

DOCUMENT RESUME

ED 345 069

CE 061 163

TITLE Agricultural/Industrial Mechanical Technician. Ohio's Competency Analysis Profile.

INSTITUTION Ohio State Univ., Columbus. Vocational Instructional Materials Lab.

SPONS AGENCY Ohio State Dept. of Education, Columbus. Div. of Vocational and Career Education.

PUB DATE Apr 92

NOTE 35p.; For related documents, see ED 338 827-852 and CE 061 142-176.

AVAILABLE FROM Vocational Instructional Materials Lab, Ohio State University, 1900 Kenny Road, Columbus, OH 43210-1090 (\$1.50).

PUB TYPE Guides - Classroom Use - Teaching Guides (For Teacher) (052)

EDRS PRICE MF01/PC02 Plus Postage.

DESCRIPTORS Agricultural Education; *Agricultural Engineering; *Auto Mechanics; Competence; *Competency Based Education; Employment Potential; Engines; Entry Workers; *Equipment Maintenance; *Industrial Education; Job Analysis; Job Skills; Occupational Information; Postsecondary Education; Power Technology; Secondary Education; Task Analysis; Vocational Education

IDENTIFIERS DACUM Process; Ohio

ABSTRACT

Developed through a modified DACUM (Developing a Curriculum) process involving business, industry, labor, and community agency representatives in Ohio, this document is a comprehensive and verified employer competency profile for agricultural/industrial mechanical technician occupations. The list contains units (with and without subunits), competencies, and competency builders that identify the skills needed to enter these occupations. The occupational, academic, and employability skills for this occupation or occupational area are included. Within the outline are three levels of items: core, advancing, and futuring. Core items identify the knowledge, skills, and attitudes essential for entry-level employment. These items are required to be taught and will be the basis for questions on the state vocational competency tests. Advancing items identify the knowledge, skills, and attitudes needed to advance in the occupation; futuring items identify the knowledge, skills, and attitudes needed to enter and remain in a given occupation 3 to 4 years from now. Titles of the 17 units are as follows: general safety precautions; general equipment maintenance; general repair procedures; general shop practices; equipment operation; cylinder head; engine block; lubrication system; cooling systems; fuel and air systems; electrical systems; drivetrain; brake systems; suspension and steering; heating and air conditioning; hydraulics; and employability skills. (YLB)

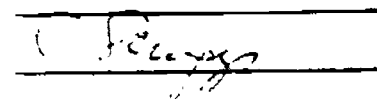
O C A P

ED 345 069

OHIO'S COMPETENCY ANALYSIS PROFILE AGRICULTURAL/INDUSTRIAL MECHANICAL TECHNICIAN

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)
This document has been reproduced as
received from the person or organization
originating it.
Minor changes have been made to improve
reproduction quality.
Points of view or opinions stated in this docu-
ment do not necessarily represent official
ERIC position or policy.

PERMISSION TO REPRODUCE THIS
MATERIAL HAS BEEN GRANTED BY



TO THE EDUCATIONAL RESOURCES
INFORMATION CENTER (ERIC)

Employer Verification Panel

Richard C. Huggins, *Northland Farm & Outdoor Power Equipment*, Circleville, Ohio

Kenneth Koenig, *Koenig Equipment Inc.*, Anna, Ohio

Dennis Lashley, *Lashley Tractor Sales, Inc.*, Quaker City, Ohio

Rodney Mobley, *Decker Inc.*, Sherwood, Ohio

Leonard F. Shetler, Jr., *Shetler's Sales & Service, Inc.*, Copley, Ohio

Richard W. Snyder, *Mid-State Power Equipment Inc.*, Carroll, Ohio

Scott Surbaugh, *Hill Implement*, Circleville, Ohio

Donald L. White, *Apple Farm Service Inc.*, Covington, Ohio

Paul Wolfe, *Finlon Equipment*, Coshocton, Ohio

200 067 169



Division of Vocational and
Career Education
Ohio Department of Education

Vocational Instructional Materials Laboratory
Center on Education and Training
for Employment



BEST COPY AVAILABLE

What is OCAP?

"A comprehensive and verified employer competency list will be developed and kept current for each program." This is the second objective of Imperative 3 of the *Action Plan for Accelerating the Modernization of Vocational Education: Ohio's Future at Work*. Ohio's Competency Analysis Profile (OCAP) lists are the Division of Vocational and Career Education's response to that objective. OCAP lists evolve from a modified DACUM process involving business, industry, labor, and community agency representatives from throughout Ohio. The OCAP process is directed by the Vocational Instructional Materials Laboratory at The Ohio State University's Center on Education and Training for Employment.

How is OCAP used?

Each OCAP contains units (with and without subunits), competencies, and competency builders that identify the occupational, academic,* and employability skills needed to enter a given occupation or occupational area. Within that outline there are three levels of items: core, advancing, and futuring. Core items identify the knowledge, skills, and attitudes essential for entry-level employment. These items will be the basis for questions on the state vocational competency tests (scheduled to begin in school year 1993-94). Advancing items (marked with one asterisk) identify the knowledge, skills, and attitudes needed to advance in a given occupation. Futuring items (marked with two asterisks) identify the knowledge, skills, and attitudes needed to enter and remain in a given occupation three to four years from now.

School districts may add as many units, subunits, competencies, and/or competency builders as desired to reflect local employment needs, trends, and specialties. Local advisory committees should be actively involved in the identification and verification of additional items. Using OCAP lists, instructors will be able to formulate their vocational courses of study and monitor competency gains via the new criterion-referenced competency testing program that will be directly tied to the competencies identified on the OCAP lists.

*Academic competencies have not been identified for all OCAPs. At a later date math, communication, and science competencies will be released.

The **Employability Skills** portion of this list was verified by the following employer panel:

Gary J. Corrigan, *Dana Corporation*, Ottawa Lake, Michigan
David Crooks, *Bowling Green State University Union Food Service*, Bowling Green, Ohio
Pat Doerman, *Farrow's Harley-Davidson*, Columbus, Ohio
William Gockenbach, *Kaiser Aluminum*, Heath, Ohio
Patsy Hathaway, *CBS Personnel Services, Inc.*, Dayton, Ohio
Marlyn Harman, *Marlyn Harman & Associates*, Cleveland, Ohio
Thomas R. Hyldahl, *Toledo Edison*, Toledo, Ohio
Carol C. James, *Ohio Contractors Association*, Columbus, Ohio
James Mack, *Chrysler Jeep Assembly*, Toledo, Ohio
Rocky McCoy, *Ironton-Lawrence Co. Community Action Organization*, Ironton, Ohio
James Needs, *Independent Crop Producer*, Upper Sandusky, Ohio
Ronald Simmons, *Former GM Executive*, Warren Ohio

Ohio Competency Analysis Profile Agricultural/Industrial Mechanical Technician

Unit 1: General Safety Precautions

Competency 1.0.1: Maintain safe work environment

Competency Builders:

- 1.0.1.1 Read and follow safety information
- 1.0.1.2 Organize and maintain clean and safe work area
- 1.0.1.3 Comply with shop and equipment safety rules
- 1.0.1.4 Ventilate work area
- 1.0.1.5 Identify and report safety hazards
- 1.0.1.6 Correct safety hazards
- 1.0.1.7 Maintain safety devices
- 1.0.1.8 Complete accident report

Competency 1.0.2: Recognize environmental issues

Competency Builders:

- 1.0.2.1 Identify hazardous materials
- 1.0.2.2 Interpret material safety data sheets (MSDSs)
- 1.0.2.3 Monitor regulation updates
- 1.0.2.4 Comply with controlled product regulations
- 1.0.2.5 Observe safety precautions when applying chemicals
- 1.0.2.6 Observe safety precautions when storing chemicals
- 1.0.2.7 Follow personal cleanup procedures after handling chemicals
- 1.0.2.8 Dispose of chemicals and chemical containers
- 1.0.2.9 Identify Environmental Protection Agency (EPA) regulations

Competency 1.0.3: Demonstrate safe work habits

Competency Builders:

- 1.0.3.1 Read and follow label information
- 1.0.3.2 Wear protective clothing and equipment
- 1.0.3.3 Check working condition of personal protective equipment
- 1.0.3.4 Use safe lifting and carrying methods
- 1.0.3.5 Interpret information on signs
- 1.0.3.6 Observe and comply with safety zones
- 1.0.3.7 Maintain and use slow-moving-vehicle signs
- 1.0.3.8 Maintain proper lighting
- 1.0.3.9 Keep riders off mobile equipment

Competency 1.0.4: Operate and maintain equipment

Competency Builders:

- 1.0.4.1 Follow safety rules
- 1.0.4.2 Observe and comply with safety zones
- 1.0.4.3 Operate equipment defensively
- 1.0.4.4 Interpret safety symbols
- 1.0.4.5 Maintain safety shields and devices according to original equipment manufacturer (OEM)
- 1.0.4.6 Shut down and lock out/tag out power equipment
- 1.0.4.7 Identify potential equipment safety hazards
- 1.0.4.8 Follow manufacturer's service recommendations

Unit 2: General Equipment Maintenance

Competency 2.0.1: Use service and operator's manuals

Competency Builders:

- 2.0.1.1 Locate manuals for equipment
- 2.0.1.2 Locate specifications for equipment
- 2.0.1.3 Interpret sketches and diagrams
- 2.0.1.4 Adhere to repair procedures

Competency 2.0.2: Assemble equipment

Competency Builders:

- 2.0.2.1 Follow general safety precautions
- 2.0.2.2 Identify equipment components
- 2.0.2.3 Check packing list against parts and hardware in bundles
- 2.0.2.4 Follow written assembly instructions
- 2.0.2.5 Lay out by checklist
- 2.0.2.6 Interpret assembly diagrams
- 2.0.2.7 Identify and use hardware items
- 2.0.2.8 Arrange parts for ease of assembly
- 2.0.2.9 Inspect assembled equipment for defects
- 2.0.2.10 Tighten bolts in sequence
- 2.0.2.11 Make necessary adjustments

Competency 2.0.3: Clean equipment

Competency Builders:

- 2.0.3.1 Follow general safety precautions
- 2.0.3.2 Select cleaning solvents and detergents
- 2.0.3.3 Follow procedures for waste disposal
- 2.0.3.4 Remove debris from equipment
- 2.0.3.5 Remove engine deposits from internal components
- 2.0.3.6 Remove oil, grease, and dirt
- 2.0.3.7 Protect equipment from weather

Competency 2.0.4: Lubricate equipment

Competency Builder :

- 2.0.4.1 Identify service points
- 2.0.4.2 Select lubricant
- 2.0.4.3 Maintain grease fittings
- 2.0.4.4 Apply lubricant

Unit 3: General Repair Procedures

Competency 3.0.1: Use measuring devices

Competency Builders:

- 3.0.1.1 Follow general safety precautions
- 3.0.1.2 Identify types of measuring devices
- 3.0.1.3 Determine factors affecting torque
- 3.0.1.4 Use a torque wrench
- 3.0.1.5 Use and read a micrometer
- 3.0.1.6 Use and read dial indicators
- 3.0.1.7 Use clearance measurement tools

Competency 3.0.2: Use and maintain hand and power tools

Competency Builders:

- 3.0.2.1 Follow general safety precautions
- 3.0.2.2 Read and follow operation instructions
- 3.0.2.3 Identify tools
- 3.0.2.4 Select and use proper tools
- 3.0.2.5 Set up and adjust tools
- 3.0.2.6 Clean and lubricate tools
- 3.0.2.7 Recondition tools
- 3.0.2.8 Sharpen tools
- 3.0.2.9 Store tools
- 3.0.2.10 Troubleshoot problems

Competency 3.0.3: Diagnose malfunctions

Competency Builders:

- 3.0.3.1 Identify effect of defective parts
- 3.0.3.2 Follow troubleshooting procedures in service manual
- 3.0.3.3 Determine potential causes of equipment failure from customer's description
- 3.0.3.4 Inspect visually for defects
- 3.0.3.5 Operate equipment to identify defects
- 3.0.3.6 Refer to manufacturer's specifications
- 3.0.3.7 Operate test equipment
- 3.0.3.8 Review past maintenance documents
- 3.0.3.9 Check for leaking fluids
- 3.0.3.10 Check for air leaks
- 3.0.3.11 Identify causes of noise

* Advancing
** Futuring

Agricultural/Industrial Mechanical Technician--4/92

Competency 3.0.4: Determine equipment repair procedures

Competency Builders:

- 3.0.4.1 Follow general safety precautions
- 3.0.4.2 Identify component parts
- 3.0.4.3 Identify component types
- 3.0.4.4 Identify component function
- 3.0.4.5 Identify fluid additives
- 3.0.4.6 Select component type
- 3.0.4.7 Use special tools
- 3.0.4.8 Use test equipment
- 3.0.4.9 Use service and technical manuals

Competency 3.0.5: Use general mechanical techniques

Competency Builders:

- 3.0.5.1 Follow general safety precautions
- 3.0.5.2 Extract broken stud or bolt
- 3.0.5.3 Replace studs
- 3.0.5.4 Thread holes and bolts
- 3.0.5.5 Tighten bolts
- 3.0.5.6 Free frozen parts
- 3.0.5.7 Maintain clean work area
- 3.0.5.8 Install gaskets and sealants
- 3.0.5.9 Inspect mating surfaces
- 3.0.5.10 Lubricate parts for assembly

Competency 3.0.6: Service bearings, seats, and seals

Competency Builders:

- 3.0.6.1 Follow general safety precautions
- 3.0.6.2 Remove seals
- 3.0.6.3 Remove bearings
- 3.0.6.4 Inspect bearings, seats, and seals
- 3.0.6.5 Clean bearings
- 3.0.6.6 Lubricate bearings
- 3.0.6.7 Install bearings and seals

Competency 3.0.7: Service belt and drive chain assemblies

Competency Builders:

- 3.0.7.1 Follow general safety precautions
- 3.0.7.2 Replace and adjust belts
- 3.0.7.3 Replace pulleys
- 3.0.7.4 Replace and adjust gear assembly
- 3.0.7.5 Replace and adjust chains
- 3.0.7.6 Replace rollers
- 3.0.7.7 Troubleshoot problems

Unit 4: General Shop Practices

Competency 4.0.1: Weld with gas

Competency Builders:

- 4.0.1.1 Follow general safety precautions
- 4.0.1.2 Select welding equipment
- 4.0.1.3 Set up welding equipment
- 4.0.1.4 Select rod
- 4.0.1.5 Select and apply flux
- 4.0.1.6 Prepare metal
- 4.0.1.7 Weld steel in horizontal position
- 4.0.1.8 Weld steel in nonhorizontal positions
- 4.0.1.9 Braze metal
- 4.0.1.10 Hard-surface metal
- 4.0.1.11 Cut metal
- 4.0.1.12 Clean and store gas welding equipment
- 4.0.1.13 Secure and store gas cylinders

Competency 4.0.2: Weld with electric arc

Competency Builders:

- 4.0.2.1 Follow general safety precautions
- 4.0.2.2 Select welding equipment and accessories
- 4.0.2.3 Select electrode
- 4.0.2.4 Select settings
- 4.0.2.5 Prepare metal
- 4.0.2.6 Weld steel in horizontal position
- 4.0.2.7 Weld pipe
- 4.0.2.8 Cut metal
- 4.0.2.9 Hard-surface metal
- 4.0.2.10 Weld steel in nonhorizontal positions
- 4.0.2.11 Weld cast iron
- 4.0.2.12 Clean and store welding equipment

Competency 4.0.3: Identify properties of metals

Competency Builders:

- 4.0.3.1 Follow general safety precautions
- 4.0.3.2 Identify types of metal
- 4.0.3.3 Identify nominal sizes of metal
- 4.0.3.4 Determine metal properties
- 4.0.3.5 Test metal for type
- 4.0.3.6 Test metal for hardness

Agricultural/Industrial Mechanical Technician--4/92

Competency 4.0.4: Fabricate with metal

Competency Builders:

- 4.0.4.1 Follow general safety precautions
- 4.0.4.2 Design metal project within manufacturer's specifications
- 4.0.4.3 Prepare bill of materials
- 4.0.4.4 Punch and drill metal
- 4.0.4.5 Cut metal
- 4.0.4.6 Grind metal
- 4.0.4.7 Select and attach hardware
- 4.0.4.8 Select and apply fasteners
- 4.0.4.9 Bend metal
- 4.0.4.10 Join metal
- 4.0.4.11 Store metal

Competency 4.0.5: Solder

Competency Builders:

- 4.0.5.1 Follow general safety precautions
- 4.0.5.2 Select soldering method
- 4.0.5.3 Select tools
- 4.0.5.4 Select flux
- 4.0.5.5 Select solder
- 4.0.5.6 Prepare surfaces
- 4.0.5.7 Apply solder
- 4.0.5.8 Clean equipment

Competency 4.0.6: Apply protective coatings*

Competency Builders:

- 4.0.6.1 Follow general safety precautions*
- 4.0.6.2 Determine type of coating needed*
- 4.0.6.3 Select and use application tools*
- 4.0.6.4 Adjust application equipment*
- 4.0.6.5 Prepare surface*
- 4.0.6.6 Apply masking tape*
- 4.0.6.7 Thin paint*
- 4.0.6.8 Apply primer coat*
- 4.0.6.9 Apply finish coat*
- 4.0.6.10 Apply wood preservative*
- 4.0.6.11 Use paint and varnish remover*
- 4.0.6.12 Clean application equipment*

Unit 5: Equipment Operation

Competency 5.0.1: Perform prestart functions

Competency Builders:

- 5.0.1.1 Follow general safety precautions
- 5.0.1.2 Select fuel type
- 5.0.1.3 Refuel power units
- 5.0.1.4 Check prestart mechanism
- 5.0.1.5 Disengage power to accessories
- 5.0.1.6 Check fluid levels

Competency 5.0.2: Hitch equipment to power units

Competency Builders:

- 5.0.2.1 Follow general safety precautions
- 5.0.2.2 Connect front-end-operated equipment
- 5.0.2.3 Connect 3-point hitch equipment
- 5.0.2.4 Attach and detach power takeoff (PTO) equipment
- 5.0.2.5 Hitch towed equipment
- 5.0.2.6 Connect hydraulic lines
- 5.0.2.7 Connect electrical hookups
- 5.0.2.8 Connect safety chains
- 5.0.2.9 Adjust ballast

Competency 5.0.3: Operate equipment and vehicles

Competency Builders:

- 5.0.3.1 Follow general safety precautions
- 5.0.3.2 Set throttle
- 5.0.3.3 Interpret equipment gauges
- 5.0.3.4 Start power unit
- 5.0.3.5 warm up engine
- 5.0.3.6 Use hand operating signals
- 5.0.3.7 Operate transmissions
- 5.0.3.8 Operate PTO unit
- 5.0.3.9 Use brake system
- 5.0.3.10 Shut down power unit
- 5.0.3.11 Operate equipment systems

Competency 5.0.4: Operate small engines

Competency Builders:

- 5.0.4.1 Follow general safety precautions
- 5.0.4.2 Identify engine variations
- 5.0.4.3 Mix fuel for two-cycle engine
- 5.0.4.4 Check fuel and fuel engine
- 5.0.4.5 Check oil level
- 5.0.4.6 Start engine
- 5.0.4.7 Regulate throttle
- 5.0.4.8 Engage power unit
- 5.0.4.9 Shut down engine

* Advancing
** Futuring

Unit 6: Cylinder Head

Competency 6.0.1: Service cylinder head

Competency Builders:

- 6.0.1.1 Follow general safety precautions
- 6.0.1.2 Remove and inspect valve cover
- 6.0.1.3 Inspect, measure, test, and install cylinder head
- 6.0.1.4 Replace valve stem seals
- 6.0.1.5 Inspect, measure, and replace valve guides
- 6.0.1.6 Recondition valve guides
- 6.0.1.7 Inspect, measure, and resurface valve seats
- 6.0.1.8 Replace valve seats
- 6.0.1.9 Inspect, replace, and adjust valve bridges
- 6.0.1.10 Inspect and replace precombustion chamber

Competency 6.0.2: Service valve assembly

Competency Builders:

- 6.0.2.1 Inspect, measure, and replace valves
- 6.0.2.2 Adjust valve clearance
- 6.0.2.3 Recondition valves
- 6.0.2.4 Lap valves
- 6.0.2.5 Measure valve head height
- 6.0.2.6 Measure valve face-to-seat contact
- 6.0.2.7 Measure valve concentricity
- 6.0.2.8 Vacuum-test valve sealing
- 6.0.2.9 Inspect, test, and replace lifters
- 6.0.2.10 Inspect and replace rocker arm components
- 6.0.2.11 Adjust and replace cam followers
- 6.0.2.12 Inspect, measure, test, and replace valve spring assembly
- 6.0.2.13 Time valve assembly

Competency 6.0.3: Service camshaft assembly

Competency Builders:

- 6.0.3.1 Inspect, measure, and replace camshaft
- 6.0.3.2 Time camshaft
- 6.0.3.3 Inspect, measure, and replace bearings
- 6.0.3.4 Measure and adjust camshaft end play
- 6.0.3.5 Inspect and replace camshaft gear

Unit 7: Engine Block

Competency 7.0.1: Service engine block

Competency Builders:

- 7.0.1.1 Follow general safety precautions
- 7.0.1.2 Remove and install engine
- 7.0.1.3 Install front and rear oil seals
- 7.0.1.4 Inspect and replace pans and covers
- 7.0.1.5 Inspect, measure, and test engine block
- 7.0.1.6 Inspect and measure cylinder walls or liners
- 7.0.1.7 Rebore cylinder*
- 7.0.1.8 Deglaze cylinder walls
- 7.0.1.9 Remove cylinder ridge
- 7.0.1.10 Inspect and measure sleeve bore
- 7.0.1.11 Replace cylinder liners and seals
- 7.0.1.12 Inspect and replace time drive gear train
- 7.0.1.13 Inspect and replace timing chain
- 7.0.1.14 Inspect and replace ring gear
- 7.0.1.15 Inspect piston cooling jets
- 7.0.1.16 Inspect and align flywheel housing

Competency 7.0.2: Service piston assembly

Competency Builders:

- 7.0.2.1 Inspect, measure, and replace piston and piston pins
- 7.0.2.2 Inspect, measure, and replace piston rings
- 7.0.2.3 Inspect, measure, and replace piston rod
- 7.0.2.4 Inspect, measure, and replace rod bearings
- 7.0.2.5 Measure piston-to-cylinder-wall clearance
- 7.0.2.6 Measure ring-to-groove clearance
- 7.0.2.7 Measure ring end gap

Competency 7.0.3: Service crankshaft assembly

Competency Builders:

- 7.0.3.1 Inspect, measure, and replace main bearings
- 7.0.3.2 Inspect, measure, and replace crankshaft
- 7.0.3.3 Inspect and replace crankshaft gear
- 7.0.3.4 Inspect, measure, and replace crankshaft vibration damper
- 7.0.3.5 Measure oil slinger runout
- 7.0.3.6 Install oil slinger
- 7.0.3.7 Measure and adjust crankshaft end play
- 7.0.3.8 Remove or add shims
- 7.0.3.9 Inspect, measure, and replace flywheel
- 7.0.3.10 Inspect, measure, and replace flexplate

* Advancing

** Futuring

Unit 8: Lubrication System

Competency 8.0.1: Maintain lubrication system

Competency Builders:

- 8.0.1.1 Follow general safety precautions
- 8.0.1.2 Check oil level
- 8.0.1.3 Select oil
- 8.0.1.4 Change oil
- 8.0.1.5 Change oil filters
- 8.0.1.6 Dispose of oil
- 8.0.1.7 Observe oil for contamination
- 8.0.1.8 Estimate engine oil consumption
- 8.0.1.9 Pull sample for oil analysis

Competency 8.0.2: Repair lubrication system

Competency Builders:

- 8.0.2.1 Perform oil pressure test
- 8.0.2.2 Adjust oil pressure
- 8.0.2.3 Inspect, measure, test, and replace oil pump
- 8.0.2.4 Repair oil pump
- 8.0.2.5 Inspect, test, and replace engine oil pressure sending unit
- 8.0.2.6 Inspect, test, and replace engine oil pressure gauge
- 8.0.2.7 Inspect and replace components regulating oil pressure
- 8.0.2.8 Inspect, measure, and repair pump drives
- 8.0.2.9 Replace idler gear
- 8.0.2.10 Inspect, test, and replace oil cooler
- 8.0.2.11 Inspect, test, and replace sensors
- 8.0.2.12 Inspect, test, and replace switches
- 8.0.2.13 Test and replace differential valve*
- 8.0.2.14 Inspect and replace oil lines

Unit 9: Cooling Systems

Competency 9.0.1: Maintain cooling system

Competency Builders:

- 9.0.1.1 Follow general safety precautions
- 9.0.1.2 Check coolant level
- 9.0.1.3 Check coolant condition
- 9.0.1.4 Inspect for leaks
- 9.0.1.5 Flush cooling system
- 9.0.1.6 Test coolant mixture
- 9.0.1.7 Mix and add coolant
- 9.0.1.8 Bleed air from system
- 9.0.1.9 Inspect and replace hoses
- 9.0.1.10 Drain and clean water filter assembly
- 9.0.1.11 Replace water filter element

(continued)

* Advancing
** Futuring

(continued)

- 9.0.1.12 Maintain coolant conditioner
- 9.0.1.13 Dispose of coolant
- 9.0.1.14 Inspect and replace belts

Competency 9.0.2: Repair cooling system

Competency Builders:

- 9.0.2.1 Inspect, test, replace, and adjust thermostat
- 9.0.2.2 Inspect, test, and replace radiator
- 9.0.2.3 Repair radiator*
- 9.0.2.4 Inspect and test pressure cap
- 9.0.2.5 Inspect, test, and replace fan assembly
- 9.0.2.6 Inspect and repair fan clutch assembly
- 9.0.2.7 Clean, inspect, test, and replace temperature sensors
- 9.0.2.8 Clean, inspect, test, and replace temperature switches
- 9.0.2.9 Inspect and replace coolant temperature gauge
- 9.0.2.10 Inspect and replace sending unit
- 9.0.2.11 Inspect and replace water pump
- 9.0.2.12 Recondition water pump assembly
- 9.0.2.13 Inspect and repair radiator shutter assembly

Unit 10: Fuel and Air Systems

Competency 10.0.1: Service gasoline fuel systems

Competency Builders:

- 10.0.1.1 Follow general safety precautions
- 10.0.1.2 Check fuel for contaminants
- 10.0.1.3 Check fuel level
- 10.0.1.4 Inspect and replace fuel filters
- 10.0.1.5 Inspect and replace fuel tank components
- 10.0.1.6 Inspect and replace fuel lines
- 10.0.1.7 Inspect and replace fuel pump
- 10.0.1.8 Inspect and test fuel pump controls
- 10.0.1.9 Inspect cold-enrichment systems
- 10.0.1.10 Remove and replace carburetor
- 10.0.1.11 Rebuild carburetor
- 10.0.1.12 Adjust carburetor idle speed
- 10.0.1.13 Adjust idle mixture
- 10.0.1.14 Adjust full-load mixture
- 10.0.1.15 Adjust linkages
- 10.0.1.16 Remove and replace fuel-injection throttle body
- 10.0.1.17 Service fuel-injection system
- 10.0.1.18 Perform fuel injector tests*
- 10.0.1.19 Replace fuel system warning devices
- 10.0.1.20 Perform manifold vacuum test
- 10.0.1.21 Repair fuel tank components*

* Advancing

** Futuring

Agricultural/Industrial Mechanical Technician--4/92

Competency 10.0.2: Service diesel fuel system

Competency Builders:

- 10.0.2.1 Follow general safety precautions
- 10.0.2.2 Check fuel for contaminants
- 10.0.2.3 Check fuel level
- 10.0.2.4 Measure fuel consumption
- 10.0.2.5 Prime and bleed fuel system
- 10.0.2.6 Inspect and replace fuel filters
- 10.0.2.7 Inspect and replace fuel tank components
- 10.0.2.8 Inspect and replace fuel transfer pump
- 10.0.2.9 Inspect and replace fuel system heaters
- 10.0.2.10 Repair fuel system heaters
- 10.0.2.11 Inspect and replace primer pump
- 10.0.2.12 Repair primer pump
- 10.0.2.13 Adjust throttle control linkage
- 10.0.2.14 Adjust electronic throttle controls
- 10.0.2.15 Inspect and replace electronic fuel controls
- 10.0.2.16 Inspect and replace injection pump drives
- 10.0.2.17 Time injection pump drives
- 10.0.2.18 Inspect, test, replace, and adjust unit injectors
- 10.0.2.19 Inspect, test, and replace unit injector electronic controls
- 10.0.2.20 Inspect smoke limiters
- 10.0.2.21 Inspect and replace components of high-pressure injection line
- 10.0.2.22 Inspect and replace components of low-pressure fuel line
- 10.0.2.23 Repair components of low-pressure fuel line
- 10.0.2.24 Inspect, test, and adjust safety shutdown devices
- 10.0.2.25 Inspect and replace injector sleeves
- 10.0.2.26 Inspect and replace injector seals
- 10.0.2.27 Inspect, test, and adjust injection nozzles
- 10.0.2.28 Measure injector nozzle protrusion
- 10.0.2.29 Repair fuel tank components*

Competency 10.0.3: Service governor system

Competency Builders:

- 10.0.3.1 Follow general safety precautions
- 10.0.3.2 Measure idler gear end play
- 10.0.3.3 Inspect, replace, and recondition governor assembly
- 10.0.3.4 Adjust governor
- 10.0.3.5 Inspect, replace, and adjust governor linkage

Competency 10.0.4: Service air-induction system

Competency Builders:

- 10.0.4.1 Follow general safety precautions
- 10.0.4.2 Inspect and replace piping
- 10.0.4.3 Inspect and replace air cleaner components
- 10.0.4.4 Inspect and install intake manifold
- 10.0.4.5 Inspect and replace turbocharger
- 10.0.4.6 Inspect and replace engine blower
- 10.0.4.7 Inspect and replace intake manifold
- 10.0.4.8 Repair intake manifold
- 10.0.4.9 Inspect, test, and replace aftercooler assembly
- 10.0.4.10 Repair aftercooler assembly
- 10.0.4.11 Inspect and repair preheater system
- 10.0.4.12 Repair starting fluid system
- 10.0.4.13 Replace components of starting fluid system
- 10.0.4.14 Replace components of emergency air-induction shutoff system
- 10.0.4.15 Repair emergency air-induction shutoff system
- 10.0.4.16 Recondition turbocharger

Competency 10.0.5: Service emission control system

Competency Builders:

- 10.0.5.1 Follow general safety precautions
- 10.0.5.2 Inspect and replace components of crankcase ventilation system
- 10.0.5.3 Inspect and replace components of exhaust gas recirculation system
- 10.0.5.4 Inspect and replace components of air-injection emission system
- 10.0.5.5 Inspect and replace components of fuel vapor control system
- 10.0.5.6 Inspect and replace components of air-temperature control system

Competency 10.0.6: Service exhaust system

Competency Builders:

- 10.0.6.1 Follow general safety precautions
- 10.0.6.2 Inspect and replace exhaust manifold
- 10.0.6.3 Repair exhaust manifold
- 10.0.6.4 Inspect and replace exhaust piping
- 10.0.6.5 Inspect and replace exhaust mufflers
- 10.0.6.6 Replace rain cap
- 10.0.6.7 Inspect and replace resonators
- 10.0.6.8 Inspect and replace catalytic converter
- 10.0.6.9 Inspect and replace mounting hardware
- 10.0.6.10 Inspect and replace heat shields

Competency 10.0.7: Repair engine brake systems**

Competency Builders:

- 10.0.7.1 Follow general safety precautions**
- 10.0.7.2 Inspect and repair engine brake assembly**
- 10.0.7.3 Adjust engine brake**
- 10.0.7.4 Inspect and repair electronic control systems**

* Advancing
** Futuring

Unit 11: Electrical Systems

Competency 11.0.1: Service ignition system

Competency Builders:

- 11.0.1.1 Follow general safety precautions
- 11.0.1.2 Read electrical schematic drawings
- 11.0.1.3 Diagnose ignition-related starting problems
- 11.0.1.4 Diagnose ignition-related running problems
- 11.0.1.5 Check for spark
- 11.0.1.6 Check ignition resistor
- 11.0.1.7 Inspect, test, and repair primary circuit wiring
- 11.0.1.8 Inspect, test, and replace distributor
- 11.0.1.9 Repair distributor
- 11.0.1.10 Inspect, test, and repair secondary circuit wiring
- 11.0.1.11 Inspect and replace ignition coil
- 11.0.1.12 Test coil polarity
- 11.0.1.13 Check and adjust ignition timing
- 11.0.1.14 Inspect, test, and replace electronic ignition components
- 11.0.1.15 Inspect, test, and replace components of spark control system
- 11.0.1.16 Repair components of spark control system
- 11.0.1.17 Inspect, test, and replace spark plugs
- 11.0.1.18 Inspect and replace spark plug wire:
- 11.0.1.19 Adjust spark plug gap
- 11.0.1.20 Inspect and replace distributor cap and rotor
- 11.0.1.21 Inspect and replace breaker points
- 11.0.1.22 Adjust breaker point gap
- 11.0.1.23 Test and replace condenser
- 11.0.1.24 Inspect and replace magneto
- 11.0.1.25 Inspect and replace ignition switch

Competency 11.0.2: Service batteries

Competency Builders:

- 11.0.2.1 Follow general safety precautions
- 11.0.2.2 Measure specific gravity
- 11.0.2.3 Identify battery voltage
- 11.0.2.4 Identify battery polarity
- 11.0.2.5 Measure cell voltage
- 11.0.2.6 Perform battery capacity test
- 11.0.2.7 Determine battery state-of-charge
- 11.0.2.8 Inspect and replace battery
- 11.0.2.9 Add water
- 11.0.2.10 Inspect and repair battery box components
- 11.0.2.11 Charge battery
- 11.0.2.12 Inspect, clean, and repair battery cables
- 11.0.2.13 Replace battery cables
- 11.0.2.14 Jump-start vehicle
- 11.0.2.15 Dispose of battery

Competency 11.0.3: Service starting system

Competency Builders:

- 11.0.3.1 Follow general safety precautions
- 11.0.3.2 Perform starter current draw test
- 11.0.3.3 Perform starter circuit voltage drop test
- 11.0.3.4 Inspect, test, and replace wires in circuit
- 11.0.3.5 Inspect and replace starter
- 11.0.3.6 Recondition starter
- 11.0.3.7 Test starter armature and field coils
- 11.0.3.8 Conduct no-load test on starter
- 11.0.3.9 Inspect, test, and replace relays
- 11.0.3.10 Inspect, test, and replace solenoids
- 11.0.3.11 Inspect and replace ignition switch

Competency 11.0.4: Service charging system

Competency Builders:

- 11.0.4.1 Follow general safety precautions
- 11.0.4.2 Diagnose charging problems
- 11.0.4.3 Inspect, adjust, and replace fans
- 11.0.4.4 Perform charging system output test
- 11.0.4.5 Perform charging circuit voltage drop test
- 11.0.4.6 Remove and replace alternator
- 11.0.4.7 Inspect, test, and replace wires in circuit
- 11.0.4.8 Inspect, test, and replace generator
- 11.0.4.9 Recondition generator
- 11.0.4.10 Test generator armature
- 11.0.4.11 Test generator field coils
- 11.0.4.12 Polarize generator
- 11.0.4.13 Adjust regulator air gap
- 11.0.4.14 Replace regulator
- 11.0.4.15 Conduct regulator current test
- 11.0.4.16 Conduct regulator voltage test

Competency 11.0.5: Service lights

Competency Builders:

- 11.0.5.1 Follow general safety precautions
- 11.0.5.2 Inspect and replace fuses
- 11.0.5.3 Diagnose lighting problems
- 11.0.5.4 Test, aim, and replace headlamps
- 11.0.5.5 Test and replace light bulbs
- 11.0.5.6 Inspect, test, and replace wires in circuit
- 11.0.5.7 Test and repair socket assembly
- 11.0.5.8 Inspect, test, and replace switches
- 11.0.5.9 Replace lenses

Agricultural/Industrial Mechanical Technician--4/92

Competency 11.0.6: Service light controls

Competency Builders:

- 11.0.6.1 Follow general safety precautions
- 11.0.6.2 Inspect and replace fuses and circuit breakers
- 11.0.6.3 Replace fuse blocks
- 11.0.6.4 Inspect, test, and replace turn signal assembly
- 11.0.6.5 Inspect, test, and replace stoplight
- 11.0.6.6 Test and replace switches
- 11.0.6.7 Inspect, test, and replace hazard flasher
- 11.0.6.8 Inspect, test, and replace backup light system

Competency 11.0.7: Service gauges

Competency Builders:

- 11.0.7.1 Follow general safety precautions
- 11.0.7.2 Diagnose problems
- 11.0.7.3 Test and replace gauge circuit voltage regulators
- 11.0.7.4 Inspect, test, and repair components of warning light system
- 11.0.7.5 Inspect, test, and repair components of warning buzzer system
- 11.0.7.6 Inspect, test, and replace speedometer system
- 11.0.7.7 Inspect, test, and replace odometer system
- 11.0.7.8 Inspect, test, and replace tachometer system
- 11.0.7.9 Calibrate speedometer, odometer, and tachometer*

Competency 11.0.8: Service electrical accessories

Competency Builders:

- 11.0.8.1 Follow general safety precautions
- 11.0.8.2 Diagnose problems
- 11.0.8.3 Inspect and replace fuses
- 11.0.8.4 Inspect, test, and repair horn circuit components
- 11.0.8.5 Inspect, test, and repair wiper speed control
- 11.0.8.6 Replace wiper speed control
- 11.0.8.7 Inspect, test, and repair wiper motor
- 11.0.8.8 Replace wiper motor
- 11.0.8.9 Inspect and repair wiper linkages
- 11.0.8.10 Inspect, test, and repair windshield washer assembly
- 11.0.8.11 Replace components of windshield washer assembly
- 11.0.8.12 Replace warning devices

Unit 12: Drivetrain

Competency 12.0.1: Repair clutch

Competency Builders:

- 12.0.1.1 Follow general safety precautions
- 12.0.1.2 Diagnose clutch problems
- 12.0.1.3 Inspect and adjust clutch linkage
- 12.0.1.4 Adjust clutch pedal free travel
- 12.0.1.5 Inspect and install clutch housing
- 12.0.1.6 Inspect clutch shaft and forks
- 12.0.1.7 Inspect and replace pilot bearing
- 12.0.1.8 Inspect and replace release bearing assembly
- 12.0.1.9 Inspect and replace clutch plate
- 12.0.1.10 Inspect and replace clutch discs
- 12.0.1.11 Inspect and replace clutch springs
- 12.0.1.12 Inspect input shaft splines
- 12.0.1.13 Replace bushings in clutch assembly
- 12.0.1.14 Reassemble and install clutch pack
- 12.0.1.15 Adjust spring tension
- 12.0.1.16 Inspect and replace master and slave cylinders
- 12.0.1.17 Rebuild master and slave cylinders
- 12.0.1.18 Inspect and replace lines and hoses
- 12.0.1.19 Bleed hydraulic system
- 12.0.1.20 Inspect self-adjusting clutch mechanism
- 12.0.1.21 Inspect, measure, and replace flywheel
- 12.0.1.22 Inspect and measure flywheel housing
- 12.0.1.23 Remove and replace electric clutch controls
- 12.0.1.24 Remove and replace hydraulic clutch controls
- 12.0.1.25 Test field coil and electromagnetic clutch

Competency 12.0.2: Service power takeoff (PTO)

Competency Builders:

- 12.0.2.1 Follow general safety precautions
- 12.0.2.2 Inspect and replace safety shields
- 12.0.2.3 Inspect and replace universal joints
- 12.0.2.4 Inspect and replace bearings
- 12.0.2.5 Inspect and replace seals
- 12.0.2.6 Inspect, measure, and replace shaft
- 12.0.2.7 Inspect and replace shaft gears
- 12.0.2.8 Inspect and replace disk
- 12.0.2.9 Inspect and replace plate
- 12.0.2.10 Inspect and replace quill assembly
- 12.0.2.11 Inspect and replace oil lines
- 12.0.2.12 Inspect and install clutch lever assembly
- 12.0.2.13 Inspect and adjust clutch lever free travel

Competency 12.0.3: Maintain transmission

Competency Builders:

- 12.0.3.1 Follow general safety precautions
- 12.0.3.2 Check oil level
- 12.0.3.3 Check oil condition
- 12.0.3.4 Select oil
- 12.0.3.5 Add oil
- 12.0.3.6 Replace oil
- 12.0.3.7 Inspect and replace transmission oil filters
- 12.0.3.8 Inspect and test transmission temperature gauge and sending unit

Competency 12.0.4: Repair transmission

Competency Builders:

- 12.0.4.1 Follow general safety precautions
- 12.0.4.2 Remove and install transmission
- 12.0.4.3 Inspect and replace/repair transmission cases
- 12.0.4.4 Open transmission
- 12.0.4.5 Inspect and replace gears
- 12.0.4.6 Inspect and replace oil seals
- 12.0.4.7 Inspect and replace bearings
- 12.0.4.8 Measure and adjust drive shaft end play
- 12.0.4.9 Measure and adjust backlash
- 12.0.4.10 Inspect vents
- 12.0.4.11 Inspect and replace transmission mounting hardware
- 12.0.4.12 Inspect cover plates
- 12.0.4.13 Inspect coolers
- 12.0.4.14 Inspect speedometer drive
- 12.0.4.15 Inspect and replace transmission drive shaft*
- 12.0.4.16 Inspect and replace differential drive shaft*
- 12.0.4.17 Inspect and replace transmission countershaft*
- 12.0.4.18 Inspect and replace transmission oil pump
- 12.0.4.19 Inspect and replace power shift valve components*
- 12.0.4.20 Rebuild and replace hydrostatic motor*
- 12.0.4.21 Rebuild and replace hydrostatic pump*
- 12.0.4.22 Rebuild two-speed pack*
- 12.0.4.23 Clean sump strainer
- 12.0.4.24 Replace hydrostat reservoir
- 12.0.4.25 Inspect and replace planetary pack components*
- 12.0.4.26 Test assembled planetary pack*
- 12.0.4.27 Separate and rejoin tractor*
- 12.0.4.28 Inspect, adjust, and replace transfer case assembly*
- 12.0.4.29 Adjust accumulator charging orifice*
- 12.0.4.30 Adjust differential lock control valve*
- 12.0.4.31 Adjust oil pressure regulating valve*
- 12.0.4.32 Check and adjust end play on gears and shafts
- 12.0.4.33 Check spline wear
- 12.0.4.34 Conduct drag test
- 12.0.4.35 Identify gear tooth wear
- 12.0.4.36 Inspect planet carrier assembly*
- 12.0.4.37 Preload gear train

* Advancing

** Futuring

Competency 12.0.5: Service shifter controls*

Competency Builders:

- 12.0.5.1 Follow general safety precautions*
- 12.0.5.2 Remove and replace shift linkage components*
- 12.0.5.3 Adjust shifting linkage*
- 12.0.5.4 Inspect and replace shift levers*
- 12.0.5.5 Inspect and replace speed change shifter yokes, shafts, pawls, and cams*
- 12.0.5.6 Inspect and replace pivots*
- 12.0.5.7 Inspect and replace latches*
- 12.0.5.8 Inspect and replace thrust washers*
- 12.0.5.9 Repair shift quadrant*
- 12.0.5.10 Replace shift cable*
- 12.0.5.11 Inspect, test, adjust, and replace air shift control components*
- 12.0.5.12 Remove and install speed range and change shifters*

Competency 12.0.6: Repair drive shaft assembly

Competency Builders:

- 12.0.6.1 Follow general safety precautions
- 12.0.6.2 Diagnose problems
- 12.0.6.3 Inspect drive shaft components
- 12.0.6.4 Repair drive shaft component
- 12.0.6.5 Replace drive shaft components
- 12.0.6.6 Check phasing of all yokes
- 12.0.6.7 Inspect and replace drive shaft center support bearings and mounts

Competency 12.0.7: Repair drive axle

Competency Builders:

- 12.0.7.1 Follow general safety precautions
- 12.0.7.2 Check for and repair fluid leaks
- 12.0.7.3 Inspect and replace cover plate
- 12.0.7.4 Inspect service vents
- 12.0.7.5 Check oil level
- 12.0.7.6 Check oil condition
- 12.0.7.7 Add oil
- 12.0.7.8 Remove and install differential*
- 12.0.7.9 Replace ring gear, bevel gears, and pinion*
- 12.0.7.10 Remove and install rear axle*
- 12.0.7.11 Remove and install planet pinion carrier assembly*
- 12.0.7.12 Replace axle oil seals*
- 12.0.7.13 Replace and adjust axle bearings*
- 12.0.7.14 Inspect and replace differential carrier assembly*
- 12.0.7.15 Inspect and replace rear-axle shafts*
- 12.0.7.16 Inspect and replace gears*
- 12.0.7.17 Inspect and replace bearings*
- 12.0.7.18 Adjust bearing preload*
- 12.0.7.19 Inspect and replace oil seals*
- 12.0.7.20 Adjust end play of drive axle*
- 12.0.7.21 Remove and replace wheel assembly
- 12.0.7.22 Diagnose wheel bearing problems
- 12.0.7.23 Inspect, lubricate, and replace wheel bearings*

* Advancing

** Futuring

Unit 13: Brake Systems

Competency 13.0.1: Repair air system*

Competency Builders:

- 13.0.1.1 Follow general safety precautions*
- 13.0.1.2 Diagnose problems*
- 13.0.1.3 Describe operation of automatic braking system*
- 13.0.1.4 Check air-system buildup time*
- 13.0.1.5 Inspect and replace air reservoir tank components*
- 13.0.1.6 Inspect, replace, align, and adjust compressor drive assembly*
- 13.0.1.7 Inspect and replace air compressor*
- 13.0.1.8 Inspect and replace air cleaner*
- 13.0.1.9 Inspect and replace oil and water lines*
- 13.0.1.10 Inspect, test, adjust, and replace system-pressure components*
- 13.0.1.11 Inspect and replace components of air dryer system*
- 13.0.1.12 Inspect and replace heater*
- 13.0.1.13 Inspect and replace electrical components*
- 13.0.1.14 Inspect, test, and replace low-pressure warning devices*
- 13.0.1.15 Inspect, test, and replace air pressure gauges*

Competency 13.0.2: Repair mechanical components

Competency Builders:

- 13.0.2.1 Follow general safety precautions
- 13.0.2.2 Disassemble drum brake assembly
- 13.0.2.3 Disassemble disc brake caliper
- 13.0.2.4 Inspect, adjust, and replace drum brake mounting hardware
- 13.0.2.5 Inspect and replace brake adjustment assembly
- 13.0.2.6 Adjust brake drag
- 13.0.2.7 Equalize brakes
- 13.0.2.8 Measure and adjust pedal free travel
- 13.0.2.9 Inspect and measure brake drums
- 13.0.2.10 Inspect and replace brake shoes
- 13.0.2.11 Replace shoe lining
- 13.0.2.12 Inspect and adjust disc brake caliper assembly
- 13.0.2.13 Inspect and replace brake pads
- 13.0.2.14 Inspect and measure brake rotors
- 13.0.2.15 Inspect, repair, and adjust parking brake

Competency 13.0.3: Repair differential brakes

Competency Builders:

- 13.0.3.1 Follow general safety precautions
- 13.0.3.2 Inspect and replace brake disc
- 13.0.3.3 Inspect and replace backing plate
- 13.0.3.4 Inspect and replace pressure plate

Competency 13.0.4: Repair brake hydraulics

Competency Builders:

- 13.0.4.1 Follow general safety precautions
- 13.0.4.2 Inspect, test, and replace master cylinder
- 13.0.4.3 Rebuild master cylinder
- 13.0.4.4 Inspect, test, and replace brake line
- 13.0.4.5 Inspect, test, and replace metering valves
- 13.0.4.6 Inspect, test, and replace proportioning valves
- 13.0.4.7 Inspect, test, and replace combination valves
- 13.0.4.8 Inspect and replace wheel cylinders
- 13.0.4.9 Rebuild wheel cylinders
- 13.0.4.10 Bleed air from system
- 13.0.4.11 Flush system
- 13.0.4.12 Determine brake fluid type
- 13.0.4.13 Add brake fluid

Unit 14: Suspension and Steering

Competency 14.0.1: Service steering mechanism

Competency Builders:

- 14.0.1.1 Follow general safety precautions
- 14.0.1.2 Inspect and replace steering column components
- 14.0.1.3 Phase steering shaft U-joints
- 14.0.1.4 Inspect and replace steering gear components
- 14.0.1.5 Adjust steering gear
- 14.0.1.6 Adjust sector shaft lash
- 14.0.1.7 Check fluid levels
- 14.0.1.8 Add fluid
- 14.0.1.9 Check for leaks
- 14.0.1.10 Inspect and replace bearings
- 14.0.1.11 Adjust steering bearings
- 14.0.1.12 Inspect and replace seals

Competency 14.0.2: Service power steering units

Competency Builders:

- 14.0.2.1 Follow general safety precautions
- 14.0.2.2 Check for leaks
- 14.0.2.3 Bleed system
- 14.0.2.4 Perform system pressure tests
- 14.0.2.5 Perform system flow tests
- 14.0.2.6 Inspect and replace reservoir
- 14.0.2.7 Inspect, test, and repair power steering pump
- 14.0.2.8 Replace power steering pump
- 14.0.2.9 Inspect and replace cooler components
- 14.0.2.10 Inspect and replace power steering valve assembly
- 14.0.2.11 Inspect and replace torque motor components

Competency 14.0.3: Service steering linkage

Competency Builders:

- 14.0.3.1 Follow general safety precautions
- 14.0.3.2 Inspect and replace pitman arm
- 14.0.3.3 Inspect, adjust, and replace tie-rod components
- 14.0.3.4 Inspect and replace idler arm components
- 14.0.3.5 Inspect and replace steering arm components

Competency 14.0.4: Align wheels

Competency Builders:

- 14.0.4.1 Follow general safety precautions
- 14.0.4.2 Check and adjust toe-in
- 14.0.4.3 Check and adjust front wheel turning angle
- 14.0.4.4 Adjust drag link
- 14.0.4.5 Check rear-axle alignment
- 14.0.4.6 Check rear-axle tracking
- 14.0.4.7 Diagnose turning-angle problems
- 14.0.4.8 Diagnose handling problems

Competency 14.0.5: Service wheels, tires, and tracks

Competency Builders:

- 14.0.5.1 Follow general safety precautions
- 14.0.5.2 Evaluate tire wear
- 14.0.5.3 Evaluate handling problems
- 14.0.5.4 Inspect and measure tires
- 14.0.5.5 Patch tires
- 14.0.5.6 Patch tubes
- 14.0.5.7 Check tire pressure
- 14.0.5.8 Inflate tires
- 14.0.5.9 Load tires with ballast
- 14.0.5.10 Balance wheel and tire assembly
- 14.0.5.11 Follow tire disposal procedures
- 14.0.5.12 Protect tires during storage
- 14.0.5.13 Adjust wheel spacing
- 14.0.5.14 Remove and mount duals
- 14.0.5.15 Replace half sleeve
- 14.0.5.16 Replace hub
- 14.0.5.17 Drill lugs
- 14.0.5.18 Replace front wheel spindle
- 14.0.5.19 Add wheel weights
- 14.0.5.20 Adjust track tension
- 14.0.5.21 Inspect track pins and bushings

Unit 15: Heating and Air-Conditioning (AC)

Competency 15.0.1: Service air-conditioning system

Competency Builders:

- 15.0.1.1 Follow general safety precautions
- 15.0.1.2 Leak-test system
- 15.0.1.3 Recover Freon
- 15.0.1.4 Evacuate system
- 15.0.1.5 Charge system
- 15.0.1.6 Clean filters
- 15.0.1.7 Inspect and correct oil level
- 15.0.1.8 Inspect pressure protection devices
- 15.0.1.9 Inspect, test, and repair compressor
- 15.0.1.10 Replace compressor
- 15.0.1.11 Inspect, test, and replace condenser
- 15.0.1.12 Inspect and replace receiver
- 15.0.1.13 Inspect and replace accumulator
- 15.0.1.14 Inspect, test, and replace expansion valve
- 15.0.1.15 Inspect, test, and replace orifice tube
- 15.0.1.16 Inspect, test, and replace evaporator
- 15.0.1.17 Inspect and replace high-pressure relief device
- 15.0.1.18 Inspect and replace system service valves
- 15.0.1.19 Inspect operation of air ducts and louvers
- 15.0.1.20 Replace blower motor
- 15.0.1.21 Inspect and replace hoses and lines
- 15.0.1.22 Inspect and replace dryer
- 15.0.1.23 Inspect and replace thermostat

Competency 15.0.2: Service heating systems

Competency Builders:

- 15.0.2.1 Follow general safety precautions
- 15.0.2.2 Inspect and replace hoses
- 15.0.2.3 Inspect, test, and repair blower
- 15.0.2.4 Replace blower
- 15.0.2.5 Inspect and repair control linkage

Unit 16: Hydraulics

Competency 16.0.1: Maintain hydraulic systems

Competency Builders:

- 16.0.1.1 Follow general safety precautions
- 16.0.1.2 Identify system types
- 16.0.1.3 Check oil level
- 16.0.1.4 Select oil
- 16.0.1.5 Interpret gauges
- 16.0.1.6 Bleed air
- 16.0.1.7 Drain, clean, flush, and fill hydraulic system
- 16.0.1.8 Replace oil filter
- 16.0.1.9 Inspect system for oil leaks
- 16.0.1.10 Inspect and replace oil cooler

Competency 16.0.2: Repair hydraulic systems

Competency Builders:

- 16.0.2.1 Follow general safety precautions
- 16.0.2.2 Read schematic of hydraulic systems
- 16.0.2.3 Inspect and replace pump and motor
- 16.0.2.4 Inspect and replace pump wear plates
- 16.0.2.5 Measure pump and motor tolerances
- 16.0.2.6 Inspect and replace cylinder barrels
- 16.0.2.7 Inspect and replace cylinder rods
- 16.0.2.8 Test valve cartridges for pressure setting
- 16.0.2.9 Inspect and replace valve components
- 16.0.2.10 Install O-rings, seals, and packing
- 16.0.2.11 Inspect and replace hoses and tubing
- 16.0.2.12 Inspect and replace accumulators
- 16.0.2.13 Troubleshoot problems

Unit 17: Employability Skills

Subunit 17.1: Career Development

Competency 17.1.1: Investigate career options

Competency Builders:

- 17.1.1.1 Determine interests and aptitudes
- 17.1.1.2 Identify career options
- 17.1.1.3 Research occupations matching interests and aptitudes
- 17.1.1.4 Select career(s) that best match(es) interests and aptitudes
- 17.1.1.5 Identify advantages and disadvantages of career options, including nontraditional careers
- 17.1.1.6 Assess differences in wages, annual incomes, and job opportunities based on geographic location
- 17.1.1.7 Develop a career plan

Competency 17.1.2: Analyze potential barriers to employment

Competency Builders:

- 17.1.2.1 Identify common barriers to employment
- 17.1.2.2 Describe strategies to overcome employment barriers

Unit 17: Employability Skills

Subunit 17.2: Decision Making and Problem Solving

Competency 17.2.1: Apply decision-making techniques in the workplace

Competency Builders:

- 17.2.1.1 Identify the decision to be made
- 17.2.1.2 Compare alternatives
- 17.2.1.3 Determine consequences of each alternative
- 17.2.1.4 Make decisions based on values and goals
- 17.2.1.5 Evaluate the decision made

Competency 17.2.2: Apply problem-solving techniques in the workplace

Competency Builders:

- 17.2.2.1 Diagnose the problem and its causes
- 17.2.2.2 Identify alternatives and their consequences in relation to the problem
- 17.2.2.3 Examine multicultural and nonsexist dimensions of problem solving
- 17.2.2.4 Utilize resources to explore possible solutions to the problem
- 17.2.2.5 Compare and contrast the advantages and disadvantages of each solution
- 17.2.2.6 Determine appropriate action
- 17.2.2.7 Evaluate results

Unit 17: Employability Skills

Subunit 17.3: Work Ethic

Competency 17.3.1: Evaluate the relationship of self-esteem to work ethic

Competency Builders:

- 17.3.1.1 Identify special characteristics and abilities in self and others
- 17.3.1.2 Identify internal and external factors that affect self-esteem

Agricultural/Industrial Mechanical Technician--4/92

Competency 17.3.2: Analyze the relationship of personal values and goals to work ethic both in and out of the workplace

Competency Builders:

- 17.3.2.1 Distinguish between values and goals
- 17.3.2.2 Determine the importance of values and goals
- 17.3.2.3 Evaluate how values affect goals
- 17.3.2.4 Identify short-term and long-term goals
- 17.3.2.5 Prioritize personal goals
- 17.3.2.6 Describe how personal values are reflected in work ethic
- 17.3.2.7 Describe how interactions in the workplace affect personal work ethic
- 17.3.2.8 Examine how life changes affect personal work ethic

Competency 17.3.3: Demonstrate work ethic

Competency Builders:

- 17.3.3.1 Examine factors that influence work ethic
- 17.3.3.2 Exhibit characteristics that reflect an appropriate work ethic

Unit 17: Employability Skills

Subunit 17.4: Job-Seeking Skills

Competency 17.4.1: Prepare for employment

Competency Builders:

- 17.4.1.1 Identify traditional and nontraditional employment sources
- 17.4.1.2 Utilize employment sources
- 17.4.1.3 Research job opportunities, including nontraditional careers
- 17.4.1.4 Interpret equal employment opportunity laws
- 17.4.1.5 Explain the critical importance of personal appearance, hygiene, and demeanor throughout the employment process
- 17.4.1.6 Prepare for generic employment tests and those specific to an occupation/organization

Competency 17.4.2: Design a résumé

Competency Builders:

- 17.4.2.1 Identify personal strengths and weaknesses
- 17.4.2.2 List skills and/or abilities, career objective(s), accomplishments/achievements, educational background, and work experience
- 17.4.2.3 Demonstrate legible written communication skills using correct grammar, spelling, and concise wording
- 17.4.2.4 Complete résumé using various formats
- 17.4.2.5 Secure references

Competency 17.4.3: Complete and process job application forms

Competency Builders:

- 17.4.3.1 Explain the importance of an application form
- 17.4.3.2 Identify ways to obtain job application forms
- 17.4.3.3 Describe methods for handling illegal questions on job application forms
- 17.4.3.4 Demonstrate legible written communication skills using correct grammar, spelling, and concise wording
- 17.4.3.5 Return application to proper person, request interview, and follow up

Competency 17.4.4: Demonstrate interviewing skills

Competency Builders:

- 17.4.4.1 Investigate interview environment and procedures
- 17.4.4.2 Explain the critical importance of personal appearance, hygiene, and demeanor
- 17.4.4.3 Demonstrate question and answer techniques
- 17.4.4.4 Demonstrate methods for handling difficult and/or illegal interview questions

Competency 17.4.5: Secure employment

Competency Builders:

- 17.4.5.1 Identify present and future employment opportunities within an occupation/organization
- 17.4.5.2 Research the organization/company
- 17.4.5.3 Use follow-up techniques to enhance employment potential
- 17.4.5.4 Compare and evaluate job offers

Unit 17: Employability Skills

Subunit 17.5: Job Retention Skills

Competency 17.5.1: Analyze the organizational structure of the workplace

Competency Builders:

- 17.5.1.1 Identify and evaluate employer expectations regarding job performance, work habits, attitudes, personal appearance, and hygiene
- 17.5.1.2 Be aware of and obey all company policies and procedures
- 17.5.1.3 Examine the role/relationship between employee and employer
- 17.5.1.4 Recognize opportunities for advancement and reasons for termination

Competency 17.5.2: Maintain positive relations with others

Competency Builders:

- 17.5.2.1 Exhibit appropriate work habits and attitude
- 17.5.2.2 Identify behaviors to establish successful working relationships
- 17.5.2.3 Cooperate and compromise through teamwork and group participation
- 17.5.2.4 Identify alternatives for dealing with harassment, bias, and discrimination based on race, color, national origin, sex, religion, handicap, or age

Unit 17: Employability Skills

Subunit 17.6: Job Advancement

Competency 17.6.1: Analyze opportunities for personal and career growth

Competency Builders:

- 17.6.1.1 Determine opportunities within an occupation/organization
- 17.6.1.2 Compare and contrast other opportunities
- 17.6.1.3 List benefits of job advancement
- 17.6.1.4 Evaluate factors involved when assuming a new position within or outside an occupation/organization

Competency 17.6.2: Exhibit characteristics needed for advancement

Competency Builders:

- 17.6.2.1 Display a positive attitude
- 17.6.2.2 Demonstrate knowledge of a position
- 17.6.2.3 Perform quality work
- 17.6.2.4 Adapt to changing situations and technology
- 17.6.2.5 Demonstrate capability for different positions
- 17.6.2.6 Participate in continuing education/training programs
- 17.6.2.7 Respect, accept, and work with ALL individuals in the workplace

Unit 17: Employability Skills

Subunit 17.7: Technology in the Workplace

Competency 17.7.1: Assess the impact of technology in the workplace

Competency Builders:

- 17.7.1.1 Cite how past business/industry practices have influenced present business/industry processes
- 17.7.1.2 Investigate the use of technology in the workplace
- 17.7.1.3 Analyze how present skills can be applied to learning new technologies

Competency 17.7.2: Use a variety of technological applications

Competency Builders:

- 17.7.2.1 Explore basic mathematical, scientific, computer, and technological principles
- 17.7.2.2 Use technology to accomplish assigned tasks
- 17.7.2.3 Create solutions to problems using technical means

Unit 17: Employability Skills

Subunit 17.8: Lifelong Learning

Competency 17.8.1: Apply lifelong learning to individual situations

Competency Builders:

- 17.8.1.1 Define lifelong learning
- 17.8.1.2 Identify factors that cause the need for lifelong learning

Competency 17.8.2: Adapt to change

Competency Builders:

- 17.8.2.1 Analyze the effects of change
- 17.8.2.2 Identify reasons why goals change
- 17.8.2.3 Describe the importance of flexibility when reevaluating goals
- 17.8.2.4 Evaluate the need for continuing education/training

Unit 17: Employability Skills

Subunit 17.9: Economic Education

Competency 17.9.1: Analyze global enterprise system

Competency Builders:

- 17.9.1.1 Identify characteristics of various enterprise systems
- 17.9.1.2 Examine the relationship between competition, risk, and profit
- 17.9.1.3 Illustrate how supply and demand influence price

Competency 17.9.2: Evaluate personal money management

Competency Builders:

- 17.9.2.1 Describe the need for personal management records
- 17.9.2.2 Identify methods of taxation
- 17.9.2.3 Analyze how credit affects financial security
- 17.9.2.4 Compare types and methods of investments
- 17.9.2.5 Prepare a personal budget
- 17.9.2.6 Be an informed and responsible consumer
- 17.9.2.7 Analyze the effects of advertising on the consumer

Unit 17: Employability Skills

Subunit 17.10: Balancing Work and Family

Competency 17.10.1: Analyze the effects of family on work

Competency Builders:

- 17.10.1.1 Recognize how family values, goals, and priorities are reflected in the workplace
- 17.10.1.2 Identify present and future family structures and responsibilities
- 17.10.1.3 Describe personal and family roles
- 17.10.1.4 Analyze concerns of working parent(s)
- 17.10.1.5 Examine how family responsibilities can conflict with work
- 17.10.1.6 Resolve family-related conflicts
- 17.10.1.7 Explain how to use support systems/community resources to help resolve family-related conflicts

Competency 17.10.2: Analyze the effects of work on family

Competency Builders:

- 17.10.2.1 Identify responsibilities associated with paid and nonpaid work
- 17.10.2.2 Compare the advantages and disadvantages of multiple incomes
- 17.10.2.3 Explain how work can conflict with family responsibilities
- 17.10.2.4 Explain how work-related stress can affect families
- 17.10.2.5 Identify family support systems and resources

Unit 17: Employability Skills

Subunit 17.11: Citizenship in the Workplace

Competency 17.11.1: Exercise the rights and responsibilities of citizenship in the workplace

Competency Builders:

- 17.11.1.1 Identify the basic rights and responsibilities of citizenship
- 17.11.1.2 Examine the history and contributions of all racial, ethnic, and cultural groups

Competency 17.11.2: Cooperate with others in the workplace

Competency Builders:

- 17.11.2.1 Identify situations in which compromise is necessary
- 17.11.2.2 Examine how individuals from various backgrounds contribute to work-related situations
- 17.11.2.3 Demonstrate initiative to facilitate cooperation
- 17.11.2.4 Give and receive constructive criticism to enhance cooperation

Unit 17: Employability Skills

Subunit 17.12: Leadership

Competency 17.12.1: Evaluate leadership styles appropriate for the workplace

Competency Builders:

- 17.12.1.1 Identify characteristics of effective leaders
- 17.12.1.2 Compare leadership styles
- 17.12.1.3 Demonstrate effective delegation skills
- 17.12.1.4 Identify opportunities to lead in the workplace

Competency 17.12.2: Demonstrate effective teamwork skills

Competency Builders:

- 17.12.2.1 Identify the responsibilities of a valuable group member
- 17.12.2.2 Exhibit open-mindedness
- 17.12.2.3 Identify methods of involving each member of a team
- 17.12.2.4 Contribute to the efficiency and success of a group
- 17.12.2.5 Determine ways to motivate others

Competency 17.12.3: Utilize effective communication skills

Competency Builders:

- 17.12.3.1 Identify the importance of listening
- 17.12.3.2 Demonstrate assertive communication
- 17.12.3.3 Recognize the importance of verbal and nonverbal cues and messages
- 17.12.3.4 Analyze written material
- 17.12.3.5 Prepare written material
- 17.12.3.6 Give and receive feedback
- 17.12.3.7 Articulate thoughts
- 17.12.3.8 Use appropriate language

Unit 17: Employability Skills

Subunit 17.13: Entrepreneurship

Competency 17.13.1: Evaluate the role of small business in the economy

Competency Builders:

- 17.13.1.1 Identify the benefits of small business to a community
- 17.13.1.2 Analyze opportunities for small business in a community

Competency 17.13.2: Examine considerations of starting a business

Competency Builders:

- 17.13.2.1 Research a business idea
- 17.13.2.2 Compare various ways to become a small business owner
- 17.13.2.3 Investigate factors to consider in financing a new business
- 17.13.2.4 Evaluate entrepreneurship as a career option

Distributed by

Vocational Instructional Materials Laboratory

The Ohio State University
1900 Kenny Road
Columbus, Ohio 43210-1090