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Preparing Activity:    NASA                      Superseding  
   UFGS-28 33 00.00 40 (June 2006)  
   NASA-13854S (December 2005)

## UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated 9 October 2006

Latest change indicated by CHG tags

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#### DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

##### SECTION 28 33 00.00 40

##### FUEL-GAS DETECTION AND ALARM

01/07

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### SECTION 28 33 00.00 40

#### FUEL-GAS DETECTION AND ALARM 01/07

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NOTE: Delete, revise, or add to the text in this section to cover project requirements. Notes are for designer information and will not appear in the final project specification.

This section covers equipment, performance, and testing of stationary electrical instruments used for sensing the presence of combustible gases, or the deficiency of oxygen, in ambient air.

Comments and suggestions on this guide specification are welcome and should be directed to the technical proponent of the specification. A listing of technical proponents, including their organization designation and telephone number, is on the Internet.

Recommended changes to a UFGS should be submitted as a Criteria Change Request (CCR).

Use of electronic communication is encouraged.

Brackets are used in the text to indicate designer choices or locations where text must be supplied by the designer.

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## PART 1    GENERAL

### 1.1    REFERENCES

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NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a RID outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

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The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

COMPRESSED GAS ASSOCIATION (CGA)

CGA P-39 (2003) Oxygen-Rich Atmospheres

ELECTRONIC INDUSTRIES ALLIANCE (EIA)

EIA 310-D (1992) Standard for Racks, Panels, and Associated Equipment

ISA - THE INSTRUMENTATION, SYSTEMS AND AUTOMATION SOCIETY (ISA)

ISA S12.13.01 (2003) Performance Requirements for Combustible Gas Detectors

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 110 (2005 Ed) Standard for Emergency and Standby Power Systems

NFPA 70 (2005) National Electrical Code

NFPA 72 (2002) National Fire Alarm Code

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-STD 461 (Rev E; 1999) Electromagnetic Emission and Susceptibility Requirements for the Control of Electromagnetic Interference

MIL-STD 462 (Rev D; 1993) Measurement of Electromagnetic Interference Characteristics

1.2 SUBMITTALS

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NOTE: Review Submittal Description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's Quality Control system. Only add a "G" if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.

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Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are [for Contractor Quality Control approval.] [for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

#### SD-01 Preconstruction Submittals

Material, Equipment, and Fixture Lists shall be submitted in accordance with paragraph entitled, "General," of this section.

#### SD-02 Shop Drawings

The following shall be submitted in accordance with paragraph entitled, "General," of this section.

Connection Diagrams  
Record Drawings

#### SD-03 Product Data

Manufacturer's Catalog Data shall be submitted in accordance with paragraph entitled, "General," of this section.

#### SD-04 Samples

Samples of detectors used shall be submitted in accordance with paragraph entitled, "Detectors," of this section.

#### SD-07 Certificates

Listing of Product Installations shall be submitted in accordance with paragraph entitled, "Installation," of this section.

#### SD-10 Operation and Maintenance Data

Operation and Maintenance Manual information shall be submitted in accordance with paragraph entitled, "System Description," of this section.

### 1.3 SYSTEM DESCRIPTION

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NOTE: If Section 26 00 00.00 20 BASIC ELECTRICAL MATERIALS AND METHODS is not included in the project specification, applicable requirements therefrom should be inserted and the following paragraph deleted.  
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Section 26 00 00.00 20 BASIC ELECTRICAL MATERIALS AND METHODS applies to work specified in this section.

Contractor shall furnish [\_\_\_\_\_] [four] copies of a Operation and Maintenance Manual giving complete instructions for the operation, inspection, testing, and maintenance of the system, including wiring diagrams and equipment malfunction checklist.

#### 1.3.1 Design Requirements

##### 1.3.1.1 Schematics

Schematics shall not be "typicals" but shall show the specific equipment to be furnished.

##### 1.3.1.2 Combustible Gas Environments

System shall provide electrically supervised detection and [\_\_\_\_\_] [noncoded] alarm for combustible gas in Class I, Division 1, Group [\_\_\_\_\_] [C and D] locations. Design shall comply with applicable requirements of NFPA 70, NFPA 72, [and [\_\_\_\_\_] ].

##### 1.3.1.3 Oxygen Deficient Atmospheres

System shall provide electrically supervised detection and [\_\_\_\_\_] [noncoded] alarm of oxygen deficient atmospheres. [Design shall comply with applicable requirements of [\_\_\_\_\_] ].

#### 1.3.2 Performance Requirements

Performance shall conform to requirements of [\_\_\_\_\_] [ISA S12.13.01].

Operation of any detection device shall result in control unit relays automatically activating [remote alarms] [, and lights].

## PART 2 PRODUCTS

### 2.1 GENERAL

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**NOTE: Local policies may dictate more elaborate procedures for qualification or approval of detector samples.**

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When spot-type detectors are used, the Record Drawings required by Section 26 00 00.00 20 BASIC ELECTRICAL MATERIALS AND METHODS shall show by number the detectors in the exact sequence in which they are installed in the circuit.

Name of the manufacturer and the serial numbers shall appear on all major components.

Connection Diagrams shall be submitted showing a complete conduit and wiring layout for the equipment to be furnished, including AWG size and type of wire, and number of conductors and connections to the equipment.

Record Drawings shall provide current factual information including deviations and amendments to the drawings, and concealed and visible changes in the work.

Manufacturer's Catalog Data shall be submitted for the [combustible gas] [oxygen deficient atmospheres] detection systems including special tools necessary for the maintenance of the equipment. Spare parts data shall be submitted consisting of one set of fuses of each type and size required, and a [\_\_\_\_\_] [hydrogen] gas calibration kit.

Material, Equipment, and Fixture Lists shall include manufacturer's style or catalog numbers, specification and drawing reference numbers, independent testing laboratory reports, and related descriptive matter on the devices to be installed.

## 2.2 ELECTROMAGNETIC COMPATIBILITY

Electrical and electronic systems shall be designed to operate without causing electromagnetic interference to, or malfunctioning due to electromagnetic interference from, other systems or equipment, and shall be in accordance with applicable requirements of [ISA S12.13.01], [\_\_\_\_\_] [MIL-STD 461] and [MIL-STD 462].

## 2.3 CONTROL UNIT

### 2.3.1 General Requirements

Control unit shall be [\_\_\_\_\_] [dual] channel, operating over a temperature range of [\_\_\_\_\_] [32 to 125] degrees F [0 to 51] degrees C. Each control unit shall be capable of monitoring [\_\_\_\_\_] [two] detectors.

Control unit shall be housed in a [\_\_\_\_\_] [weatherproof] cabinet suitable for [\_\_\_\_\_] [wall] mounting [in a Class I, Division 1, Group [\_\_\_\_\_] location]. Relays shall be [\_\_\_\_\_] [solid state] [plug-in] type. Rectifiers shall be solid state type.

### 2.3.2 Control Circuits

Circuits shall be solid state, with plug-in type circuit boards, in a housing [conforming to EIA 310-D,] suitable for [Class 1, Group [\_\_\_\_\_] [non-hazardous] locations.

### 2.3.3 Power Supply Component

Transformer, rectifier, resistors, charger, batteries and other required power-supply components shall be incorporated in the control unit, or a separate power-supply unit may be furnished and installed as approved for the application.

### 2.3.4 Indicator Light and Reset

Each control unit shall have [buttons for test, and] indicator lights for Power, [Malfunction,] and Alarm. Indicator lamps shall be color coded as follows: Power (green), [Malfunction [(yellow)] [(\_\_\_\_),] and Alarm [(\_\_\_\_)] [(red)]]]. Zero, Alarm, and Calibration settings shall be adjustable.

### 2.3.5 Malfunction Circuits

Sensing circuits shall be monitored by individual malfunction circuits. Open circuit shall activate malfunction light and operate relays for [remote] warning signal [and lights].

### 2.3.6 Alarm

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**NOTE: Exercise care to ensure options selected properly satisfy project requirements.**  
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Unit shall be arranged to operate alarm relays, activating audible and visible alarms, and continue operation until [[reset by a keyed switch] [silenced by a switch] [in] [on] the unit cabinet] [or] [the atmosphere returns to set conditions].

[Reset key shall not be removable until conditions have returned to normal.] [Cabinet shall be locked by the same key used to reset the alarm relays.] [Operation of the silencing switch shall light an indicator lamp, which shall be plainly visible when the cabinet is closed.]

Audible alarm and [\_\_\_\_\_] [red] rotating alarm beacon shall be provided [as indicated].

## 2.4 DETECTORS

If detectors have not been previously qualified and approved for installation, [samples](#) of detectors shall be submitted.

### 2.4.1 Circuit Design

Detector circuit design shall be suitable for the types and numbers of detectors, as approved, and detector circuit current shall not exceed ratings of the individual detectors and associated relays.

### 2.4.2 Combustible Gas Detector

Combustible gas detector shall be [\_\_\_\_\_] [diffusion] [sample draw] type [\_\_\_\_\_] [catalytic] sensor [meeting the requirements of [ISA S12.13.01](#),] in a housing suitable for the environment, and shall be intrinsically safe for use in Class I, Division 1, Group [\_\_\_\_\_] locations.

Output signal shall be [\_\_\_\_\_] [4-20 mA]. Operating range shall be [\_\_\_\_\_] [minus 40 to 165] degrees F [minus 40 to 74] degrees C.

#### 2.4.3 Oxygen Detector

Oxygen detector shall be [\_\_\_\_\_] [a paramagnetic] [an electrochemical] cell [meeting the requirements of CGA P-39]. Minimum shelf life shall be [\_\_\_\_\_] [6] months.

Output signal shall be [\_\_\_\_\_] [4-20 mA]. Operating range shall be [\_\_\_\_\_] [40 to 90] degrees F [4 to 33] degrees C, [\_\_\_\_\_] [10 to 100] percent relative humidity. Measurement shall be adjustable through a range of [\_\_\_\_\_] [0 to 25] percent oxygen-in-air, and actuation level shall be set at 19.5 percent oxygen.

#### 2.5 POWER SUPPLY

Primary power supply shall be a [\_\_\_\_\_] [120]-volt, 60 Hz source. An alternate source of power, arranged to become energized automatically within at least [ten] [\_\_\_\_\_] seconds upon loss of normal power, in accordance with NFPA 110, shall be provided.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

Listing of Product Installations for combustible gas detection systems shall include identification of at least 5 units, include identification of at least 5 units, similar to those proposed for use, that have been in successful service for a minimum period of 5 years. List shall include such data as number of false alarms and malfunctions experienced while in service over a period of [\_\_\_\_\_] [2] years.

##### 3.1.1 Combustible Gas Systems

Installation of combustible gas detection and alarm systems shall comply with NFPA 70 and applicable requirements of NFPA 72 [, and [\_\_\_\_\_] ].

##### 3.1.2 Oxygen Deficiency Systems

Installation of oxygen detection and alarm systems shall comply with NFPA 70 [and] [\_\_\_\_\_] .

#### 3.2 GROUNDING

Grounding shall be in accordance with NFPA 70.

#### 3.3 TESTS

Performance tests shall be conducted in accordance with ISA S12.13.01 [\_\_\_\_\_] .

Operation of the entire system shall be tested in operational and alarm modes. Each detector shall be activated by [\_\_\_\_\_] [a hydrogen gas bottle representing the adjusted Lower Flammable Limit (LFL)]. Malfunction feature shall be tested for each control unit.

-- End of Section --