**ENGINEERING SPECIFICATION**

**Analog Gas Transmitters with Building Automation Systems**

**(CO, NO2, COMBUSTIBLES, AMMONIA)**

# SECTION XXXXXX GAS MONITORING AND CONTROL SYSTEM

## PART 1 – GENERAL

* 1. **RELATED DOCUMENTS**

Applicable portions of all documents listed in the index as well as Section XXXXX apply to work of this section.

* 1. **SCOPE**

Work under this section of the specifications shall include the furnishing and installation of a complete gas monitoring and control system including all related accessories.

* 1. **SUBMITTALS**

Furnish submittal data for the following materials and equipment in accordance with the requirements of Section XXXXX “General Requirements for Mechanical Trades.”

* 1. Gas monitoring and control system.
	2. All related devices.
	3. **ACCEPTABLE MANUFACTURERS**

INTEC Controls.

**PART 2 – PRODUCT SPECIFICATIONS**

**2.1 BUILDING AUTOMATION SYSTEM**

1. The building automation system shall provide continuous monitoring of the designated gas levels in the assigned area and control the ventilation system in accordance with all applicable codes and standards.
2. The building automation system shall have the capability to accept any combination of 4-20 mA transmitters as provided by INTEC Controls.
	1. **CARBON MONOXIDE (CO) SENSOR/TRANSMITTER**
3. The carbon monoxide sensor/transmitter shall provide monitoring of the carbon monoxide levels in the parking garage and control the ventilation system via the DDC/BA system in accordance with all applicable codes and standards.
4. The sensors shall be electrochemical type. The sensor/transmitter shall have plug-in technology for ease of troubleshooting and replacement of both the element and the printed circuit board. Solid-state sensors or air sampling devices shall not be acceptable.

1. The sensor range shall be 0-250 ppm carbon monoxide. A microprocessor-based transmitter shall generate a polarity protected, proportional 4-20 mA output signal. The wiring between the transmitter and the DDC/BA system shall be a 2-wire, twisted and shielded, 4-20mA, 17-28 VDC configuration. Each sensor/transmitter shall cover between 5,000 and 10,000 square feet of the garage floor and placement shall be applied strategically and appropriately per floor plan requirements.
2. The sensor shall have stability and resolution of ± 0.5 ppm of reading, repeatability of ± 2% of reading, and a response time of 30 seconds to a 90% step change. The long-term output drift shall not exceed more than 0.4% of signal loss per month. The permissible ambient working temperature shall be 14°F to 104°F (-10°C to 40°C) and permissible ambient humidity shall be 15 to 95% RH, non-condensing. The sensor shall require no routine maintenance other than periodic calibration. Its life expectancy shall be 5 years of normal service. The manufacturer shall provide a two 2-year warranty for materials and workmanship, and a 12-month warranty on the sensing element under normal exposure.
3. The sensor/transmitter printed circuit board shall have the capability of adding up to (2) alarm relays with individual set-points for local control or status indication.
4. The sensor/transmitter shall be RFI/EMI protected and contained in a NEMA 1 metal enclosure to prevent vandalism. The enclosure for the sensor/transmitter shall be installed on walls or columns approximately 5 feet above the floor.
5. The output signal from the sensor/transmitter shall be a direct input to the DDC/BA system. All sequences of fan and alarm control, including time delay functions to prevent hunting of ventilation fans shall be a part of the DDC/BA system.
6. If the level of Carbon Monoxide reaches 25 ppm in the area of detection, the low alarm shall activate and the exhaust fans will be started. If the level of CO increases to 100 PPM, the high alarm shall activate.
7. The sensor/transmitter shall be NRTL performance tested and certified to ANSI/UL 2075.
8. The contractor shall supply the PolyGard® Series AT-1110 CO sensor/transmitter, by INTEC Controls; phone (858) 578-7887; fax (858) 578‑4633.
	1. **NITROGEN DIOXIDE (NO2) SENSOR/TRANSMITTER**
9. The Nitrogen Dioxide sensor/transmitter shall provide monitoring of the Nitrogen Dioxide levels present in diesel exhaust in the parking garage or loading dock and control the ventilation system via the DDC/BA system in accordance with all applicable codes and standards.
10. The sensors shall be electrochemical type. The sensor/transmitter shall have plug-in technology for ease of troubleshooting and replacement of both the sensing element and the printed circuit board. Solid-state sensors or air sampling devices shall not be acceptable.

1. The sensor range shall be 0-10 ppm to 0-20 ppm Nitrogen Dioxide via calibration. A micro-processor-based transmitter shall generate a polarity protected, proportional 4-20 mA output signal. The wiring between the transmitter and the DDC/BA system shall be a 2-wire, twisted and shielded, 4-20mA, 17-28 VDC configuration. Each sensor/transmitter shall cover between 4,000 and 6,000 square feet of the garage floor and placement shall be applied strategically and appropriately per floor plan requirements.
2. The sensor shall have an accuracy and resolution of ±0.1 PPM of reading, repeatability of ±2% of reading, and a response time of less than 40 seconds to a 90% step change. The sensor drift shall not exceed more than 2% signal loss per month. The permissible ambient working temperature shall be 14°F to 104°F (-10°C to 40°C) and the permissible ambient humidity shall be 15 to 95% RH, non-condensing. The sensor shall require no routine maintenance other than periodic calibration. Its life expectancy shall be 2 years of normal service. The manufacturer shall provide a two 2-year warranty for materials and workmanship, and a 12-month warranty on the sensing element under normal exposure.
3. The sensor/transmitter shall be RFI/EMI protected and contained in a NEMA 1 metal enclosure to prevent vandalism. The enclosure with the sensor/transmitter shall be installed on walls or columns approximately 1.5 ft. above the floor.
4. The sensor/transmitter shall have the capability of adding up to (2) relays as a separate component to the printed circuit board of the sensor.
5. The output signal from the sensor/transmitter shall be a direct input into the digital control building automation system. All sequences of fan and alarm control, including time delay functions to prevent hunting of ventilation fans shall be a part of the DDC/BA system.
6. If the level of NO2 reaches 2 ppm, the low alarm shall activate. If the level of NO2 increases to 5 ppm, the high alarm shall activate.
7. The contractor shall supply the PolyGard® Series AT-1130 NO2 sensor/transmitter, by INTEC Controls; phone (858) 578-7887; fax (858) 578‑4633.
	1. **COMBUSTIBLE GAS SENSOR/TRANSMITTER**
8. The combustible gas sensor/transmitter shall provide monitoring of the combustible gas levels in the designated area and control the ventilation system via the DDC/BA system in accordance with all applicable codes and standards.
9. The sensors shall be catalytic pellistor type. The sensor/transmitter shall have plug-in technology for ease of troubleshooting and replacement of both the sensing element and printed circuit board.

1. The sensor range shall be 0-100% LEL. A microprocessor-based transmitter shall generate a polarity protected, proportional 4-20 mA output signal. The wiring between the transmitter and the DDC/BA system shall be a 3-wire, twisted and shielded, 4-20mA, 17-28 VDC configuration. Each sensor/transmitter shall cover 2500 square feet, maximum 5,000 square feet (dependent on the target gas) of the designated area and placement shall be applied strategically and appropriately per floor plan requirements.
2. The sensor shall have an accuracy of ± 1% of reading, repeatability of ± 2% of reading, and a response time of less than 15 seconds to a 90% step change. The long-term output drift shall not exceed more than 1% LEL of methane signal loss per month. The permissible ambient working temperature shall be -4°F to 104°F (-20°C to 40°C) and permissible ambient humidity 15 to 95% RH, non-condensing. The sensor shall require no routine maintenance other than periodic calibration. Its life expectancy shall be 5 years of normal service. The manufacturer shall provide a two 2-year warranty for materials and workmanship, and a 12-month warranty on the sensing element under normal exposure.
3. The sensor transmitter shall have the capability of adding up to (2) relays as a separate component to the sensor’s printed circuit board.
4. The sensor transmitter shall be RFI/EMI protected and contained in a NEMA 1 metal enclosure to prevent vandalism. The sensor/transmitter shall be installed according to recommended mounting height dependent on the target gas (Refer to table “Mounting Height).
5. The output signal from the sensor/transmitter shall be a direct input to the digital control building automation system. All sequences of fan and alarm control, including time delay functions to prevent hunting of ventilation fans, shall be a part of the DDC/BA system.
6. If the level of gas reaches 20% LEL in the area of detection, the low alarm shall activate. If the level of gas increases to 40% LEL, the high alarm shall activate.
7. The sensor/transmitter shall be NRTL performance tested and certified to ANSI/UL 2075.
8. The contractor shall supply the PolyGard® Series AT-33XX **{*XX*=See chart below}** sensor/transmitter, by INTEC Controls; phone (858) 578‑7887; fax (858) 578-4633.

|  |  |  |  |
| --- | --- | --- | --- |
| ***XX***= | Gas to be Sensed | ***XX***= | Gas to be Sensed |
| **..5** | Acetylene | **..50** | Methanol |
| **..15** | Cyclohexane | **..55** | Methane |
| **..20** | Ethane | **..60** | n-Butane |
| **..25** | Ethyl Alcohol | **..70** | n-Octane |
| **..27** | Ethyl Acetate | **..75** | n-Pentane |
| **..30** | Gasoline | **..80** | Propane |
| **..35** | n-Hexane | **..85** | Acetone |
| **..40** | Hydrogen | **..90** | JP8 |
| **..45** | Isopropyl Alcohol |   |   |

* 1. **AMMONIA SENSOR/TRANSMITTER**
1. The ammonia sensor/transmitter shall provide monitoring of the ammonia levels in the designated area and control the ventilation system via the DDC/BA system in accordance with all applicable codes and standards.
2. The sensors shall be electrochemical type. The sensor/transmitter shall have plug-in technology for ease of troubleshooting and replacement for both element and pc board. Solid-state sensors and air sampling systems are not acceptable.

1. The sensor range shall be 0-300 ppm ammonia. A micro-processor-based transmitter shall generate a polarity protected, proportional 4-20 mA output signal. The wiring between the transmitter and the DDC/BA system shall be a 2-wire, twisted and shielded, 4-20mA, 17-28 VDC configuration. Each sensor/transmitter shall cover 2,000 square ft. of the designated area and placement shall be applied strategically and appropriately per floor plan requirement.
2. The sensor accuracy shall be ±3 ppm of reading, repeatability of ±3 ppm of reading, with a response time of less than 40 seconds. The permissible ambient working temperature shall be 32°F to 104°F (0°C to 40°C) or -40°F to 104°F (-40°C to 40°C) for low temperature applications. The permissible ambient humidity shall be 0 to 99% RH, non-condensing. The sensor shall require no routine maintenance other than periodic verification & calibration. Its life expectancy shall be 1 to 2 years of normal service. The manufacturer shall provide a two 2-year warranty for materials and workmanship, and a 12-month warranty on the sensing element under normal exposure.
3. The sensor/transmitter shall be RFI/EMI protected and contained in a NEMA 2 metal enclosure to prevent vandalism. The enclosure that contains the sensor/transmitter shall be installed on walls or columns approximately 0.5 to 1.50 ft. below the ceiling.
4. The output signal from the sensor/transmitter shall be a direct input to the digital control building automation system. All sequences of fan and alarm control, including time delay functions to prevent hunting of ventilation fans, shall be part of the DDC/BA system.
5. If the gas concentration reaches 25 ppm in the area of detection, the low alarm shall activate. If the level of gas increases to 35 ppm, the high alarm shall activate.
6. The contractor shall supply the PolyGard® Series AT-1120 or AT-1125 sensor/transmitter, by INTEC Controls; phone (858) 578-7887; fax (858) 578-4633.
	1. **SUPPLIER**

The contractor shall supply all gas detection transmitters and associated products by INTEC Controls; phone (858) 578-7887; fax (858) 578-4633.

* 1. **WARRANTY**

The manufacturer shall provide a two 2-year warranty for materials and workmanship, and a 12-month warranty on the sensing element under normal exposure.

### PART 3 – EXECUTION

* 1. **INSPECTION**

General: Examine areas and conditions under which gas monitoring and control system shall be installed. Related items shall be examined as well.

* 1. **CONTROL SEQUENCE**

The BAS shall operate according to the specifications recommended by the manufacturer. The operation shall be as follows:

* + - 1. The BAS software shall be programmed to the desired set points before operation.
			2. The controller shall continuously detect the surrounding air for any traces of the gas detected.
			3. When the low alarm set point is reached, the BAS shall activate the corresponding devices, such as the exhaust fans, dampers, etc.
			4. If the gas level continues to increase to the high alarm set point, the BAS shall activate the corresponding devices, such as the audio/visual alarm, etc.
			5. The sensor shall continue to trace the specified gas and the BAS will not disable the alarm until the gas level is dropped a significant percentage below the alarm set points.

**3.4 OPERATION AND MAINTENANCE MANUALS**

The operation and maintenance manuals shall contain all information necessary for the operation, maintenance, replacement, installation, and parts procurement for the entire gas detection system. This documentation shall include specific part numbers.

* 1. **AS-BUILT DOCUMENTATION**

Following project completion and testing, the BAS contractor will submit as-built drawings reflecting the exact installation of the system.

* 1. **CALIBRATION/VERIFICATION**

Calibration shall be not necessary to verify system operation. The user shall verify signal transmission from the sensor to the automation system by applying appropriate test gas to the corresponding sensor. The calibration kit can be used for system verification or sensor calibration when required. One calibration kit shall be provided by the contractor. It may be purchased from INTEC Controls; phone (858) 578-7887; fax (858) 578-4633.