Problem Statement:

- Teams will be allowed 30 minutes to complete the problem with a warning given at 5 minutes remaining.
- Teams will provide at least one multi-gas instrument, one anemometer, one magnehelic gauge and one smoke tube set complete with aspirator bulbs. The contestants will provide the equipment, tools, and supplies necessary to complete the problem.
- For the purposes of the problem, standard area and air velocity readings will be to ensure the same correction factor and final calculations. After completing the check, the judge will give the contestant the actual reading for the test.

Judge's Notes

Gas Monitor

- The team-supplied gas meter will be considered correct if within the following:
    - Oxygen readings are considered to be correct if within plus or minus 0.5% by volume;
    - Methane readings are considered to be correct if within plus or minus 0.2% by volume (LEL readings are not acceptable);
    - Carbon Monoxide readings are considered to be correct if within plus or minus 10% of the actual value present; and
    - Nitrogen Dioxide readings are considered to be correct if within plus or minus 3 ppm of the actual value present.

- The technician team will be expected to evaluate the instrument(s), repair all of the deficiencies, properly calibrate or functional (bump) test the instrument(s), and check for proper action level alarm set points. During this process, the technician team may need to reconfigure the instrument(s) to complete these tasks.
    - MX-6 bugs for this problem (TBD)
        1. _____
        2. _____
        3. _____
        4. _____
        5. _____

Judge's Notes

Air Quantity/Differential Pressure

- Teams will supply their own Contestant(s) will provide their own anemometer, tape measure, smoke tubes, aspirating bulb, pen or pencil, timing device (not on a phone/communication device), "simple" calculator and may provide a "wand" extension for their anemometer.
- As a judge, you will give the contestants the length and width after they measure both on their own. You will also participate in the smoke tube test as the downwind timer. You will give the contestant the times below for each quadrant taken.
    - **Width: 15 feet**
    - **Height: 12 feet**
    - **Quadrant 1: 8 seconds**
    - **Quadrant 2: 10 seconds**
    - **Quadrant 3: 11 seconds**
    - **Quadrant 4: 9 seconds**
- Contestants will be required to explain both the smoke tube test and anemometer reading including how to take measurements using both tools.
- For the anemometer reading, the contestant will be required to set up the anemometer pointing the correct direction that is reset to zero before starting. The contestant will complete a traverse over one minute, turning off the anemometer and then reading the dial. Contestants will be required to apply the correction factor from the given table before continuing their quantity calculations.
    - **Width: 15 feet**
    - **Height: 12 feet**
    - **Feet/Minute: 1450**
- Correction Factor

Reading (fpm)	Correction	Reading (fpm)	Correction
50	+15	500	-5
75	+15	550	-8
100	+14	600	-10
125	+14	700	-15
150	+14	800	-20
175	+13	900	-25
200	+12	1000	-30
250	+11	1200	-35
300	+10	1400	-45
350	+5	1600	-50
400	0	1800	-60
450	-2	2000	-65

- For the magnehelic reading, inform the contestant that they are standing on the intake side (high pressure). They will need to connect the tubing to the high pressure side leaving the low pressure side open to air.
    - **Pressure: 0.26 in. Water Gauge**

Air Calculation Worksheet

A worksheet will be provided and is to be completed by each contestant to document final air readings for the anemometer, smoke tube and magnehelic portions of the contest.

The completed worksheet will be returned to the judge(s) at the completion of the problem.

Smoke Tube Reading

Pull 10 foot out on the tape measure in the entry and observe the time it takes for a puff of smoke to travel the length of the 10 foot tape measure in each of four quadrants;

1st quadrant 8 seconds *Space for calculations*

2nd quadrant 10 seconds

3rd quadrant 11 seconds

4th quadrant 9 seconds

Total 38 /4 = average time 9.5 seconds

Distance in Feet (10)/Average time = 1.05 feet per second (FPS).

FPS x 60 (seconds/minute) = 63 FPM

Entry width 15 x Entry height 12 = 180 SF (area in square feet)

Area 180 x FPM velocity 63 = 11,340 CFM

Anemometer Reading

Entry width 15 x Entry height 12 = 180 SF (area in square feet)

FPM reading 1450 + or – correction factor -45 = 1405 corrected FPM

Area 180 x (corrected) FPM velocity 1405 = 252,900 CFM

Space for calculations

Magnehelic gauge

Record dial reading 0.26 Positive x Negative