

AGRICULTURAL MECHANICS

Purpose

The Missouri State Agricultural Mechanics CDE shall reflect the agricultural mechanics instruction provided contestants in Missouri secondary agriculture departments. Specifically, the skill and problem solving activities shall reflect the competencies included in the Missouri Agricultural Mechanics curriculum. Agricultural Mechanics competencies shall include the areas of agricultural machinery, small engine power, tractor power, agricultural electrification, woodwork and carpentry, concrete and plumbing, metal fabrication, soil and water management, and repair and maintenance. The written examination, skill activities, and problem solving activities will be conducted to assess the participants' knowledge of these agricultural mechanics competencies. Agricultural Mechanics competency profiles are available through the Instructional Materials Laboratory.

Objectives

The overall purpose of the Agricultural Mechanics CDE is to motivate contestants to greater learning by providing an opportunity to apply classroom knowledge in a competitive situation and to promote state-of-the-art Agricultural Mechanics programs within the State of Missouri. Contestants in the Agricultural Mechanics CDE should have developed the following competencies:

Agricultural Machinery

The contestant should be able to perform the competencies identified in the Missouri Agricultural Machinery Curriculum. Subtopics include operating and maintaining: power units; primary tillage equipment; secondary tillage equipment; planting equipment; chemical applicators; harvesting equipment; and materials and handling equipment.

Small Engine Power

The contestant should be able to perform the competencies identified in the Missouri Agricultural Power I Curriculum. Subtopics include: using measuring tools, principles of operation; using shop tools and equipment; selecting engine parts and fasteners; using a service manual; testing and analyzing a single cylinder engine system; and servicing a single cylinder engine.

Tractor Power

The contestant should be able to perform the competencies identified in the Missouri Agricultural Power II Curriculum. Subtopics include: principles of operation; testing and analyze the multi-cylinder components; servicing a multi-cylinder engine; and servicing the power train.

Agricultural Electrification (circuits and motors)

The contestant should be able to perform the competencies identified in the Missouri Agricultural Structures II Curriculum, Unit D, Agricultural Structures I Curriculum, Unit B, Competency Number 7, and the following specific competencies not in the curriculum that pertain to electrical motors: selecting motors based on the type of application; interpreting motor nameplate data; interpreting motor wiring connection diagrams; servicing electric motors;

connecting motor drives; identifying motors and motor parts; and identifying methods of providing motor protection. References for electric motors are listed in the National FFA Career Development Events, Agricultural Mechanics Section, Pages 13-14.

Woodwork and Carpentry

The contestant should be able to perform the competencies identified in the Missouri Agricultural Construction Curriculum, Units C and E; Agricultural Structures Curriculum I, Unit A; Agricultural Structures Curriculum II, Unit B; Agricultural Science I Curriculum, Material Selection, Plan Reading, and Interpretation Unit; and Agricultural Science II Curriculum, Power Tools Unit.

Concrete and Plumbing

The contestant should be able to perform the competencies identified in the Missouri Agricultural Structures Curriculum I, Unit B; Agricultural Structures Curriculum II, Units A and E.

Metal Fabrication (Arc or MIG and oxy-acetylene welding)

The contestant should be able to perform the arc welding and oxy-acetylene welding competencies identified in the Missouri Agricultural Science I and II Curriculum materials; Agricultural Construction Unit A, Competencies 1 to 4; and the Agricultural Construction Unit B, Competencies 1 to 10.

Soil and Water Management

The contestant should be able to perform the following competencies in addition to those identified in the current curriculum: describing principles involved in appropriate conservation and/or land use planning; reading legal land descriptions; determining land area; determining the percent of slope or grade; leveling a leveling instrument; using a hand level; taking rod readings; measuring distances with tapes or instruments; laying out corners using instruments; recording field notes for differential and profile leveling; laying out foundations, footings, and batter boards; laying out a contour line; measuring crop residue on the land; determining soil losses; and determine the cubic feet of dirt to move. Global Positioning System (GPS) may be used to better understand land measurement and control erosion. GPS handheld units may be used to determine area, potential cut and fill, etc. The contestant should also be able to perform the competencies identified in the Missouri Agricultural Advanced Crop Production Unit C, "Soil Conservation." References for Soil and Water Management are listed in the National FFA Career Development Events Bulletin, Agricultural Mechanics Section.

Repair and Maintenance (tool ID, sharpening and adjustment, hot metal and cold metal)

The contestant should be able to perform the competencies identified in the Missouri Agricultural Construction Curriculum, Unit D; Agricultural Science I Curriculum, Tool Sharpening and Reconditioning; Agricultural Science I, Woodworking Unit; Agricultural Power I, Units B and C; Agricultural Science II Curriculum, Tool Sharpening and Reconditioning and Cold Metal Work.

Written Examination

The contestant should be knowledgeable about all six areas designated for that respective year.

Crosswalk with Show-Me Standards

Objectives – Students participating in the Career Development Event should be able to:		Show-Me Standards	
		Knowledge Standards (Content Areas)	Performance Standards (Goals)
1.	Agricultural Machinery: to perform the competencies identified in the Missouri Agricultural Machinery Curriculum.	CA.3	1.3, 1.4, 1.6, 1.8
2.	Small Engine Power: to perform the competencies identified in the Missouri Agricultural Power I Curriculum.	MA.1, MA.2, MA.3, MA 5, MA.6	3.1, 3.2, 3.3, 3.6 4.4, 4.8
3.	Tractor Power: to perform the competencies identified in the Missouri Agricultural Power II Curriculum.	SC.1, SC.4, SC.5, SC.8	
4.	Agricultural Electrification: to perform the competencies identified in the Missouri Agricultural Structures II Curriculum	SS.5, SS.7	
5.	Woodwork & Carpentry: to perform the competencies identified in the Missouri Agricultural Construction Curriculum, Units C and E		
6.	Concrete & Plumbing: to perform the competencies identified in the Missouri Agricultural Structures Curriculum I, Unit B; Agricultural Structures Curriculum II, Units A and E.		
7.	Metal Fabrication: to perform the arc welding and oxy-acetylene welding competencies identified in the Missouri Agricultural Science I and II Curriculum materials; Agricultural Construction Unit A, Competencies 1 to 4; and the Agricultural Construction Unit B, Competencies 1 to 10.		
8.	Soil and Water Management: to perform the following competencies such as: describe principles involved in appropriate conservation planning; read legal land descriptions; determine land area; determine percent of slope or grade; level a leveling instrument; use of hand level; rod readings; and determine the cubic feet of dirt to move.		
9.	Repair and Maintenance: to perform the competencies identified in the Missouri Agricultural Construction Curriculum, Unit D; Agricultural Science I Curriculum, Tool Sharpening and Reconditioning; Agricultural Science I, Woodworking Unit; Agricultural Power I, Units B and C; Agricultural Science II Curriculum, Tool Sharpening and Reconditioning and Cold Metal Work.		

Corresponding Secondary Agriculture Curriculum			
Course and/or Curriculum:	Agricultural Science I Agricultural Science II Agricultural Machinery Agricultural Power I Agricultural Power II Agricultural Structures I Agricultural Structures II Agricultural Construction Advanced Crop Production	Unit(s):	Agricultural Mechanics Agricultural Mechanics Soil Conservation

Event Format

1. The Ag Mechanics CDE shall consist of the following four (4) components:
 - A. *Written Test*
 - B. *Skill Tests in Ag Power & Machinery*
 - C. *Skill Tests in Ag Structures and Electricity*
 - D. *Skill Tests in Ag Construction and Soil & Water Management*
2. The three Skill Test event components and associated skill/problem solving areas rotate in the following manner:

CDE FORMAT AND ROTATION Skill and Problem Solving Activities			
Section	Area	Odd Years	Even Years
Ag. Power & Machinery	Ag. Machinery	Ag. Machinery	Ag. Machinery
	Small Engine Power	Small Engine Power	
	Tractor Power		Tractor Power
Ag. Structures & Electricity	Ag. Electrification	Circuits	Motors
	Woodworking and Carpentry	Woodworking and Carpentry	
	Concrete and Plumbing		Concrete and Plumbing
Ag. Construction & Soil & Water Management	Metal Fabrication	Arc or MIG	Oxy
	Soil and Water Management	Soil and Water Management	
	Repair and Maintenance		Repair and Maintenance

3. Each contestant will compete in each area of the CDE. Each contestant will take the written examination.
4. Work will be judged on accuracy, workmanship, and the ability to interpret instructions, plans, and drawings.
5. Each contestant will be allowed 20 minutes to perform the activities in each skill/problem solving area. Each contestant will be allowed 60 minutes to complete the written examination.
6. Skill activity sheets for the district agricultural mechanics event will be distributed at the January district meeting. A brief preview of the event will be provided at the district meetings.
7. Pictures or slides may be used in any area rather than actual items.
8. Problem solving may be a part of the event in any area. The use of computers may be incorporated into the solving of problems that are associated with the six areas designated for that respective year.
9. Practice metal will be provided if necessary. **DO NOT** bring metal for practice.
10. Only tools listed on Form 1 (included in following pages) will be used for the tool identification, sharpening, and adjustment skill activity. The contestant should look for the major defect or improper adjustment as they complete this part of the CDE and indicate Useable or Non-useable under Working Condition.

11. Only parts and tools listed on Form 76 will be used for Ag. Power I.D. Section.
12. The written examination will be an objective test covering the six areas designated for that year.

Event Scoring

Event	Points
Skill Tests (6 skills at 50 pts each)	300
Written Exam	100
TOTAL	400

1. Each skill activity will be worth 50 points. The written examination will be worth 100 points. As such, an individual could earn 400 points; each team could earn a total of 1200 points.
2. **Tie scores among teams should be broken using the high individual team member's score.** In case the scores are tied, the scores of the second high individual on each team should be used.

Event Rules and Regulations

1. Contestants shall not communicate with any person other than the persons in charge of the CDE.
2. Each contestant must bring the following materials:

Odd Years	Even Years
1. #2 lead pencil	1. #2 lead pencil
2. Clean clipboard	2. Clean clipboard
3. Safety glasses	3. Safety glasses
4. Arc or Mig welding helmet	4. Oxy-acetylene goggles
5. Welding gloves	5. Welding gloves
6. Chipping hammer	

No contestant will be permitted to participate without the previous listed equipment.

3. A GPS handheld unit will be provided if it is a part of the event. (See Ag Mechanics Appendix I & II for examples)
4. Each team will consist of three members who have qualified by participating at a district CDE. Only in Agricultural Mechanics a 4th team member/alternate that participated at the district CDE and is certified by the district may participate in the National CDE on the state winning team. A student that participated in the National CDE event cannot participate at state again in Agricultural Mechanics.
5. Only contestants and CDE workers will be allowed in the CDE area during the event. Teachers will be allowed to view the event set-up only after the event is completed. Teachers will not be allowed to communicate with the judges until event grading has been completed.
6. No CDE papers will be returned after the CDE.
7. Time allowances will be made by the CDE superintendent or assistants for equipment breakdowns or improperly functioning equipment.

8. Contestants will wear safety eye protection during all skill activities. Contestants will not be allowed to compete in an activity without their own safety glasses. Sharing of safety glasses with fellow team members or other contestants will not be allowed.
9. Arc welding and oxy-acetylene participants must wear appropriate clothing and shoes. (i.e. long pants, coveralls or overalls; long sleeve shirt; and leather shoes or boots) All exposed skin must be covered. **NO tennis shoes or sandals will be permitted. NO frayed clothing will be permitted.**
10. List of machinery for state CDE will be available by March 1st of the CDE year on the UMC Agricultural Engineering website (<http://web.missouri.edu/~schumacher/leon.html>) or by calling the UMC Agricultural Engineering office (573-882-2731).

References

References for the CDE are those listed for the respective areas of the Missouri Agricultural Science I and II; Agricultural Structures; Agricultural Power I and II; Agricultural Machinery, and Agricultural Construction Curricula. References are listed in the Career Development Events Bulletin, Agricultural Mechanics Section:

1. *FOS - John Deere*
2. *Agricultural Power and Machinery*. McGraw-Hill.
3. *Mechanics in Agriculture*. Interstate Publishers.
4. *Agricultural Mechanics Fundamentals and Applications*. Delmar Publishers.
5. *Modern Agricultural Mechanics*. Interstate Printers and Publishers.
6. *Developing Shop Safety Skills*. American Association for Vocational Instructional Materials (available from UMC-IML).
7. *Power Tool Safety and Operation*. Hobar (available from UMC-IML).
8. *Agricultural Mechanics I Lesson Plans*. UMC-IML.
9. *Agricultural Mechanics II Lesson Plans*. UMC-IML.
10. *Agricultural Buildings and Structures*. Reston Publications.
11. *Practical Farm Buildings*. Interstate Publishers.
12. *National Electrical Code (1993 edition)*. NFPA
13. *Agricultural Structures*. UMC-IML.
14. National FFA Agricultural Mechanics web site:
<http://web.missouri.edu/%7Eschumacher/natcon.html> or
<http://www.ffa.org/programs/cde/> - (Download CDE Handbook- Scroll to page 43)

Forms

See following pages for Agricultural Mechanics Form 1, List 1, Form 76, Ag Mechanics Appendix I, Ag Mechanics Appendix II.

**MISSOURI AGRICULTURAL MECHANICS CDE
AG POWER: SMALL ENGINE PARTS AND TOOL LIST**

Tool Number	TOOLS	Tool Number	GENERAL
_____	Tachometer	_____	Air Cleaner Cartridge
_____	Voltmeter	_____	Breather Tube
_____	Ohmmeter	_____	Bushing
_____	Ammeter	_____	Clutch (Starter)
_____	Spark Tester	_____	Connecting Lock/Screw Lock
_____	Compression Tester	_____	Crankcase Breather
_____	Dial Indicator	_____	Cylinder Head Screw (Head Bolt)
_____	Dial Caliper	_____	Flywheel Key
_____	Torque Wrench	_____	Flywheel Guard
_____	Micrometer	_____	Governor Blade
_____	Telescope Gauge	_____	Governor Link
_____	Hole Gauge	_____	Governor Spring
_____	Feeler Gauge	_____	Housing Blower (Shroud)
_____	Wire Feeler Gauge	_____	Muffler
_____	Plug Gauge (Go-no-Go)	_____	Oil Slinger (Dipper)
_____	Valve Seat Refacer	_____	Piston Cap
_____	Valve Lapper	_____	Piston Pin
_____	Valve Seat Cutter	_____	Piston Rod
_____	Valve Grinder	_____	Screen-Rotating
_____	Valve Seal Puller	_____	Spring Washer (Flywheel Washer)
_____	Pilots		
_____	Driver		
_____	Support Jack		
_____	Flywheel Puller		
_____	Flywheel Holder		
_____	Starter Clutch Wrench		
_____	Valve Spring Compressor		
_____	Piston Ring Compressor		
_____	Condensor Spring Compressor		
_____	Piston Ring Grover		
_____	Reamer		
_____	Cylinder Hone		
_____	Counterbore Cutter		
_____	Carbon Ring Remover		
	CARBURETOR		
_____	Flow-jet		
_____	Vacu-jet		
_____	Pulsa-jet		
	PRIMARY		
_____	Cam Gear		
_____	Crankcase Cover (Oil Sump)		
_____	Crankshaft		
_____	Cylinder (Block)		
_____	Cylinder Head		
_____	Fuel Tank		
_____	Piston		
			PISTON RINGS
		_____	Compression
		_____	Oil
		_____	Scraper
			IGNITION
		_____	Breaker Points
		_____	Breaker Points (Plunger)
		_____	Breaker Points (Spring)
		_____	Condenser
		_____	Cover (Points)
		_____	Flywheel
		_____	Magneto (Armature)
		_____	Spark Plug
			GASKETS
		_____	Air Cleaner
		_____	Crankcase
		_____	Head
		_____	Valve Cover (crankcase breather)
			VALVE
		_____	Exhaust
		_____	Intake
		_____	Spring
		_____	Spring Retainer
		_____	Tappet

**Missouri Agricultural Mechanics CDE
Tool Identification, Fitting and Adjustment Skill Activity**

Name: _____ Contestant Number _____

School: _____ School Number: _____

<u>Tool No.</u>	<u>Condition</u>				<u>Tool No.</u>	<u>Condition</u>			
1. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	26. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
2. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	27. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
3. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	28. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
4. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	29. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
5. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	30. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
6. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	31. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
7. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	32. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
8. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	33. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
9. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	34. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
10. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	35. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
11. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	36. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
12. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	37. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
13. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	38. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
14. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	39. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
15. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	40. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
16. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	41. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
17. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	42. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
18. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	43. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
19. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	44. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
20. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	45. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
21. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	46. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
22. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	47. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
23. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	48. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
24. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	49. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
25. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	50. _____	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>

Missouri Agricultural Mechanics CDE

Tool Identification, Fitting and Adjustment Skill Listing

- | | | |
|----------------------------------|----------------------------------|----------------------------------|
| 1. Bit, Auger | 47. Hammer, Ball Peen | 93. Ratchet, Flex Head |
| 2. Bit, Expansion Auger | 48. Hammer, Blacksmith | 94. Rivet, Set |
| 3. Bit, Masonry | 49. Hammer, Curved Claw | 95. Rivet, Pop Rivet Tool |
| 4. Bit, Router | 50. Hammer, Rawhide | 96. Saw, Back |
| 5. Bit, Screwdriver | 51. Hammer, Ripping | 97. Saw, Compass |
| 6. Bit, Wood Screw Pilot | 52. Hammer, Sheet Metal Setting | 98. Saw, Coping |
| 7. Bit, Spade | 53. Indicator, Dial | 99. Saw, Cross Cut |
| 8. Bolt Cutter | 54. Indicator, Speed | 100. Saw, Hack |
| 9. Brace, Ratchet | 55. Jacob's Chuck | 101. Saw Miter Box |
| 10. Caliper, Inside | 56. Level, Aluminum | 102. Saw, Rip |
| 11. Caliper, Outside | 57. Level, Mason's | 103. Scratch Awl |
| 12. Caliper, Vernier | 58. Level, Mechanic's | 104. Screwdriver, Standard |
| 13. Countersink | 59. Level, Line | 105. Screwdriver, Clutch Head |
| 14. Chalkline | 60. Mason's Trowel | 106. Screwdriver, Offset |
| 15. Chisel, Wood | 61. Micrometer, Inside | 107. Screwdriver, Phillips |
| 16. Chisel, Cold | 62. Micrometer, Outside | 108. Screwdriver, Torque |
| 17. Chisel, Diamond Point | 63. Nail Set | 109. Screw Extractor |
| 18. Chisel, Round Nose | 64. Nut Driver | 110. Sliding T Bevel |
| 19. Clamp, C | 65. Oil Stone | 111. Snips, Aviation |
| 20. Clamp, Corner | 66. Pipe Cutter | 112. Snips, Tinner |
| 21. Clamp, Three Way | 67. Pipe Die | 113. Socket, 4 Point |
| 22. Clamp, Bar | 68. Pipe Reamer | 114. Socket, 6 Point |
| 23. Die, Split Round Adjustable | 69. Pipe Tap | 115. Socket, 8 Point |
| 24. Die, Solid | 70. Plane, Jack | 116. Socket, 12 Point |
| 25. Die, Stock | 71. Plane, Block | 117. Socket, Universal |
| 26. Die, Two Piece Adjustable | 72. Plane, Surform | 118. Socket, Extension |
| 27. Dividers | 73. Plane, Hand | 119. Socket, Flex Handle |
| 28. Edger, Concrete | 74. Pliers, Combination | 120. Socket, Reducer/Adaptor |
| 29. File, Card | 75. Pliers, Diagonal Cutting | 121. Socket, Deep |
| 30. File, Flat Bastard | 76. Pliers, Groove Joint | 122. Socket, Speed Handle |
| 31. File, Flat Mill | 77. Pliers, Lineman's | 123. Socket, Spark Plug |
| 32. File, Half Round | 78. Pliers, Locking | 124. Square, Carpenter's Framing |
| 33. File, Wood | 79. Pliers, Locking Chain Wrench | 125. Square, Combination |
| 34. Float, Magnesium | 80. Pliers, Needle Nose | 126. Square, Steel |
| 35. Float, Steel | 81. Pliers, Slip Joint | 127. Square, Try |
| 36. Float, Wood | 82. Pliers, Water Hose Clamp | 128. Twist Drill, Morris Taper |
| 37. Gauge, Drill | 83. Pliers, Wire Stripper | 129. Twist Drill, Straight Shank |
| 38. Gauge, Flat Feeler | 84. Puller, Bearing | 130. Wrench, Adjustable End |
| 39. Gauge, Spark Plug Feeler | 85. Puller, External Gear | 131. Wrench, Box |
| 40. Gauge, Small Hole | 86. Puller, Internal Gear | 132. Wrench, Combination |
| 41. Gauge, Marking | 87. Puller, Nail | 133. Wrench, Pounds-Foot Torque |
| 42. Gauge, Screw Pitch | 88. Punch, Center | 134. Wrench, Impact |
| 43. Gauge, Telescoping | 89. Punch, Drive Pin | 135. Wrench, Pounds-Inch Torque |
| 44. Gauge, Wire | 90. Punch, Lining-Up | 136. Wrench, Tap |
| 45. Gauge, Sheet and Plate Metal | 91. Putty Knife | 137. Wrench, Ratcheting B |
| 46. Grinding Wheel Dresser | 92. Ratchet, Reversible | |