E1

AMEC

aim 10 GPA boundary

2026 NCWSS/WSWS Team Sprayer Calibration Judge Use Only

3.5 miles / hr | 1 hr / 3600 s | 5280 ft / 1 mile → 15.58 s → 15.6 s

Team Sprayer Calibration – Judge Score Sheet

max 25 min → time 23 tie breaker

Team #: KEY Station: TBD Example: E1 Judge: TBD Time Start: _____ Time End: _____

Category	Pts	Awarded
Written Calculation	35	# TBD steer guessing
Boom Height	15 [20-24 accepted]	→ deducted prop. if lower or higher
Walking Speed (Pass 1)	7.5 Yes or No	if no prop. deducted
Walking Speed (Pass 2)	7.5 Yes or No	if no prop. deducted
Uniform Spray Pattern	15	# after flow rate and pattern test
Nozzle Selection	40	→ type and flow rate (no pressure)
Screen Selection	20	# must have check valves

1:1 inch ratio [100]
20 nozzle spacing AIXR11005 or [AIXR11005 also available - no waivers]
20 boom height T7 pg #18-19 → 100 psi w/ check

4% 107.49 - 116.13

% reduction

Nozzle	Correct Tip	Correct Screen[a]	Target[b] mL/15 s	Measured mL/15 s	% Error	Deduction	Score (/15)
1	_____	_____	111.66	_____	_____	_____	_____
2	_____ AIXR11005	_____ 100 psi	111.66	_____ TBD	_____	_____ TBD	_____ TBD
3	_____	_____ w/ check	114.66	_____	_____	_____	_____
4	_____	_____	111.66	_____	_____	_____	_____

[a]Correct Screen(s): needs to have a check valve

[b]See Key for Targeted mL/min

↳ steer measured

Automatic Deduction Reference (per nozzle)

Deviation	±4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%
Deduction	0	1	2	3	4	5	6	7	8	9	10	11

Rule: No deduction for ±4% variation. Deduct 1 point for each additional 1% deviation beyond the ±4% allowance.

Safety Glasses Worn?	☑ Yes ☐ No # IMPORTANT all must have
Safety Penalty	-50 (if applicable)
FINAL SCORE (/200)	[200]

Notes:

TEAM: KEY

Team Sprayer Calibration (Total 200 points)

Team Sprayer Calibration (200 points). The purpose of this event is to evaluate a team's ability to calibrate and properly operate a research backpack sprayer. This is a team event and will not be used in calculating individual scores. However, students competing as individuals (less than 3 members per team) may also compete in this event.

All safety equipment, sprayer components, calculators, stopwatches, and TeeJet Agricultural Spray Products catalogs will be provided by the society and/or contest host. Use of personal calculators will not be permitted. Safety glasses must be worn by all students, judges, observers, etc., who are in the calibration event area. 50 points will be deducted from the team score if a judge sees a student without safety glasses during the time they are working on the problem.

Each team will be given a basic (easily solved) written problem that will be calculated during this session. The answers to the question will provide the parameters (application volume, recommended droplet size, etc.) to which a CO2 backpack sprayer is to be calibrated. Each team will be expected to choose the appropriate nozzle tips, speed, and pressure for accurate calibration and application. Each team will be asked to deliver a designated number of gallons/acre or liters/hectare over a given length or area demonstrating proper sprayer use.

Scoring will be based on accuracy of calibration and application. Time will be used to break any ties. Time will start when the team approaches the spray table. When a team is ready to make the calibration run, they are to advise the judge, and the time will be stopped. If time reaches 25 minutes, the judge will instruct the contestants to stop. Once time is stopped, no further adjustments can be made to the sprayer. The calibrated sprayer is then used by a contestant to spray a predetermined area with the judge watching for proper boom height, speed, and uniformity of spray pattern. Following the application evaluation, each nozzle will be checked for accurate output. Variation in output up to ±4% variation per nozzle will be allowed. As an example, if the correct nozzle output is 150 ml/15 sec, the acceptable range will be 144 to 156 mL/15 sec.

Scoring is as follows:

- Correct problem calculation (35 points)
- Correct boom height (15 points)
- Correct speed (15 points)
- Uniform spray pattern (15 points)
- Nozzle selection (40 points, 10 points/nozzle)
- Screen selection (20 points, 5 points/screen)
- Sprayer output (60 points, 15 points per nozzle. Each 1% over or under the 4% allowance will result in a loss of 1 point. For example, if a nozzle is producing 8% less than the correct calculated output, 4 points will be deducted.)

KEY W7 07-29-26

NCWSS/WSWS Joint Contest TSC E1

Scenario: After scouting your research plots ahead of soybean planting, you are noting some common lambsquarters (2-3") and Palmer amaranth (3-4") along the north edge of your research plots (20 ft by 80 ft) that require maintenance. Set up and calibrate a plot sprayer (simulating ground-boom application) using available resources to apply Aim EC (1.5 fl oz/A) to soybean preplant burndown. You make walking applications at a speed of 308 feet/min. **Note:** There are some sensitive specialty crop plants nearby, so you will want to minimize drift as much as possible (see the Spray Drift Management section on the product label for additional information, if needed).

3.5 MPH

1. Do you need to visit Bulletins Live! Two (BLT) before application? (1 pt.)
   ☐ Yes ☒ No

2. For an application of Aim EC, what are the requirements for a ground application as listed in scenario (6 pts.)

   a. Minimum spray carrier volume? (3 pts.) 10 (Label # pg # 3)

   b. Droplet size? (3 pts.) 450 µm → Coarse (Medium Accepted) (Label # pg # 4)

3. Given the sprayer setup you have, what is the target GPM? 0.118 (1 pts.) (nearest thousandth) and the calculated pressure required for output 24.3 psi (2.5 pts.)

$$GPM = \frac{GPA \times MPH \times HS}{5940} = \frac{10 \times 3.5 \times 20}{5940} = 0.118$$

$$\frac{(0.10)^2 \text{ or } (0.15)^2}{(0.118)^2} = \frac{40}{x}$$

0.15 → 24.3 psi
0.10 → 55.7 psi

4. How many grams of active ingredient are going to be applied per hectare? 26 (3.5 pts.) (Round to the nearest whole number.)

$$\frac{1.5 \text{ fl oz}}{3a} \left| \frac{256 \text{ zi}}{128 \text{ fl oz}} \right| \frac{2.47 \text{ ac}}{1 \text{ Ha}} \left| \frac{453.59 \text{ g}}{1 \text{ lb}} \right. = 26.26$$

5. How much AIM EC do you need to add to create a 3L (bottle) mix size? 3.5 mL (3.5 pts)

$$\frac{3000 \text{ mL}}{3785 \text{ mL}} \left| \frac{1 \text{ gal}}{10 \text{ gal}} \right| \frac{2 \text{ c}}{2 \text{ c}} \left| \frac{1.5 \text{ fl oz}}{1 \text{ fl oz}} \right| \frac{29.6 \text{ mL}}{} \rightarrow 3.519$$

6. Will a 3 L mix size meet your needs? ☒ Yes ☐ No

   a. If No, what total mix volume would you need? _____ mL (3.5 pts)

$$\frac{3000 \text{ mL}}{3785 \text{ mL}/10 \text{ gal}} \rightarrow 0.079 \text{ ac} \quad \left| \quad \frac{20 \times 80}{43560 \text{ ft}^2} \rightarrow 0.037 \text{ ac} \right.$$

7. If you add a high-surfactant methylated seed oil adjuvant that constitutes 0.5% of the volume of the finished spray tank mix, what amount will need to be added to the tank mix? 15 mL/bottle (3.5 pts) (Round to the nearest whole number)

$$\frac{0.5}{100} \times 3000 \rightarrow 15 \text{ mL}$$

8. Under difficult environmental conditions (low relative humidity) or hard water, it is recommended to add ammonium sulfate (AMS) at 2 lbs/ac to 4 lbs/ac. If you decide to add 3.0 lbs/ac, how much AMS would you need to add per bottle?
   3.8 dry oz/bottle (3.5 pts.)

$\frac{2000}{3785} / 10$ ← H

$\frac{0.079\,ac}{1\,ac} \mid \frac{3\,lb}{1\,lb} \mid \frac{16\,dry\,oz}{1\,lb} \rightarrow 3.79 - 3.8$

9. In case you are without dry products and only have liquid available. What will be equivalent to liquid replacement to get 3.0 lbs/ac? How much liquid AMS (Valcheck AMS) would you need to add per bottle? 269.1 ml/bottle (3.5 pts.)

label provided pg #2

3qt → 2.5 lb
x qt → 3 lb → 3.6 qt

$\frac{5.6\,qt}{x\,ac} \mid \frac{3785\,mL}{4\,qt} \mid \frac{0.079\,ac}{1\,ac} \rightarrow \frac{269.11}{270}$

$\frac{269.1}{270}$

H → $\frac{3000}{3785} / 10$

10. As part of the Spray Buffer for Ground Application, it is required to maintain a downwind buffer between desirable perennial vegetation or crops before blossom and after total leaf drop, and/or near other desirable or annual crops. How does this change with boom height and application rates? (Round to the nearest whole number.) (3.5 pts)

USE RATE	Low Spray Boom	High Spray Boom
lbs ai per acre	Buffer (ft.)	
0.025	20	33
0.031	26	46

label provided pg #3

Calculation Instructions:

- Round only the final answer to one decimal place (nearest tenth) unless otherwise instructed.
- Do not round intermediate calculations; carry sufficient decimal places throughout all calculations.
- A discrepancy of ± 0.15% from the correct answer is acceptable.
- Use the conversion factors and constants provided in the Helpful Conversion Sheet whenever conversions are required.

Place below for additional notes and calculations:

Helpful Conversions:

1 lb = 16 dry oz = 453.59 g

1 gal = 128 fl oz = 3785 mL

1 fl oz = 29.6 mL

1 ha = 2.471 ac

$(0°C \times \frac{9}{5}) + 32 = 32\ F$

Liberty Ultra
20GDA w/ deuse coop

E3

2026 NCWSS/WSWS Team Sprayer Calibration Judge Use Only

3.5 miles / 1 hr / 5280 ft → 15.58s or 15.6s
hr 3600s 1 mile

Team Sprayer Calibration – Judge Score Sheet

Team #: KEY Station: TBD Example: E3 Judge: TBD Time Start: _____ Time End: _____ max 25 min time 25 tiebreaker

Category	Pts		Awarded
Written Calculation	35		# TBD after grading
Boom Height	15	[20-24] accepted	→ deducted if outside [proportional]
Walking Speed (Pass 1)	7.5	yes or HO	if HO proportional deduction
Walking Speed (Pass 2)	7.5	yes or HO	if HO proportional deduction
Uniform Spray Pattern	15		# after flow rate and pattern test
Nozzle Selection	40		→ type and flow rate (no pressure)
Screen Selection	20		# must have check valves

1:1 inch ratio [110°]
20 nozzle spacing
20 boom height

TJ pg # 18-19 AIHU11002 @ 55.7 psi
pg # 16-17 TT 11003 @ 24.7 psi
} 50 mm / check

Nozzle	Correct Tip	Correct Screen[a]	Target[b] mL/15 s	Measured mL/15 s	% Error	Deduction	Score (/15)
1	_____	_____	223.31	_____	_____	_____	_____
2	_____ AIHU 0.2 or	_____ 50 mesh	223.31	_____ TBD	_____	_____ TBD	_____ TBD
3	_____	_____	223.31	_____	_____	_____ (%)	_____
4	_____ TT 0.3	_____ w/ mesh	223.31	_____	_____	_____	_____

[a]Correct Screen(s): needs to have a check valve
[b]See Key for Targeted mL/min

↳ 4% after measure
214.38 – 232.24

Automatic Deduction Reference (per nozzle)

Deviation	±4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%
Deduction	0	1	2	3	4	5	6	7	8	9	10	11

Rule: No deduction for ±4% variation. Deduct 1 point for each additional 1% deviation beyond the ±4% allowance.

Safety Glasses Worn?	☒ Yes ☐ No # IMPORTANT ZY must have
Safety Penalty	-50 (if applicable)
FINAL SCORE (/200)	200

Notes:

TEAM: KEY

Team Sprayer Calibration (Total 200 points)

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- Correct problem calculation (35 points)
- Correct boom height (15 points)
- Correct speed (15 points)
- Uniform spray pattern (15 points)
- Nozzle selection (40 points, 10 points/nozzle)
- Screen selection (20 points, 5 points/screen)
- Sprayer output (60 points, 15 points per nozzle. Each 1% over or under the 4% allowance will result in a loss of 1 point. For example, if a nozzle is producing 8% less than the correct calculated output, 4 points will be deducted.)

KEY WZ 07-27-26

NCWSS/WSWS Joint Contest TSP E3

Scenario: After scouting your research plots of soybeans, you are noting some common lambsquarters (2-3") and Palmer amaranth (3-4") along the north edge of your research plots (20 ft by 80 ft) that require maintenance. Set up and calibrate a plot sprayer (simulating ground-boom application) using available resources to apply Liberty Ultra (at 28 fl oz/ac) to a denser soybean canopy (V5). You make walking applications at a speed of 308 feet/min. **Note:** There are some sensitive specialty crop plants nearby, so you will want to minimize drift as much as possible (See section 10 on product label for additional spray drift mitigation, if needed).

3.5 MPH

1. Do you need to visit Bulletins Live! Two (BLT) before application? (1 pt.)

   ☒ Yes ☐ No

   # provided label pg #12 11.0 section

2. For an application of Liberty Ultra, what are the requirements for a ground application as listed in scenario (6 pts.)

   a. Spray carrier volume? (3 pts.) 20 — product label pg# 8 — # 8.1 Section

   b. Droplet size? (3 pts.) Medium to Coarse (M-C) — product label pg# 8 — #8.2 section

3. Given the sprayer setup you have, what is the target GPM? 0.236 (1 pts.) (nearest thousandth) and the calculated pressure required for output 55.7 or 24.7 psi (2.5 pts.)

   $GPM = \frac{GPA \times MPH \times W}{5940} = \frac{20 \times 3.5 \times 20}{5940} \rightarrow 0.236$

   $\frac{(0.20)^2}{(0.236)^2} = \frac{40}{x}$ or $\frac{(0.30)^2}{(0.236)^2} = \frac{40}{x}$

   0.20 → 55.7 psi
   0.30 → 24.7 psi
   } accepted

4. How many grams of active ingredient are going to be applied per hectare? 432 (2.5 pts.) (Round to the nearest whole number.)

   $\frac{28 \text{ fl oz}}{\text{ac}} \mid \frac{1.76 \text{ lb ai}}{128 \text{ fl oz}} \mid \frac{2.471 \text{ ac}}{1 \text{ ha}} \mid \frac{453.59 \text{ g}}{1 \text{ lb}} \rightarrow 431.52$

5. How much Liberty Ultra do you need to add to create a 3L (bottle) mix size? 32.8 mL (3.5 pts)

   $\frac{3000 \text{ mL}}{3785 \text{ mL}} \mid \frac{1 \text{ gal}}{20 \text{ gal}} \mid \frac{\text{ac}}{28 \text{ fl oz}} \mid \frac{29.6 \text{ mL}}{1 \text{ fl oz}} \rightarrow 32.84$

6. Will a 3 L mix size meet your needs? ☒ Yes ☐ No

   a. If No, what total mix volume would you need? _____ mL (3.5 pts)

   $\frac{3000 \text{ mL}}{3785 \text{ mL}} / 20 \rightarrow 0.039 \text{ ac}$ | $\frac{20 \times 80}{43560 \text{ ft}^2} \rightarrow 0.037 \text{ ac}$

7. If you add an oil emulsion drift-reducing adjuvant that constitutes 0.3% of the volume of the finished spray tank mix, what amount will need to be added to the tank mix? 9 mL/bottle (3.5 pts)

   $\frac{0.3}{100} \times 3000 \rightarrow 9$

8. Under difficult environmental conditions (low relative humidity) or hard water, it is recommended to add ammonium sulfate (AMS) at 1.5 lbs/ac to 3 lbs/ac. If you decide to add 2.0 lbs/ac, how much AMS would you need to add per bottle? (1.25 / 1.27) dry oz/bottle (3.5 pts.) (nearest hundredth)

$\frac{0.039\,zc}{} \mid \frac{2\,Lb}{zc} \mid \frac{16\,dry\,oz}{1\,Lb} \rightarrow (1.25 - 1.27)$

$\frac{3000}{2985} / 20 \hookrightarrow 1.27$

9. In case you are without dry products and only have liquid available. What will be equivalent to liquid replacement to get 3.0 lbs/ac? How much liquid AMS (Valcheck AMS) would you need to add per bottle? (88.57 / 90.00) ml/bottle (nearest hundredth) (3.5 pts.)

Label provided pg #2

$3\,at \rightarrow 2.5\,Lb \rightarrow 2.4$
$X \rightarrow 2\,Lb$

$\frac{2.4\,qt}{2c} \mid \frac{2985\,ml}{4\,qt} \mid \frac{0.039\,zc}{} \rightarrow (88.57 - 90)$

$\frac{3000}{2985} / 20$

10. As part of the Mandatory Spray Drift Management, it is required to maintain a downwind buffer between the last spray row and the protection area when using the ground application method at a minimum of 10ft. How can the ground buffer distance be reduced to 0 feet? (3.5 pts)

#flow provided Label pg #10
9.2.3

1. Oil emulsion btzA 2.5% V/V
2. Over the top hooded sprayer, Label application, below crop with drop nozzles
3. Row middle hooded sprayer
4. Windbreak or shelter belt between application site and non-targeted area is present and meet criteria.

Calculation Instructions:

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