6. Demonstrate awareness of confined spaces, potential hazards, and safety standards.					
7. Demonstrate awareness of alarms and evacuation procedures.					

Physical Strength & Aptitude	Met	Not met	Reviewed by	Date	Comments
1. Demonstrate the strength and stamina to work in construction jobs.					
2. Demonstrate manual dexterity, balance, and hand-eye coordination.					
3. Demonstrate proper stretching techniques prior to work or exercise.					
4. Build strength and conditioning through structured activities such as construction-related physical tasks.					
5. Demonstrate proper lifting and carrying of heavy construction materials and objects.					
6. Learn the basics of nutrition and its impact on physical performance.					

Trades Math	Met	Not met	Reviewed by	Date	Comments
1. Use and accurately read a tape measure.					
2. Demonstrate an understanding of addition, subtraction, multiplication and division, and perform basic math operations in trades application.					
3. Demonstrate an understanding of whole numbers, fractions, decimals and percents, and use/ convert them in trade applications.					
4. Demonstrate an understanding of perimeter, area, and volume and calculate them in trades applications.					
5. Demonstrate an understanding of ratio, proportion, and scale and use them in trades applications.					
6. Demonstrate an understanding of basic geometry, including the Pythagorean Theorem, and use in trades applications.					
7. Demonstrate an understanding of basic algebra and use in trades applications to solve for unknowns.					
8. Demonstrate an ability to use mathematical skills to estimate and identify mathematical functions required in the trades.					

Basic Construction Trades	Met	Not met	Reviewed by	Date	Comments
1. Understand the function and scope of the various building and construction trades.					
2. Identify types of building construction and phases of a construction project.					
3. Identify basic components and building materials used in construction.					
4. Identify processes in building construction, including site preparation, foundation and form work, framing, etc.					
5. Recognize basic hand and power tools and identify their uses.					
6. Recognize basic fasteners and identify their use, such as nails, screws and bolts.					
7. Recognize basic machinery and identify its use.					

*Apprenticeship Preparation Programs may also choose to include some of the following competencies in their basic training.*

Practical Applications & Certifications	Met	Not met	Reviewed by	Date	Comments
1. Identify and recognize basic blueprint terms and symbols and follow the plan in construction applications.					
2. Demonstrate knowledge and operation of a forklift, per government and industry standards.					Received certification?
3. Demonstrate establishing and maintaining traffic flow in a construction zone, per government and industry standards.					Received certification?
4. Demonstrate first aid and CPR skills, per American Red Cross standards.					Received certification?
5. Demonstrate trades-specific skills by observing trades people, doing classroom projects and/or on-the-job training:					
a) Basic carpentry skills					
b) Basic electrical skills					
c) Basic ironworker skills					
d) Basic masonry trades skills					
e) Basic mechanical and heavy equipment skills					
f) Basic painting skills					
g) Basic plumbing skills					
h) Basic sheet metal skills					

# Program Resources and Samples

Following are a few samples that can be used or adapted by Apprenticeship Preparation Programs, including:

1. Sample Course outline
2. Tools, Safety Equipment and Facilities Suggestions
3. Sample Student Self-Assessment
4. Sample Employability Evaluation Sheet
5. Sample Individual Employment and Training Plan (*Note: Because most training programs work with students who have employment barriers, it is recommended that programs work with students to develop employment and support service plans to identify and work through barriers that can hinder their ability to find work and stay employed.*)

# 1. Sample Course Outline

Course Title	Hours of Instruction & Lab
Construction Employment Readiness	25
Resume Preparation and Interview Skills	20
Industrial Safety	40
Strength Building and Nutrition	45
Trades Math I	30
Trades Math II	30
Construction Trades I	40
Construction Trades II	40
Construction Lab	40
First Aid/CPR	8
Flagging and Traffic Control	8
Total	326

## Course Descriptions

Construction Employment Readiness: This course prepares students for employment in the building trades, with an emphasis on employer expectations. Students learn about the nature of construction work, drug testing practices, expected work ethic, and the importance of showing up to work and being punctual. Students develop an understanding of harassment in the workplace and how to handle these situations. Students complete a construction readiness assessment and develop a plan to meet employment requirements, such as having a driver's license, and reliable transportation.

Job Search and Interview Skills: This course teaches students about job search techniques and skills in preparation for finding employment in the construction trades. Students learn about the different procedures for applying for apprenticeships and jobs, complete applications and prepare a resume listing relevant work experience, practice interviewing, and track career exploration activities.

Industrial Safety: This course provides an overview of safe work practices for the construction industry. Students learn about OSHA, common jobsite hazards and preventative measures, personal protective equipment and its uses, scaffold and ladder safety, fall protection, confined spaces, alarms and evacuation procedures. Students practice safe use of tools and proper lifting and carrying of materials.

Strength Building and Nutrition: This course helps students develop the physical fitness needed to work in the trades and help prevent injuries. Students practice proper stretching, proper lifting, and participate in construction-related activities to build strength and stamina. Students also learn about good nutrition and how it impacts performance.

Trades Math I: This course teaches students about the fundamentals of basic mathematics, with applications in the building trades. Students learn to read a tape measure, perform basic math operations (addition, subtraction, multiplication and division), and use and convert whole numbers,

fractions, decimals and percents. Students learn to calculate perimeter, volume and area. *Note: Students can test out of this course.*

Trades Math II: This course further develops students' trades-related math skills and advances to more complex problem solving. Students practice accurate use of a tape measure and practice their math skills using ratio, proportion, scale, basic geometry, basic algebra, and estimating.

Construction Trades I: This course introduces students to more than ten different building and construction trades. It is intended to help students understand the functions and scopes of work of different trades and determine their trades of interest. Students will visit apprenticeship training centers and participate in hands-on training in the various trades.

Construction Trades II: This course provides students with an overview of building construction. Students learn about types of construction, phases of a construction project, common building materials and construction processes. Students begin to identify basic hand and power tools, fasteners and machinery. Students will visit construction job sites.

Construction Lab: This course provides students with an opportunity to apply learning through hands-on projects and shop practices. Students practice safe use of hand and power tools and complete simple and more advanced construction projects. Students work individually and in teams and practice effective workplace communication skills.

First Aid/CPR: This course teaches students how to administer CPR and basic first aid, as applied to construction trades. Students will identify signals of medical emergencies and how to care for them. Upon successful completion of the course, students will earn Red Cross Certification.

Flagging and Traffic Control: This course prepares students for the Washington State three-year flagger certification exam. Students will learn how to establish and maintain traffic flow, gain experience in designing and setting up work zone traffic control equipment, learn proper hand and sign signals, and recognize and minimize worksite hazards.

## 2. Tools, Safety Equipment and Facilities

The following summarizes the tools, safety equipment and facility resources that contribute to an ideal training environment. APP providers can use this information as a guide to prioritize the purchases of tools and equipment, and tailoring an appropriate training site.

### Power and hand tools:

Circular saw	Drill	Threading tools
Table saw	Angle drill	Pipe wrenches
Band saw	Socket set	Adjustable wrenches
Worm drive saw	Boring bits	Screw drivers
Scroll saw	Drill bits	Hand sander
Saws all	Tap and die set	Hammers
Drill press	Level	Files
Planer	Squaring tool	Pry bars
Router	Micrometer	Tape measures
Sander	Plumb Bob	C clamps
Paint brush	Trowel	Grinders
Roto hammer	Soldering kit	Propane tank
Pipe reamer	Electrical testing equipment	Punch set
Various pliers	Wire stripper	Vise grip

### Safety equipment:

Hard hats	Gloves	Face shields
Work boots & Rubber boots	Rain gear	Goggles
Safety vests	Dusk masks	Ear protection

### Facility features:

Designated shop area	Appropriate ventilation	Access to computer lab
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### 3. Student Self-Assessment for those considering construction careers

Name: \_\_\_\_\_ Date: \_\_\_\_\_

**Rate yourself on the following:**

**1. Good work ethic** *Before rating yourself consider the following:*

- Can you show up every day, on time for work and school, with no excuses?
- Do you always have a back-up day care and transportation plan?
- Can you work hard at a steady pace without complaining?

(5) Excellent (4) Good (3) Fair (2) Needs Improvement (1) No Way **Score:** \_\_\_\_\_

**2. Positive Attitude** *Before rating yourself consider the following:*

- Are you a good listener?
- Can you work with others as a team to build a project, whether you like someone or not?
- Can you follow directions of crew leaders regardless of the manner in which they are given?
- On a construction work site directions are often given quickly and may sound angry because the immediacy of the jobs situation demands it. Are your feelings too sensitive to handle this type of environment?

(5) Excellent (4) Good (3) Fair (2) Needs Improvement (1) No Way **Score:** \_\_\_\_\_

**3. Physical Strength and Endurance for Trades Work** *Before rating yourself consider the following:*

- Most trades require physical strength, endurance and the ability to be safety conscious in all work.
- Are you able to work in a physically demanding environment for extended periods of time in all weather conditions?
- Can you work at heights or in a small confined space?
- Can you work in environments that may be extremely noisy, dirty, hot, cold, wet, smelly, and potentially dangerous? When a situation is life-threatening, you are responsible for your own life.

(5) Excellent (4) Good (3) Fair (2) Needs Improvement (1) No Way **Score:** \_\_\_\_\_

**4. Drug Free and Can Pass Drug/Alcohol Tests** *Before rating yourself consider the following:*

- Many apprenticeship programs and skilled trade employers randomly screen workers for drug and alcohol use.
- Many of these tests can detect marijuana usage within three months or more after use.
- Most apprenticeship programs require a drug test as part of their application process.

(5) Excellent (4) Good (3) Fair (2) Needs Improvement (1) No Way **Score:** \_\_\_\_\_

**5. Valid Washington State Driver's License and a Good Driving Record** *Consider the following:*

- Do you have reliable transportation (preferably your own car)?
- Companies may send you to another job in the middle of the day and you need to be able to get there.
- Your employer may need you to drive a company truck to get supplies.
- Are you willing to drive to where the work is, which may be far from your home and may not be on a bus line?

(5) Excellent (4) Good (3) Fair (2) Needs Improvement (1) No Way **Score:** \_\_\_\_\_

**6. Good Comprehension of the English Language** *Before rating yourself consider the following:*

- Good verbal and written comprehension skills are needed for successful learning on the job and in apprenticeship school.
- Can you follow written and verbal instruction accurately?
- Are you able to read and understand safety instructions and procedures?

(5) Excellent (4) Good (3) Fair (2) Needs Improvement (1) No Way **Score:** \_\_\_\_\_

**7. Minimum Education and/or Qualifications Required for Entering the Trades** *Before rating yourself consider the following:*

- A GED or high school diploma is required to enter most trade apprenticeships.
- Do you have good basic math skills? Some trades require algebra or geometry.
- Some apprenticeships require accurate reading of a tape measure.
- Do you have a basic knowledge of how to operate hand and power tools safely?

(5) Excellent (4) Good (3) Fair (2) Needs Improvement (1) No Way **Score:** \_\_\_\_\_

**8. Current Living Situation is Stable and has a Telephone** *Before rating yourself consider the following:*

- Are you able to manage personal issues such as relationship or credit problems so they do not interfere with work or school performance?
- Are you able to resolve unexpected transportation or children problems so they do not interfere with work or school attendance?

(5) Excellent (4) Good (3) Fair (2) Needs Improvement (1) No Way **Score:** \_\_\_\_\_

**9. Do You Have an Overall Aptitude for The Trades** *Before rating yourself consider the following Questions:*

<b>DO YOU LIKE?</b>	<b>YES</b>	<b>NO</b>	<b>DO YOU DISLIKE?</b>	<b>YES</b>	<b>NO</b>
<i>Working with your hands?</i>			<i>Working at a desk all day?</i>		
<i>Being physical, working hard?</i>			<i>Working with groups of children or sick people?</i>		
<i>Making repairs around the house?</i>			<i>Dealing regularly with the public in a store or restaurant?</i>		
<i>Fixing outlets, radios stereos, small appliances?</i>			<i>Helping others solve their personal or Family problems?</i>		
<i>Driving cars, vans, farm equipment?</i>			<i>Working one place all day?</i>		
<i>Seeing concrete results from your work?</i>			<i>Answering questions and referring people to other sources of information?</i>		
<i>Solving technical problems/puzzles?</i>			<i>Completing writing tasks?</i>		
<i>Working from a pattern, blueprint or diagram To construct or make things?</i>			<i>Using the same equipment all the time?</i>		
<i>Working independently, with little supervision?</i>			<i>Work in which you rarely use your physical strength?</i>		
<i>Taking on Challenges?</i>			<i>Receiving lots of supervision and feedback on your work?</i>		

(5) Excellent (4) Good (3) Fair (2) Needs Improvement (1) No Way **Score:** \_\_\_\_\_  
 (20-18 yes) (17-14 yes) (13-10 yes) (9-5 yes) (4-0 yes)

**TOTAL SCORES FOR YOUR OVERALL RATING:**

**TOTAL** \_\_\_\_\_

**If your score is:**

- 45-40** You are an excellent candidate for a skilled trades apprenticeship.
- 39-34** With a little preparation, a skilled trades apprenticeship is a good choice for you.
- 33-27** Pre-apprenticeship program might be the best place for you to start.
- 26 or less** A skilled trade apprenticeship is not the best choice for you.

## 4. Employability Evaluation Report

Student \_\_\_\_\_

Date \_\_\_\_\_

	E=Excellent (3 points)	S=Satisfactory (2 points)	N=Needs Improvement (1 point)		U=Not Meeting Program Standards (0 point)		
1.	Attends work daily			E	S	N	U
2.	Reports to work on time			E	S	N	U
3.	Participates in activities-classroom/shop Completion of assignments/class & labs			E	S	N	U
4.	Follows directions- written & verbal			E	S	N	U
5.	Works well with others			E	S	N	U
6.	Observes work site operating procedures/safety			E	S	N	U
7.	Accepts suggestions for improvement Seeks clarification when needed			E	S	N	U
8.	Shows an eagerness to work hard			E	S	N	U
9.	Takes responsibility for actions			E	S	N	U
10.	Dresses appropriately for work			E	S	N	U

\*Students are considered to be work ready when they have an average score of 20-30 points consecutively for at least 4 weeks. 15-19 points=needs improvement. 14 or below=failure to meet program standards.

\*Students who obtain the highest average scores may request letters of recommendation.

Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Student's signature \_\_\_\_\_ Date \_\_\_\_\_

Instructor's signature \_\_\_\_\_ Date \_\_\_\_\_

## 5. Sample Individual Employment and Training Plan

Student: \_\_\_\_\_

### MATH AND TUTORING

Math Pre-Test \_\_\_\_\_ Math Post-Test \_\_\_\_\_ Compass / Asset Score \_\_\_\_\_

Tutoring Needed? \_\_\_\_\_ Tutoring Plan: \_\_\_\_\_

Comments: \_\_\_\_\_

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### HOUSING SITUATION

X	Housing	Agency Referral	Phone #	Date
	Stable			
	Section 8			
	Transitional			
	Homeless Prevention			
	Rent Assistance			
	Youth living @ home			
	Other			

Comments: \_\_\_\_\_

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### MEDICAL PLAN

X	Medical	Agency Referral	Phone #	Date
	Medical Coupons			
	Basic Health			
	Private Insurance			
	Student Accident Insurance			

Comments: \_\_\_\_\_

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## SUPPORT SERVICES ASSISTANCE

X	Support Services	Agency Referral	Phone #	Date
	Transportation			
	Work/School clothing			
	Food			
	Counseling			
	Tools			
	Tutoring			
	Other			

Comments:

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## OTHER TRAINING RELATED ISSUES

X	Referrals to:	Agency Referral	Phone #	Date
	Federal Financial Aid			
	ESL classes			
	Learning Disabilities Testing and Classes			
	1:1 Tutoring			
	Legal Assistance			
	Drivers License Assistance			
	Citizenship status			

Comments:

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## EMPLOYMENT GOALS

What three occupations is the student most interested in?

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

Is the student currently employed? \_\_\_\_\_ . If yes, please explain:

### Referrals to Potential jobs

Apprenticeship / Company and/or Position	Contact Information	Phone #	Date

Has student enrolled with AOP (Apprenticeship Opportunities Project)? \_\_\_\_\_ Date enrolled: \_\_\_\_\_

Overall Comments:

\_\_\_\_\_  
Student signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Coordinator signature

\_\_\_\_\_  
Date

# Survey of Apprenticeship Coordinators

What skills do applicants need to be competitive for entry into different apprenticeship programs?

Source: Participating Apprenticeship Program Training Coordinators

Employability skills	Carpenters	Cement Masons	CITC	Heat Frost	Ironworkers	Laborers	Painters	Plumbers, Steamfitters & Refrigeration	Sheet Metal	Average
Show up on time each day	1	1	1	1	1	1	1	1	1	1.0
Ability to follow verbal and written instructions	2	1	1	2	2	2	1	1	1	1.4
Be motivated	3	1	1	2	1	2	1	1	1	1.4
Ability to work as a team member	2	1	1	2	1	1.5	2	2	1	1.5
Ability to listen and ask questions	2	2	1	2	2	1	1	2	1	1.6
Have a positive attitude	3	1	3	2	1	2	1	1	1	1.7
Ability to communicate effectively	2	2	1	2	3	2	1	1	1	1.7
Ability to read instructions, operating directions	2	2	2	2	2	2	2	2	1	1.9
Knowledge of appropriate dress for job	2	3	3	1	3	2	2	3	2	2.3
Have a basic understanding of the trade	3	3	3	2	3	3	3	2	2	2.7

Comments:

- Timeliness is very important
- Candidates must communicate effectively to be considered
- A positive attitude is key

Safety	Carpenters	Cement Masons	CITC	Heat Frost	Ironworkers	Laborers	Painters	Plumbers, Steamfitters & Refrigeration	Sheet Metal	Average
Understand safety and health hazards of jobsite	3	3	4	2	2	3	2	4	2	2.8
Ability to use personal protective equipment	3	3.5	1	3	3	3	2	4	4	2.9
Ability to perform CPR and industrial first aid	3	4	2	3	3	3	3	2	4	3.0
Knowledge of CPR and industrial first aid	3	4	3	3	3	3	3	3	3	3.1
Demonstrate knowledge of personal protective equipment	3	3.5	4	3	3	3	2	4	3	3.2
Read and interpret material safety data sheets	3	3.5	4	2	4	3	3	4	3	3.3
Knowledge of OSHA fall protection requirements	3	3.5	4	2	4	3	2	4	4	3.3

Comments:

All above topics will be taught to new apprentices but any knowledge they have prior to us teaching is helpful

Physical aptitudes	Carpenters	Cement Masons	CITC	Heat Frost	Ironworkers	Laborers	Painters	Plumbers, Steamfitters & Refrigeration	Sheet Metal	Average
Ability to work with sufficient stamina to complete a full shift	2	2	1	1	1	1	1	1	1	1.2
Demonstrate manual dexterity, balance and eye-hand coordination	2	2	1	2	1	2	1	2	2	1.7
Ability to work safely at varying heights	2	3	2	1	2	3	2	4	1	2.2
Ability to lift heavy objects	2	2	1	2	2	3	2	4	2	2.2

Trades Math	Carpenters	Cement Masons	CITC	Heat Frost	Ironworkers	Laborers	Painters	Plumbers, Steamfitters & Refrigeration	Sheet Metal	Average
Understand and perform basic math operations (addition, subtraction, multiplication, division).	2	2	1	1	2	2	3	1	1	1.7
Ability to use and convert whole numbers, fractions, decimals and percentages.	2	3	1	2	2	3	3	1	2	2.1
Ability to calculate area and volume	4	2	1	2	2	3	3	1	3	2.3
Ability to calculate perimeter	4	2	1	2	2	3	3	2	3	2.4
Understand Pythagorean Theorem	4	2	1	2	3	3	4	1	3	2.6
Ability to calculate ratio and proportion	3	2	1	3	3	4	3	1	3	2.6
Ability to use algebra, understand algebraic symbols and formulas	4	3	1	2	3	3	4	1	3	2.7
Ability to use exponents, powers and square roots	4	3	3	3	3	5	4	1	3	3.2

Comments:

- Basic math skills are important because apprenticeship programs don't have time to do basic training
- Must understand and comprehend real-life construction scenarios, I.e. story problems
- Need to do basic math operations without a calculator
- Whole numbers, fractions, decimals and percentages are biggest problems for new apprentices
- For some trades, like plumbers and electricians, higher levels of math are required, for example: ability to use exponents, powers, square roots, algebra

Basic construction skills	Carpenters	Cement Masons	CITC	Heat Frost	Ironworkers	Laborers	Painters	Plumbers, Steamfitters & Refrigeration	Sheet Metal	Average
Ability to read a tape measure; measure distance; make conversions	2	2	2	1	2	1	3	2	2	1.9
Able to identify common hand tools	2	2	2	2	2	2	2	3	2	2.1
Able to identify common power tools	2	2	2	2	2	2	2	3	2	2.1
Ability to carry and move stacks of materials properly	2	2	1	2	2	3	2	3	2	2.1
Ability to use basic functions of a calculator	2	2	1	2	3	2	3	3	2	2.2
Able to properly use common power tools	2	2	2	2	2	2	3	3	2	2.2
Able to properly use common hand tools	2	2	2	3	2	2	2	3	2	2.2
Understand basic construction terminology	2	3.5	3	2	2	2	2	3	3	2.5
Ability to read a map	2	2	4	2	4	2	2	3	2	2.6
Able to identify common construction materials	2	2	3	2	3	3	3	3	3	2.7
Demonstrate knowledge of scaffold safety, building and use	3	3.5	4	2	3	3	1	3	4	2.9
Ability to tie construction-related knots	3	3.5	4	3		3	3	3	3or4	3.2
Knowledge of crane signals	3	3.5	5	2		3	3	2	4	3.2
Ability to properly operate a forklift	3	3.5	5	3	3	4	3	3	3or4	3.4
Ability to read a blueprint, symbols, notes, dimensions	3	4	4	2	4	4	3	3	4	3.4

Comments:

- We will teach use of hand tools; scaffold safety and use is big part of apprentice training in years 1 and 2

Occupation-specific skills	Carpenters	Cement Masons	CITC	Heat Frost	Ironworkers	Laborers	Painters	Plumbers, Steamfitters & Refrigeration	Sheet Metal	Average
Ability to measure, layout and dig a ditch Trench, excavate and shore according to WISHA	4	3.5	4	5	5	2	5	4	5	4.2
Ability to build, square and level concrete forms	4	3.5	4	5	5	2	5	5	5	4.3
Develop proper technique to compact ground and backfill	4	3.5	4	5	5	4	5	4	5	4.4

Participating Apprenticeship Programs:

- Construction Industry Training Council
- Northwest Laborers – Employers Training Trust Fund
- Northwest Washington Plumbers and Steamfitters
- Pacific Northwest Ironworkers and Employers Local #86
- Pacific Northwest Regional Council of Carpenters
- Seattle Heat and Frost Insulators and Asbestos Workers
- Seattle Pipe Trades
- Western Washington Cement Masons
- Western Washington Painters & Allied Trades
- Western Washington Sheet Metal

## Notes