



**National Craft Assessment and Certification Program  
S P E C I F I C A T I O N S**

**INDUSTRIAL MILLWRIGHT V4  
MLWR15\_04**

September 2013

**Focus Statement**

A journey-level millwright will be able to:

- Identify hand tools, fasteners and equipment used in the trade and distinguish their applications
- Apply basic layout principles, blueprint reading, and master intermediate trade math
- Identify appropriate gaskets and O-rings according to their application
- Apply oxyfuel cutting techniques
- Use safe rigging practices
- Set baseplates and soleplates
- Properly use precision measuring tools
- Install packing and seals (including mechanical seals)
- Remove and install bearings and couplings
- Fabricate shims
- Pre-align and install equipment
- Install belt and chain drives, fans and blowers
- Identify conveyor parts and explain their functions
- Distinguish types of alignment (conventional, laser and reverse) and identify the steps that must be taken for each
- Identify types of pumps common to the millwright trade, and distinguish their application, troubleshooting and repairing procedures
- Identify types of compressors and their maintenance procedures
- Troubleshoot and repair gearboxes
- Identify turbine components and explain their functions

**Overview**

- Three-hour closed-book examination
- May use a basic function, non-printing calculator
- No extra papers, books, notes or study materials are allowed
- The minimum passing score is 75
- A Performance Verification is available

**Study Materials**

All NCCER written assessments are referenced to NCCER’s curriculum listed in the content. You may order modules from Pearson (1.800.922.0579) or from NCCER’s Online Catalog at [www.nccer.org](http://www.nccer.org)

**Assessment Development**

All questions are developed and approved by subject matter experts under the direction of NCCER and Prov™, NCCER’s testing partner.

**Credentials**

NCCER will send appropriate credentials to the assessment center for successful completions.

**Training Prescription Reports**

Each candidate will have access to individual results of the written assessment from Prov’s website at [www.provexam.com](http://www.provexam.com).

**Registry**

Assessment results will be maintained in NCCER’s Registry and become a portable record of the candidate’s training and assessment achievements.

**Written Assessment Content Summary:**

<b>Content Domain</b>	<b>Number of Questions</b>
<b>Millwright Fundamentals</b> [00101-09, 15106-06, 15206-07, 15207-07]	16
<b>Millwright Tools</b> [15102-06, 15204-07, 15205-07]	12
<b>Math &amp; Measurement</b> [15201-07, 15104-06, 15302-08]	12
<b>Bearings, Fasteners, &amp; Gaskets</b> [15103-06, 15105-06, 15209-07, 15306-08]	16
<b>Packing &amp; Seals</b> [15303-08, 15304-08, 15305-08]	12
<b>Couplings, Shims, Drives, &amp; Blowers</b> [15307-08, 15308-08, 15311-08, 15312-08]	16
<b>Construction Drawings</b> [15503-09]	4
<b>Equipment Installation</b> [15401-08, 15404-08, 15505-09, 15507-09]	16
<b>Maintenance and Troubleshooting</b> [15405-08, 15406-08, 15411-08]	12
<b>Alignment</b> [15403-08, 15501-09, 15502-09]	12
<b>Total Number of Questions</b>	<b>128</b>

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Learning Objectives related to Assessment:

<b>Millwright Fundamentals</b>	
<b>Registry ID Number:</b>	<b>Module Title Objectives:</b>
<b>00101-09</b>	<b>Basic Safety</b>
	Explain OSHA's General Duty Clause and 1926 CFR Subpart C.
	Explain the role of OSHA in job-site safety.
	Explain fall protection, ladder, stair, and scaffold procedures and requirements.
	Identify caught-in-between hazards and demonstrate safe working procedures and requirements.
	Define safe work procedures to use around electrical hazards.
	Demonstrate the use and care of appropriate personal protective equipment (PPE).
	Explain the importance of hazard communications (HazCom) and Material Data Safety Sheets (MSDSs).
	Identify other construction hazards on your job site, including hazards material exposures, environmental elements, welding and cutting hazards, confined spaces, and fires.
<b>15106-06</b>	<b>Oxyfuel Cutting</b>
	Identify and explain the use of oxyfuel cutting equipment.
<b>15206-07</b>	<b>Rigging</b>
	Identify and describe the uses of common rigging hardware and equipment.
	Use and understand the correct hand signals to guide a crane operator.
	Tie knots used in rigging.
	Identify basic rigging and crane safety procedures.
	Inspect common rigging equipment.
<b>15207-07</b>	<b>Setting Baseplates and Soleplates</b>
	Establish baseplate and soleplate locations.
	Install baseplates and soleplates.
	Field-verify a plate installation.
<b>Millwright Tools</b>	
<b>Registry ID Number:</b>	<b>Module Title Objectives:</b>
<b>15102-06</b>	<b>Millwright Hand Tools</b>
	Explain the purpose of each of the tools commonly used by millwrights.
<b>15204-07</b>	<b>Specialty Tools</b>
	Use torque multipliers.
	Use bevels.
	Use telescoping gauges.
	Use thickness gauge stock.
	Use drill gauges.
	Use radius gauges.
<b>15205-07</b>	<b>Millwright Power Tools</b>
	Use and care for bearing heaters.

	Explain power tool safety.
	Use and care for drills.
	Identify and explain key broaches.
	Perform precision drilling.
	Use and care for pipe threading machines.
	Use and care for drill presses.
	Use and care for pipe threading machines.
	<b>Math &amp; Measurement</b>
<b>Registry ID Number:</b>	<b>Module Title Objectives:</b>
<b>15201-07</b>	<b>Intermediate Trade Math</b>
	Use tables.
	Use ratios and proportions.
	Solve basic algebra problems.
	Solve area problems.
	Solve volume problems.
	Solve circumference problems.
<b>15104-06</b>	<b>Basic Layout</b>
	Identify layout tools and explain their uses.
	Scribe straight lines.
	Scribe circles using dividers and trammel points.
	Lay out equipment locations.
<b>15302-08</b>	<b>Precision Measuring Tools</b>
	Use levels.
	Use calipers.
	Use micrometers.
	Use speed measurement tools.
	Use dial indicators.
	<b>Bearings, Fasteners, &amp; Gaskets</b>
<b>Registry ID Number:</b>	<b>Module Title Objectives:</b>
<b>15103-06</b>	<b>Fasteners and Anchors</b>
	Identify and explain the use of threaded fasteners.
	Identify and explain the use of non-threaded fasteners.
	Identify and explain the use of anchors.
<b>15105-06</b>	<b>Gaskets and O-Rings</b>
	Identify the various types of gaskets and explain their uses.
	Lay out, cut, and install a flange gasket
	Select an O-ring for a given application and install it.
<b>15209-07</b>	<b>Introduction to Bearings</b>
	Identify various types of bearings.
<b>15306-08</b>	<b>Removing and Installing Bearings</b>
	Remove defective bearings using manual pullers and/or a press.
	Describe using heat to remove a defective bearing.
	Identify common bearing failure modes and describe the conditions that cause them.
	Install pillow block bearings.

	<b>Packing &amp; Seals</b>
<b>Registry ID Number:</b>	<b>Module Title Objectives:</b>
<b>15303-08</b>	<b>Installing Packing</b>
	Identify and explain the types of packing.
	Install packing.
<b>15304-08</b>	<b>Installing Seals</b>
	Identify and explain types of seals.
	Identify and explain seal materials.
<b>15305-08</b>	<b>Installing Mechanical Seals</b>
	Identify and explain types of mechanical seals.
	Explain mechanical seal classification.
	<b>Couplings, Shims, Drives, &amp; Blowers</b>
<b>Registry ID Number:</b>	<b>Module Title Objectives:</b>
<b>15307-08</b>	<b>Installing Couplings</b>
	Identify and explain coupling types.
	Install couplings.
<b>15308-08</b>	<b>Fabricating Shims</b>
	Identify and explain types of shim stock.
	Identify and explain shim materials.
	Fabricate shims.
<b>15311-08</b>	<b>Installing Belt and Chain Drives</b>
	Identify and explain belt drive types.
	Install chain drives.
<b>15312-08</b>	<b>Installing Fans and Blowers</b>
	Identify and explain types of fans.
	Identify and explain types of blowers.
	<b>Equipment Installation</b>
<b>Registry ID Number:</b>	<b>Module Title Objectives:</b>
<b>15401-08</b>	<b>Conveyors</b>
	Identify and explain the use of roller conveyors and their components.
	Identify and explain the use of belt conveyors and their components.
	Identify and explain the use of screw conveyors and their components.
	Identify and explain the use of chain conveyors and their components.
	Identify and explain the use of pneumatic conveyors and their components.
<b>15404-08</b>	<b>Pumps</b>
	Identify and explain rotary pumps.
	Identify and explain reciprocating pumps.
	Identify and explain centrifugal pumps.
<b>15505-09</b>	<b>Turbines</b>
	Identify and explain types of turbines.
	Identify and explain steam turbine components.

<b>15507-09</b>	<b>Installing Electric Motors</b>
	Explain proper methods for motor storage.
	Determine if a motor has a thrust bearing or relies on electromagnetic force to determine rotor location.
	<b>Maintenance and Troubleshooting</b>
<b>Registry ID Number:</b>	<b>Module Title Objectives:</b>
<b>15405-08</b>	<b>Troubleshooting and Repairing Pumps</b>
	Troubleshoot a pump.
	Inspect a pump.
	Remove a pump from the system.
	Install a pump.
<b>15406-08</b>	<b>Compressors and Compressor Maintenance</b>
	Identify and explain types of compressors.
	Explain the principles of compressor operation.
<b>15411-08</b>	<b>Troubleshooting and Repairing Gearboxes</b>
	Explain how gears operate and identify types of gears.
	Identify types of gearboxes.
	<b>Alignment</b>
<b>Registry ID Number:</b>	<b>Module Title Objectives:</b>
<b>15403-08</b>	<b>Conventional Alignment</b>
	Explain types of misalignment.
	Align couplings, using the straightedge and feeler gauge method.
	Align couplings, using the dial indicator method.
<b>15501-09</b>	<b>Reverse Alignment</b>
	Perform reverse dial indicator alignment, using the mathematical equation.
	Measure shaft and coupling runout, using a dial indicator.
	Explain the conditions that can cause misalignment.
	Perform reverse dial indicator alignment, using a graphical alignment chart.
<b>15502-09</b>	<b>Laser Alignment</b>
	Explain lasers and laser alignment systems.
	Troubleshoot repeatability and laser problems.
	Operate a laser alignment system.
	<b>Construction Drawings</b>
<b>Registry ID Number:</b>	<b>Module Title Objectives:</b>
<b>15503-09</b>	<b>Advanced Blueprint Reading</b>
	Identify and explain the parts of a machine drawing.
	Locate individual components on a plant layout.
	Read and interpret assembly drawings.
	Read and interpret detail drawings.
	Identify piping arrangement drawings.