

# Outdoor Power Equipment Career Development Event

Effective August 1, 2007

## Purpose

The Outdoor Power Equipment Career Development Event (CDE) is an extension of the Agricultural Education classroom and laboratory. Additionally, this CDE serves as an authentic assessment designed to evaluate students' knowledge in recognizing and repairing malfunctions in Outdoor Power Equipment. The skills Agricultural Education students employ in this CDE are the same skills required by outdoor power equipment technicians.

## Date and Location

District: Set annually by the respective District

State: Set annually by the Agricultural Education Service

## CDE Rules

1. The District CDE must be operated using the state rules and regulations.
2. Each school must have a team of three students. Each student will participate independently, except for the team event.
3. The top two teams from each district will participate in the State Outdoor Power Equipment CDE (the top two individuals in each district, if not on the top two winning teams, may participate at the state level as individuals).
4. There will be a minimum of five stations; one of which must be a troubleshooting station (e.g. four skill stations and one troubleshooting station); a 20-question general knowledge written test; and a team event (e.g. a problem solving pre-delivery scenario).
5. Ten minutes will be allowed for each of the aforementioned stations with the exception for the written test and team activity where 20-minutes will be allotted.
6. All Outdoor Power Equipment used at the troubleshooting station will include but will not be limited to Briggs & Stratton, Tecumseh or Kohler.
7. The troubleshooting station may include any of the activities listed under the header "Skill Areas" later in this document.
8. A manual must accompany the companion outdoor power equipment at troubleshooting station.
9. Contestants may provide their own digital multi-meter as long as it has a minimum of 10M $\Omega$  impedance (e.g. Fluke 88 Automotive Meter). One will be provided.
10. Contestants can use non-programmable calculators, steel rules and pencils. No other tools are to be brought to the CDE.
11. All outdoor power equipment must be less than 29 horsepower and less than 10 years old.
12. Judges will observe the progress of contestant repairs but will not interfere with them unless such repairs are damaging to the engine or are threatening to the safety of the contestants.
13. Tied team scores will be resolved based on the following criteria:
  - a. First criteria team consistency
  - b. Second criteria best combined team troubleshooting score
  - c. Third criteria best combined team written exam score
14. Tied individual scores will be resolved based on the following criteria:
  - a. First criteria: troubleshooting score
  - b. Second criteria: highest written exam score
15. Contestants must be dressed appropriately, including but not limited to clear, non-tinted safety glasses with side shields (Z87.1) and work shoes (no athletic or open-toed shoes are permitted). A trouble diagnosis guide will be useful in preparing contestants. The guide may be used in the CDE. A service instruction manual will be available to all contestants at the troubleshooting station.
16. A team must participate in the District Outdoor Power Equipment CDE to be eligible to participate in the State Outdoor Power Equipment CDE.

## Outdoor Power Equipment CDE Host Instructions

1. The host of the District CDE is responsible for supplying all outdoor power equipment, tools (special and hand), fire extinguishers, replacement parts, manuals, scorecards and judges.

NOT FOR DUPLICATION OR DISTRIBUTION

2. Discretion should be used in selecting skills requiring specialized equipment.
3. The host must provide any other items necessary to conduct the CDE.
4. The host or judges may require additional sheets for evaluation of certain skills.
5. At least 10 days prior to the date of the State Outdoor Power Equipment CDE, the names of the schools representing each district must be forwarded to the Agricultural Education Service by the district's CDE Advisory Committee Member

### Skill Areas

Skill areas include but are not limited to the following areas performance:

#### Contestants may be required to explain the use of and take measurements using the following:

- |  |                   |
|--|-------------------|
| 1. Cylinder bore telescoping gauge                   | 5. Feeler gauge   |
| 2. Dial Caliper                                      | 6. Micrometer     |
| 3. Dial indicator                                    | 7. Plastigauge    |
| 4. Digital multi-meter ( $\geq 10M\Omega$ impedance) | 8. Plug gap gauge |

#### Contestants may be asked to explain and demonstrate the use of following:

- |                          |                          |
|--------------------------|--------------------------|
| 1. Ring Compressor       | 4. Piston Groove Cleaner |
| 2. Piston Ring Expander  | 5. Ignition Tester       |
| 3. Cylinder Ridge Reamer | 6. Battery Tester        |

#### Contestants may be asked to explain, measure and calculate the following:

- |                          |                                 |
|--------------------------|---------------------------------|
| 1. Bore and stroke       | 7. Engine RPM                   |
| 2. Coil capacity         | 8. Ring end gap                 |
| 3. Crank endplay         | 9. Ring side clearance          |
| 4. Cylinder out-of-round | 10. Valve steam guide clearance |
| 5. Cylinder taper        | 11. Valve tappet clearance      |
| 6. Engine displacements  |                                 |

#### Contestants may be asked to identify, explain and demonstrate the use of the following:

1. Outdoor power equipment nuts and bolts
2. Outdoor power equipment parts
3. Fuels, lubricants and coolants
4. Tools and special equipment (including but not limited to the following)

Battery tester	Gasket and Carbon Scraper	Stack Pulley Removal Tool
Battery Tester	Housing Holder	Starter Clutch Remover
Carburetor/Crankcase	Ignition Tester	Starter Rewind Tool
Pressure Gauge	Ignition tester	Tachometer
C-Clamp Pliers	Inline spark tester	Three-Jaw Gear Puller
Compression Tester	Internal-External Snap Ring Pliers	Throttle Wire Bend Tool
Condenser Tool	Key Puller	Torque Wrench
Crankshaft Wrench	Piston Groove Cleaner	Valve Grinder
Cylinder Hone	Piston Ring Expander	Valve Lapper
Cylinder Ridge Reamer	Plug gap gauge	Valve Lapping Compound
Feeler gauge	Pocket Screw Driver	Valve Refacer
Flywheel Holder	Ratchet Starter Remover	Valve Seat Cutter
Flywheel Knocker	Ring Compressor	Valve Seating Tool
Flywheel Puller	Snap ring pliers	Valve Spring Compressor
Flywheel Wrench	Spindle Bearing Removal Tool	

#### Contestants may be asked perform the following skills:

- |                                   |   |
|-----------------------------------|---|
| 1. Complete work orders           | 10. Clean air cleaner   |
| 2. Check for spark                | 11. Adjust and set carburetor linkages  |
| 3. Check for proper valve seating | 12. Use parts manuals or internet websites to make recommendations for ordering parts or recommending specifications and tolerances |
| 4. Install piston rings           | 13. Check cylinder compression (leak down test)   |
| 5. Install pistons                | 14. Explain engine specifications   |
| 6. Time crank and cams            | 15. Test electrical starter/generator/alternators   |
| 7. Set mechanical governors       |   |
| 8. Check heads for warpage        |   |
| 9. Set armature and air gaps      |   |

## References

1. General Theories of Operation, Briggs & Stratton Corporation.(current edition)
2. Repair Instructions, Briggs & Stratton Corporation - (current editions)
3. Tecumseh Mechanics Manual (current edition)
4. I & T Small Engines Service Manual (current edition)
5. Small Engines by R. Bruce Radcliff and Dann L. Roark. ISBN 0-8269-0012-7. American Technical Publishers, Inc, Homewood, Il 60430
6. Small Engines Workbook by R. Bruce Radcliff. ISBN 0-8269-0013-5. American Technical Publishers, Inc, Homewood, Il 60430
7. Small Engines Workbook Answer Key. ISBN 0-8269-0014-3. American Technical Publishers, Inc, Homewood, Il 60430
8. Small Gas Engines by Alfred C. Roth (book, workbook & instructor's manual). ISBN 1-59070-183-6. The Goodheart-Wilcox Company, Inc.- Tinley Park Il 60430
9. John Deere FOS Manuals
10. Online industry parts reference sites (e.g. Briggs and Stratton)

## Scoring

### *Individual score*

Four (4) skill stations (20 points per station).....	80 points
One (1) troubleshooting station.....	20 Points
General Knowledge Exam (20 questions at one point each).....	<u>20 points</u>
Total Individual Score (per participant) .....	120 points

### *Team Score*

Three (3) individuals x 120 points .....	360 points
Team Activity.....	<u>100 points</u>
Total Team Possible Score .....	460 points

# Outdoor Power Equipment Troubleshooting Scorecard

Team: \_\_\_\_\_

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

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

*Instructions:* Points are awarded to teams for the following categories and tasks completed. Maximum points per item are listed, but fewer points may be awarded.

## Safety (5 points)

### Points Scored

1. Safety glasses (1 pts.) \_\_\_\_\_
2. Safety procedures (1 pts.) \_\_\_\_\_
3. Safe equipment operation (1 pts.) \_\_\_\_\_
4. Communication with judge (1 pts.) \_\_\_\_\_
5. Cleanliness (1 pts.) \_\_\_\_\_

**Total Safety Points** \_\_\_\_\_

## Use of Tools/Equipment (5 points)

1. Proper use of tools (1 pts.) \_\_\_\_\_
2. Proper use of the service manual/related material (2 pts.) \_\_\_\_\_
3. Proper use of diagnostic equipment (2 pts.) \_\_\_\_\_

**Total Tools/Equipment Points** \_\_\_\_\_

## Diagnostics (10 points)

1. Diagnostic procedure (2 pts.) \_\_\_\_\_
2. Location of problems (3 pts.) \_\_\_\_\_
3. Proper repair of problems (3 pts.) \_\_\_\_\_
4. Explanation of faults to the scorer (2 pts.) \_\_\_\_\_

**Total Diagnostics Points** \_\_\_\_\_

**Subtotal Points** \_\_\_\_\_

*Instructions:* This section may **deduct** points for unsafe or unapproved diagnostic or repair methods. This includes unsafe oil or fuel handling techniques. Point deductions may be up to the maximum listed for each.

## Unsafe or Unapproved Methods (10 points)

1. Fluid systems (4 pts.) \_\_\_\_\_
2. Electrical/Electronic systems (4 pts.) \_\_\_\_\_
3. Cleanliness (e.g. using manual with dirty hands) (2 pts.) \_\_\_\_\_

**Total Points Deducted for Unsafe or Unapproved Methods** { - \_\_\_\_\_ }

## Bonus Points:

One point for each unused full minute (under 10 minutes) per station. Outdoor power equipment must operate per judge's satisfaction before time points are allowed.

Time Started \_\_\_\_\_ Time Finished \_\_\_\_\_ Unused Minutes \_\_\_\_\_

**Total Bonus Points** \_\_\_\_\_

Judges: \_\_\_\_\_

**Total Station Points**

Judges: \_\_\_\_\_

BUTION