



**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 corresponding hands-on Performance Verification is available

NCCER Curriculum

All NCCER knowledge assessments are referenced to NCCER's curriculum modules as listed on this specification sheet. You may order modules from Pearson (800.922.0579) or from NCCER's Online Catalog at www.nccer.org.

Assessment Development

All questions are developed and approved by subject matter experts under the direction of NCCER.

Credentials

Upon successful completion of the knowledge assessment, NCCER will send applicable credentials to the assessment center.

Score Report and Training Prescription

Each candidate will have access to their assessment results including their overall score and recommended training.

NCCER Registry

Knowledge assessment results are recorded in NCCER's Registry and become a part of the portable record of an individual's NCCER credentials.

Knowledge Assessment Contents:

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

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Learning Objectives related to Assessment:

Millwright Fundamentals	
Registry ID Number:	Module Title Objectives:
00101-09	Basic Safety
	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.
15106-06	Oxyfuel Cutting
	Identify and explain the use of oxyfuel cutting equipment.
15206-07	Rigging
	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.
15207-07	Setting Baseplates and Soleplates
	Establish baseplate and soleplate locations.
	Install baseplates and soleplates.
	Field-verify a plate installation.
Millwright Tools	
Registry ID Number:	Module Title Objectives:
15102-06	Millwright Hand Tools
	Explain the purpose of each of the tools commonly used by millwrights.
15204-07	Specialty Tools
	Use torque multipliers.
	Use bevels.
	Use telescoping gauges.
	Use thickness gauge stock.
	Use drill gauges.
	Use radius gauges.
15205-07	Millwright Power Tools
	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.
	Math & Measurement
Registry ID Number:	Module Title Objectives:
15201-07	Intermediate Trade Math
	Use tables.
	Use ratios and proportions.
	Solve basic algebra problems.
	Solve area problems.
	Solve volume problems.
	Solve circumference problems.
15104-06	Basic Layout
	Identify layout tools and explain their uses.
	Scribe straight lines.
	Scribe circles using dividers and trammel points.
	Lay out equipment locations.
15302-08	Precision Measuring Tools
	Use levels.
	Use calipers.
	Use micrometers.
	Use speed measurement tools.
	Use dial indicators.
	Bearings, Fasteners, & Gaskets
Registry ID Number:	Module Title Objectives:
15103-06	Fasteners and Anchors
	Identify and explain the use of threaded fasteners.
	Identify and explain the use of non-threaded fasteners.
	Identify and explain the use of anchors.
15105-06	Gaskets and O-Rings
	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.
15209-07	Introduction to Bearings
	Identify various types of bearings.
15306-08	Removing and Installing Bearings
	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.

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

15507-09	Installing Electric Motors
	Explain proper methods for motor storage.
	Determine if a motor has a thrust bearing or relies on electromagnetic force to determine rotor location.
	Maintenance and Troubleshooting
Registry ID Number:	Module Title Objectives:
15405-08	Troubleshooting and Repairing Pumps
	Troubleshoot a pump.
	Inspect a pump.
	Remove a pump from the system.
	Install a pump.
15406-08	Compressors and Compressor Maintenance
	Identify and explain types of compressors.
	Explain the principles of compressor operation.
15411-08	Troubleshooting and Repairing Gearboxes
	Explain how gears operate and identify types of gears.
	Identify types of gearboxes.
	Alignment
Registry ID Number:	Module Title Objectives:
15403-08	Conventional Alignment
	Explain types of misalignment.
	Align couplings, using the straightedge and feeler gauge method.
	Align couplings, using the dial indicator method.
15501-09	Reverse Alignment
	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.
15502-09	Laser Alignment
	Explain lasers and laser alignment systems.
	Troubleshoot repeatability and laser problems.
	Operate a laser alignment system.
	Construction Drawings
Registry ID Number:	Module Title Objectives:
15503-09	Advanced Blueprint Reading
	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.