

**PART 1 - GENERAL REQUIREMENTS**

**1.01 SUMMARY**

- A. Extent of vehicle emission monitoring systems work required by this Section is indicated on drawings and by requirements of this Section.
- B. Control sequences are specified in this section or on the drawings
- C. Refer to Division 26 Sections for the following work; not work of this Section.
  - 1. Power supply conduit and wiring for power source to power connection of the control panel.
- D. Provide the following electrical work as work of this Section, complying with requirements of Division 26 Sections.
  - 1. Control wiring between field-installed controls, indicating devices, and unit control panels.

**1.02 QUALITY ASSURANCE**

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of vehicle emission monitoring equipment, of types and sizes required, whose products have been in satisfactory use for a minimum of three years. Manufacturer shall submit a list of 12 similar projects.
- B. Codes and Standards:
  - 1. UL Compliance: Comply with UL Safety Standard for Vehicle Emission Systems.
  - 2. NEMA Compliance: Comply with NEMA standards pertaining to enclosures for vehicle emission control systems
  - 3. NFPA Compliance: Comply with NFPA 70 "National Electric Code" where applicable for electric equipment, devices and wiring.
  - 4. ISO Compliance: Equipment shall be manufactured within an ISO 9001-2000 production environment.

**1.03 SUBMITTALS**

- A. Product Data: Submit manufacturer's technical product data for the vehicle emission monitoring system furnished, indicating dimensions, capacities, performance characteristics, electrical characteristics, finishes of materials, and including installation instructions and start-up instructions.
- B. Shop Drawings: Submit shop drawings for the vehicle emission monitoring system, containing the following information:

1. Schematic flow diagram of system showing control panel and transmitting device(s).
  2. Label each control device with setting or adjustable range of control.
  3. Indicate all required electrical wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.
  4. Provide details of faces of control panels, including controls, instruments, and labeling.
  5. Provide sequence of operation including alarm points and functions.
- C. Maintenance Data: Submit maintenance instructions and spare parts lists. Include this data, product data, and shop drawings in maintenance manuals; in accordance with requirements of Division 1.

#### **1.04 DELIVERY, STORAGE, AND HANDLING**

- A. Provide factory shipping cartons for each piece of equipment, and control device. Maintain cartons through shipping, storage and handling as required to prevent equipment damage, and to eliminate dirt and moisture from equipment. Store equipment and materials inside and protected from weather.

### **PART 2 - PRODUCTS**

#### **2.01 ACCEPTABLE MANUFACTURERS**

- A. Manufacturer: Subject to compliance with requirements, provide vehicle emission monitoring systems of one of the following:
1. Airtest Technologies, Inc.
  2. American Gas Safety.
  3. Armstrong Monitoring.
  4. Brasch Manufacturing Company.
  5. Critical Environmental Technologies.
  6. DSP – Monoxivent.
  7. Sentech Corporation.
  8. Specified Controls.
  9. Tox Alert.
  10. Vulcain Alarm, Inc. (a Division of Honeywell Analytics).

#### **2.02 VEHICLE EMISSION MONITORING SYSTEM**

- A. General: Provide complete vehicle emission monitoring system as specified, consisting of control panel, transformer, and transmitting devices as required for a complete installation. Except as otherwise indicated, provide manufacturer's standard control system components as indicated by published product information, designed and constructed as recommended by manufacturer.

- B. System Requirements: Vehicle emission monitoring system shall meet the following general requirements:
1. System shall be capable of detecting presence of CO and NO<sub>2</sub> vehicle emissions at concentration levels as indicated. Manufacturer shall coordinate with the Contractor the specific requirements for this installation.
  2. System shall be capable of indicating, alarming, and energizing ventilation equipment. The system shall also be capable of communicating with the building automation system specified in Division 23 Section "Direct Digital Control for HVAC" through an RS-232 or RS-485 port.
  3. System installation shall consider monitoring sensing locations for early warning indication to prevent excessive emission levels without alarm.
- C. Control Panel and Equipment: Provide control panel with suitable brackets for wall mounting, for each vehicle emission monitoring system. Install panel at location shown on the drawings.
1. Fabricate panels of galvanized steel, painted steel, or extruded aluminum alloy, totally enclosed, with hinged doors and keyed lock.
  2. Controller: Vehicle emission control panel shall be capable of communicating digitally with networked transmitters and relay modules. Provide sufficient communication buses to accommodate the number of addressable transmitters indicated.
  3. Provide a single power supply, 17-27 Vac or 24-38 Vdc to power the entire vehicle emission monitoring network.
  4. The control panel shall manage internal DPDT relays at fully programmable alarm levels and be capable of activating multiple relay modules. Relay rating shall be not less than 5 A, 30 Vdc or 250 Vac resistive load.
  5. The control panel shall include a self-test function for all programmed outputs and a real time clock to enable operation of the outputs for a specific timeframe.
  6. The control panel shall allow for output operation on alarms set at a maximum, minimum, or average value of a specific group of transmitters. This shall also allow alarm activation when a specific number or percentage of transmitters reaches their respective alarm levels.
  7. The control panel shall indicate the exact concentration of gas, the gas detected, and the location of the sensor on a graphic LCD display. The LCD shall have color-coded LED for each alarm point with Green-Normal, Red-Alarm, and Yellow-Failure.
  8. The control panel shall provide a minimum of two low--high alarm levels for each gas detected.
  9. The control panel shall provide an audible alarm of minimum 65 dBA at three feet which may be activated at any programmable concentration level.
  10. The control panel shall be factory programmed and field adjustable by integral keypad with program stored on Flash memory card.
  11. The control panel shall be capable of local activation of ventilation equipment through programmable time-delay relays.

12. The control panel shall be capable of operation between zero and 120 degree F.
  13. Provide a remote annunciator panel where indicated.
  14. Provide BACnet communication capability over twisted-pair Ethernet (10BaseT) wires.
- D. Vehicle emission transmitters: Vehicle emission transmitter(s) shall be provided for monitoring vehicle emission levels.
1. Transmitters shall be powered by the control panel single source power supply.
  2. Transmitters shall be fully addressable and capable of communicating digitally through an RS-485 port.
  3. Transmitters shall be capable of remote sensing up to a maximum of 300 feet.
  4. Transmitters sensing cell shall automatically compensate for variations in relative humidity and temperature to maintain accuracy.
  5. Each transmitter shall include an LED or digital display of gas concentration levels.
  6. Transmitters shall be capable of operation at relative humidity levels of 5-90% and temperatures of zero to 100 degrees F.
  7. Transmitter CO programmable alarm set points shall be 25 PPM (low first warning) and 200 PPM (high alarm warning).
  8. Transmitter NO2 programmable alarm set points shall be 1 PPM (low first warning) and 3 PPM (high alarm warning).
  9. Transmitters shall be capable of sending (through the control panel) analog 4-20mA signal to the BMS/DDC system.

## **PART 3 - EXECUTION**

### **3.01 INSPECTION**

- A. Examine areas and conditions under which vehicle emission monitoring systems are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

### **3.02 INSTALLATION OF VEHICLE EMISSION MONITORING SYSTEMS**

- A. General: Install systems and materials in accordance with manufacturer's instructions. Install electrical components and use electrical products complying with requirements of applicable Division 26 sections of these specifications. Mount control panel at location indicated on the drawings at convenient height for user interface.
- B. Communication Wiring: Transmitters shall be installed in daisy chain with end of line resistor on last transmitter.

- C. Transmitter Location(s): Install vehicle emission transmitters at heights and locations indicated on the drawings. If location or height is not indicated, comply with the vehicle emission monitoring system manufacturer's installation instructions.

### **3.03 ADJUSTING AND CLEANING**

- A. Start-Up: Start-up, test, and adjust vehicle emission monitoring system in presence of manufacturer's authorized representative. Demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.
- B. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint. Replace sensor filters, if contaminated during installation work.
- C. Final Adjustment: After completion of installation, adjust vehicle emission monitoring system to meet system requirements.
- D. Final adjustment shall be performed by specially trained personnel in direct employ of manufacturer of vehicle emission monitoring system.

### **3.04 TRAINING**

- A. General: At a time mutually agreed upon between the Owner and Contractor, provide the services of a factory trained and authorized representative to train Owner's designated personnel for a minimum of four hours on the operation and maintenance of the equipment provided under this section.
- B. Content: Training shall include but not be limited to:
  - 1. Overview of the system and/or equipment as it relates to the facility as a whole.
  - 2. Operation and maintenance procedures and schedules related to startup and shutdown, troubleshooting, servicing, preventive maintenance and appropriate operator intervention.
  - 3. Review data included in the operation and maintenance manuals. Refer to Division 1 Section "Operating and Maintenance Data."
- C. Certification: Contractor shall submit to the Engineer a certification letter stating that the Owner's designated representative has been trained as specified herein. Letter shall include date, time, attendees and subject of training. The certification letter shall be signed by the Contractor and the Owner's representative indicating agreement that the training has been provided.
- D. Schedule: Schedule training with Owner with at least 7 days' advance notice.

### **3.05 SEQUENCE OF OPERATION**

#### **A. Ventilation System Activation:**

1. When CO concentration exceeds 25 PPM, activate the ventilation fans and open ventilation dampers to maintain concentration below the programmable first warning level of 25 PPM.
2. When NO<sub>2</sub> concentration exceeds 1 PPM, activate the ventilation fans and open ventilation dampers to maintain concentration below the programmable first warning level of 1 PPM.

#### **B. Alarm Activation:**

1. Activate audible and visual alarms if CO concentration reaches 200 PPM.
2. Activate audible and visual alarms if NO<sub>2</sub> concentration reaches 3 PPM.

**END OF SECTION**