

\*\*\*\*\*  
USACE / NAVFAC / AFCEC / NASA UFGS-28 33 00.00 40 (February 2014)  
-----  
Preparing Activity: NASA Superseding  
UFGS-28 33 00.00 40 (February 2011)

## UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated October 2015

\*\*\*\*\*

### SECTION TABLE OF CONTENTS

#### DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

#### SECTION 28 33 00.00 40

#### FUEL-GAS DETECTION AND ALARM

02/14

#### PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 ADMINISTRATIVE REQUIREMENTS
  - 1.3.1 Pre-Installation Meetings
- 1.4 MAINTENANCE MATERIALS
- 1.5 WARRANTY

#### PART 2 PRODUCTS

- 2.1 SYSTEM DESCRIPTION
  - 2.1.1 Design Requirements
    - 2.1.1.1 Schematics
    - 2.1.1.2 Combustible Gas Environments
    - 2.1.1.3 Oxygen Deficient Atmospheres
  - 2.1.2 Performance Requirements
  - 2.1.3 Electromagnetic Compatibility
- 2.2 COMPONENTS
  - 2.2.1 Control Unit
    - 2.2.1.1 Control Circuits
    - 2.2.1.2 Power Supply Component
    - 2.2.1.3 Indicator Light and Reset
    - 2.2.1.4 Malfunction Circuits
    - 2.2.1.5 Alarm
  - 2.2.2 Detectors
    - 2.2.2.1 Circuit Design
    - 2.2.2.2 Combustible Gas Detector
    - 2.2.2.3 Oxygen Detector
  - 2.2.3 Power Supply
- 2.3 EQUIPMENT

#### PART 3 EXECUTION

- 3.1 INSTALLATION
  - 3.1.1 Combustible Gas Systems

- 3.1.2 Oxygen Deficiency Systems
- 3.1.3 Grounding
- 3.2 FIELD QUALITY CONTROL
- 3.3 CLOSEOUT ACTIVITIES
  - 3.3.1 Warranty
  - 3.3.2 Record drawings

-- End of Section Table of Contents --

\*\*\*\*\*  
USACE / NAVFAC / AFCEC / NASA UFGS-28 33 00.00 40 (February 2014)  
-----  
Preparing Activity: NASA Superseding  
UFGS-28 33 00.00 40 (February 2011)

## UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated October 2015

\*\*\*\*\*

### SECTION 28 33 00.00 40

#### FUEL-GAS DETECTION AND ALARM 02/14

\*\*\*\*\*

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

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).

\*\*\*\*\*

## PART 1 GENERAL

\*\*\*\*\*

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.

\*\*\*\*\*

Section 26 00 00.00 20 BASIC ELECTRICAL MATERIALS AND METHODS applies to work specified in this section.

## 1.1 REFERENCES

\*\*\*\*\*

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.

\*\*\*\*\*

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 (2015) Oxygen-Rich Atmospheres; 2nd Edition

#### ELECTRONIC COMPONENTS INDUSTRY ASSOCIATION (ECIA)

ECIA EIA/ECA 310-E (2005) Cabinets, Racks, Panels, and Associated Equipment

#### INTERNATIONAL SOCIETY OF AUTOMATION (ISA)

ANSI/ISA 12.13.01 (2002) Performance Requirements for Combustible Gas Detectors

#### NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 110 (2016) Standard for Emergency and Standby Power Systems

NFPA 70 (2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3-4 2014; AMD 4-6 2014) National Electrical Code

NFPA 72 (2013) National Fire Alarm and Signaling Code

#### U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-STD-461 (2007; Rev F) Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment

## 1.2 SUBMITTALS

\*\*\*\*\*

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.

The Guide Specification technical editors have designated those items that require Government approval, due to their complexity or criticality, with a "G." Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a "G" to an item, 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.

An "S" following a submittal item indicates that the submittal is required for the Sustainability Notebook to fulfill federally mandated sustainable requirements in accordance with Section 01 33 29 SUSTAINABILITY REPORTING.

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

\*\*\*\*\*

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.] Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Material, Equipment, and Fixture Lists[; G[, [\_\_\_\_]]]

Manufacturer's Sample Warranty[; G[, [\_\_\_\_]]]

SD-02 Shop Drawings

Connection Diagrams[; G[, [\_\_\_\_]]]

SD-03 Product Data

Manufacturer's Catalog Data[; G[, [\_\_\_\_]]]

Spare Parts Data[; G[, [\_\_\_\_]]]

[ SD-04 Samples

Samples[; G[, [\_\_\_\_]]]

] SD-07 Certificates

Listing of Product Installations[; G[, [\_\_\_\_]]]

SD-10 Operation and Maintenance Data

Operation and Maintenance Manual[; G[, [\_\_\_\_]]]

SD-11 Closeout Submittals

Warranty[; G[, [\_\_\_\_]]]

Record Drawings[; G[, [\_\_\_\_]]]

### 1.3 ADMINISTRATIVE REQUIREMENTS

#### 1.3.1 Pre-Installation Meetings

Within [30] [\_\_\_\_] days of Contract Award submit the following to the Contracting Officer for review:

- a. Material, equipment, and fixture lists
- b. Listing of product installations
- c. Manufacturer's sample warranty
- d. Manufacturer's catalog data
- e. Connection Diagrams
- f. Spare parts data

When submitting Listing of Product Installations for combustible gas detection systems, 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. Also include such data as number of false alarms and malfunctions experienced while in service over a period of [\_\_\_\_] [2] years.

#### 1.4 MAINTENANCE MATERIALS

Submit [\_\_\_\_] [four] copies of an operation and maintenance manual giving complete instructions for the operation, inspection, testing, and maintenance of the system, including wiring diagrams and equipment malfunction checklist.

#### 1.5 WARRANTY

Submit a sample warranty for approval by the Contracting Officer.

## PART 2 PRODUCTS

### 2.1 SYSTEM DESCRIPTION

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

#### 2.1.1 Design Requirements

##### 2.1.1.1 Schematics

Submit schematic drawings showing the specific equipment to be furnished;  
no "typical's".

##### 2.1.1.2 Combustible Gas Environments

Provide system with electrically supervised detection and [\_\_\_\_\_] [noncoded] alarm for combustible gas in Class I, Division 1, Group [\_\_\_\_\_] [C and D] locations, conforming to the applicable requirements of NFPA 70, NFPA 72, [and [\_\_\_\_\_] ].

##### 2.1.1.3 Oxygen Deficient Atmospheres

Provide system with electrically supervised detection and [\_\_\_\_\_] [noncoded] alarm of oxygen deficient atmospheres[, conforming to the applicable requirements of [\_\_\_\_\_] ].

#### 2.1.2 Performance Requirements

Provide system with performance conforming to the requirements of FM Approval Standard for Combustible Gas Detectors (Class Number 6310 and 6320), and [\_\_\_\_\_] [ANSI/ISA 12.13.01]. Ensure the operation of any detection device results in control unit relays automatically activating [remote alarms] [, and lights].

Ensure the name of the manufacturer and the serial numbers appear on all major components. Submit the following:

- a. Connection diagrams 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.
- b. Manufacturer's catalog data for the [combustible gas] [oxygen deficient atmospheres] detection systems including special tools necessary for the maintenance of the equipment.
- c. Material, equipment, and fixture lists including 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.

#### 2.1.3 Electromagnetic Compatibility

Ensure design of electrical and electronic systems operate without causing electromagnetic interference to, or malfunctioning due to electromagnetic interference from, other systems or equipment, and in accordance with

applicable requirements of [ANSI/ISA 12.13.01] [\_\_\_\_\_] [MIL-STD-461].

## 2.2 COMPONENTS

### 2.2.1 Control Unit

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

Provide control unit housed in a [\_\_\_\_\_] [weatherproof] cabinet suitable for [\_\_\_\_\_] [wall] mounting [in a Class I, Division 1, Group [\_\_\_\_\_] location] with [\_\_\_\_\_] [solid state] [plug-in] type relays and solid state rectifiers.

#### 2.2.1.1 Control Circuits

Provide control unit with plug-in type circuit boards, in a housing [conforming to ECIA EIA/ECA 310-E,] suitable for [Class 1, Group [\_\_\_\_\_] [non-hazardous] locations].

#### 2.2.1.2 Power Supply Component

Provide [control unit with transformer,, rectifier, resistors, charger, batteries and other required power-supply components incorporated][a separate power-supply unit as approved for the application].

#### 2.2.1.3 Indicator Light and Reset

Provide each control unit with [buttons for test, and] indicator lights for Power, [Malfunction,] and Alarm. Color code indicator lamps as follows: Power (green), [Malfunction [(yellow)] [[\_\_\_\_\_] and Alarm [[\_\_\_\_\_] [[red]]]. Zero, Alarm, with adjustable calibration settings.

#### 2.2.1.4 Malfunction Circuits

Ensure sensing circuits are monitored by individual malfunction circuits. Open circuit will activate malfunction light and operate relays for [remote] warning signal [and lights].

#### 2.2.1.5 Alarm

\*\*\*\*\*  
**NOTE: Exercise care to ensure options selected  
properly satisfy project requirements.**  
\*\*\*\*\*

Arrange the unit 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].

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

Provide audible alarm and [\_\_\_\_\_] [red] rotating alarm beacon [as indicated].



Provide alarm system with capability to transmit individual alarms [to the base-wide fire reporting system] [to security] and/or [base-wide utility monitoring system].

## 2.2.2 Detectors

If detectors have not been previously qualified and approved for installation at this project location, submit samples of detectors.

### 2.2.2.1 Circuit Design

Ensure detector circuit design is suitable for the types and numbers of detectors, as approved, and detector circuit current does not exceed ratings of the individual detectors and associated relays.

Electrically supervise the circuits to the detectors for [grounds] [opens] and/or [shorts].

### 2.2.2.2 Combustible Gas Detector

Provide [\_\_\_\_\_] [diffusion] [sample draw] type Combustible Gas Detector (CGD) [with] [\_\_\_\_\_] [catalytic] sensor [meeting the requirements of ANSI/ISA 12.13.01,] in a housing suitable for the environment, and intrinsically safe for use in Class I, Division 1, Group [\_\_\_\_\_] locations.

Provide combustible gas detector that detects combustible vapors that are produced from flammable liquids such as gasoline, ethanol, etc.

Provide CGD with [\_\_\_\_\_] [4-20 mA] output signal, with an operating range of [\_\_\_\_\_] [minus 40 to 74] degrees C [minus 40 to 165] degrees F.

Provide CGD with a visible and audible alarm that actuates at [\_\_\_\_\_] percent of LEL. [Provide CGD that includes a pre-alarm that actuates at [\_\_\_\_\_] percent.]

### 2.2.2.3 Oxygen Detector

Provide [\_\_\_\_\_] [a paramagnetic] [an electrochemical] cell Oxygen Detector (OD) [meeting the requirements of CGA P-39], with a minimum shelf life of [\_\_\_\_\_] [6] months, and the following:.

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

## 2.2.3 Power Supply

Provide with a [\_\_\_\_\_] [120]-volt, 60 Hz source power supply, and 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.

## 2.3 EQUIPMENT

Furnish fuses of each type and size required, and a [\_\_\_\_\_] [hydrogen] gas calibration kit.

## PART 3 EXECUTION

### 3.1 INSTALLATION

#### 3.1.1 Combustible Gas Systems

Ensure installation of combustible gas detection and alarm systems complies with NFPA 70 and applicable requirements of NFPA 72 [, and [\_\_\_\_\_] ].

#### 3.1.2 Oxygen Deficiency Systems

Ensure installation of oxygen detection and alarm systems complies with NFPA 70 [and] [\_\_\_\_\_] .

#### 3.1.3 Grounding

Install grounding in accordance with NFPA 70.

### 3.2 FIELD QUALITY CONTROL

Conduct performance tests in accordance with ANSI/ISA 12.13.01 [\_\_\_\_\_] .

Test operation of the entire system in operational and alarm modes. Activate each detector by [\_\_\_\_\_] [a hydrogen gas bottle representing the adjusted Lower Flammable Limit (LFL)]. Test malfunction feature for each control unit.

### 3.3 CLOSEOUT ACTIVITIES

#### 3.3.1 Warranty

Submit [3] [\_\_\_\_\_] signed original warranties to the Contracting Officer.

#### 3.3.2 Record drawings

Provide current factual information including deviations and amendments to the drawings, and concealed and visible changes in the work. When spot-type detectors are used, show by number the detectors in the exact sequence in which they are installed in the circuit.

-- End of Section --