UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated January 2021
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SECTION TABLE OF CONTENTS

DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

SECTION 28 31 02.00 20

FIRE ALARM REPORTING SYSTEMS - DIGITAL COMMUNICATORS

02/10

PART 1 GENERAL

1.1 REFERENCES
1.2 DESCRIPTION OF WORK
1.3 SYSTEM DESCRIPTION
1.3.1 SYSTEM DESIGN
1.3.2 Power Calculations
1.4 SUBMITTALS
1.5 QUALITY ASSURANCE
1.5.1 Qualifications of Installer
1.5.2 Manufacturer's Representative
1.5.3 Qualifications of System Technician
1.5.4 Regulatory Requirements
1.5.5 Drawing Requirements
1.5.5.1 System Floor Plans
1.5.5.2 System Wiring Diagrams
1.5.5.3 System As-built Drawings
1.5.6 System UL Listing or FM Approval
1.6 MAINTENANCE
1.6.1 Spare Parts
1.6.2 Manuals

PART 2 PRODUCTS

2.1 DIGITAL ALARM COMMUNICATOR TRANSMITTER (DACT)
2.1.1 Transmitter Identity Code
2.1.2 Transmission Confirmation
2.1.3 Automatic DACT Test
2.1.4 Battery Supervision
2.1.5 Trouble Supervision
2.1.6 DACT Power Supplies
2.1.6.1 Battery Power Supply
2.2 OVERVOLTAGE AND SURGE PROTECTION
2.2.1 Power Line Surge Protection
2.2.2 Communications Link Surge Protection
2.2.3 Sensor Wiring Surge Protection

2.3 DIGITAL ALARM COMMUNICATOR RECEIVER (DACR)
2.3.1 Display
2.3.2 Memory
2.3.3 Digital Clock
2.3.4 Printers
2.3.5 Audible Trouble and Alarm Devices
2.3.6 Power Supplies
2.3.7 Emergency Power Source
2.3.7.1 Emergency Power Switchover
2.3.8 Console Battery Charger
2.3.9 Console Supervision
2.3.10 Power Supervision
2.3.11 Electrical Connections
2.4 CONDUIT
2.4.1 Rigid Steel Conduit (Zinc-Coated)
2.4.2 Intermediate Metal Conduit (IMC)
2.4.3 Electrical Metallic Tubing (EMT)
2.5 OUTLET BOXES
2.6 WIRING
2.7 GROUND RODS

PART 3 EXECUTION

3.1 INSTALLATION
3.1.1 Continuity of Protection
3.2 FIELD QUALITY CONTROL
3.2.1 Preliminary Testing
3.3 FINAL ACCEPTANCE TEST
3.4 ADDITIONAL TESTS
3.5 MAINTENANCE INSTRUCTIONS
3.6 INSTRUCTION OF GOVERNMENT PERSONNEL

-- End of Section Table of Contents --

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USACE / NAVFAC / AFCEC / NASA	**UFGS-28 31 02.00 20 (February 2010)**

Preparing Activity: NAVFAC	**Superseding**
	UFGS-28 31 02.00 20 (November 2009)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated January 2021

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SECTION 28 31 02.00 20

FIRE ALARM REPORTING SYSTEMS - DIGITAL COMMUNICATORS
02/10

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NOTE: This guide specification covers the requirements for a complete base-wide municipal-type fire alarm system which provides reporting of fire alarms to a central location through the use of digital alarm communicator transmitters connected to various building interior fire alarm systems.

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 item(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).

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NOTE: Interior building fire alarm systems are covered by Section 28 31 60 INTERIOR FIRE ALARM SYSTEM, NON-ADDRESSABLE, Section 28 31 66 INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM, NON-ADDRESSABLE, Section 28 31 70 INTERIOR FIRE ALARM SYSTEM, ADDRESSABLE, and Section 28 31 76 INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM, ADDRESSABLE.

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NOTE: The following information shall be shown on the drawings:

1. A complete layout of the fire alarm watch office showing locations of new equipment and existing equipment that is to remain. Show points of connection to power supplies.
2. Locations of digital alarm communicator transmitters to be installed.
3. Locations of local alarm systems and initiating devices to be connected to digital alarm communicator transmitters, and points of connection to AC power (Note: AC power shall be obtained ahead of the main disconnects).
4. A table showing each transmitter location, phone number, and the number of auxiliary zones to be connected and their descriptions (e.g., Bldg. 591, phone numbers: 555-1212, 555-1213; Zone 1 - FACP Zone 1; Zone 2 - FACP Zone 2; Zone 3 - Sprinkler Riser, etc.).
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PART 1 GENERAL

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 Reference Identifier (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.

FM GLOBAL (FM)

FM APP GUIDE	(updated on-line) Approval Guide http://www.approvalguide.com/

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C62.41.1	(2002; R 2008) Guide on the Surges Environment in Low-Voltage (1000 V and Less) AC Power Circuits

IEEE C62.41.2	(2002) Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI C80.1	(2005) American National Standard for Electrical Rigid Steel Conduit (ERSC)
ANSI C80.3	(2015) American National Standard for Electrical Metallic Tubing (EMT)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2020; ERTA 20-1 2020; ERTA 20-2 2020; TIA 20-1; TIA 20-2; TIA 20-3; TIA 20-4) National Electrical Code
NFPA 72	(2019; TIA 19-1; ERTA 1 2019) National Fire Alarm and Signaling Code

UNDERWRITERS LABORATORIES (UL)

UL 467	(2013; Reprint Jun 2017) UL Standard for Safety Grounding and Bonding Equipment
UL 514A	(2013; Reprint Aug 2017) UL Standard for Safety Metallic Outlet Boxes
UL 514B	(2012; Reprint May 2020) Conduit, Tubing and Cable Fittings
UL 1242	(2006; Reprint Aug 2020) Standard for Electrical Intermediate Metal Conduit -- Steel
UL Fire Prot Dir	(2012) Fire Protection Equipment Directory

1.2 DESCRIPTION OF WORK

Work includes provision of labor, material, tools and equipment necessary for and incidental to the provision of a complete and usable base-wide digital alarm communicator fire alarm system. The system shall be in accordance with NFPA 72 and as specified herein. Materials and equipment furnished under this contract shall be the current products of one manufacturer regularly engaged in production of such equipment. Electronics shall be solid state. The system shall be listed by the Underwriters' Laboratories (UL) or approved by Factory Mutual Engineering and Research (FM) as a public fire reporting system, in accordance with NFPA 72. Equipment used to interconnect the system with local building fire alarm systems shall be UL listed or FM approved, in accordance with NFPA 72. As an alternate to the above listing requirements, all equipment shall be UL Fire Prot Dir listed or FM APP GUIDE approved as a proprietary protective signaling system in accordance with NFPA 72, provided the system meets the requirements as specified herein without violating such listing or approval. The system shall conform to the Federal Communications Commission's rules and regulations concerning connection of telephone equipment, systems, and protective apparatus to the public switched telephone network. In the National Fire Protection Association

(NFPA) publications referred to herein, the advisory provisions shall be considered mandatory, as though the word "shall" had been substituted for "should" wherever it appears; reference to the "authority having jurisdiction" shall be interpreted to mean the [[_____] Division] [Engineering Field Activity [_____]], Naval Facilities Engineering Command, Fire Protection Engineer

1.3 SYSTEM DESCRIPTION

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NOTE: Include all types of initiation devices/panels to which system shall be connected. A/E shall investigate existing systems in each building. In some cases it may be necessary to replace old, unapproved "drill panels" and shunt systems with new local energy panel/systems (refer to Section 28 31 60 INTERIOR FIRE ALARM SYSTEM, NON-ADDRESSABLE, Section 28 31 66 INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM, NON-ADDRESSABLE, Section 28 31 70 INTERIOR FIRE ALARM SYSTEM, ADDRESSABLE, Section 28 31 76 INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM, ADDRESSABLE, as appropriate).

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1.3.1 SYSTEM DESIGN

System shall be a complete base-wide public fire reporting system, complying with NFPA 72, except as modified herein. The exterior fire alarm reporting and receiving system shall comply with NFPA 72 [2], [3], [4], [5-8]-line Hunt Group. The system shall consist of digital alarm communicator transmitters (DACT) at each protected premise and digital alarm communicator receivers (DACR) at the fire alarm receiving station located at [_____]. The system shall be supervised such that any telephone line connected to a DACT which fails due to loss of line voltage shall be annunciated at the receiving station. The system shall be designed to operate from direct current supplied from a rectifier and from storage batteries. The system shall be designed to record alarm and trouble information from each DACT as well as supervisory alarms received at the DACR. Provide spare DACRs in accordance with NFPA 72. Connect system to existing [and new] local building fire alarm systems, [and] [sprinkler water flow detectors] [and] [existing] [manual pull stations] [and] [existing extinguishing system control panels] as shown to form auxiliary alarm systems in accordance with NFPA 72.[New local energy fire alarm systems are specified in [Section 28 31 60 INTERIOR FIRE ALARM SYSTEM, NON-ADDRESSABLE] [Section 28 31 66 INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM, NON-ADDRESSABLE] [Section 28 31 70 INTERIOR FIRE ALARM SYSTEM, ADDRESSABLE] [Section 28 31 76 INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM, ADDRESSABLE].][System shall include [street boxes] [and] [master boxes] as specified herein and where shown, to allow manual initiation of fire alarm transmission by the general public.]

1.3.2 Power Calculations

Submit design calculations to substantiate battery capacity exceeds supervisory and alarm power requirements for digital alarm communicator transmitters, receiving consoles and interface panels (if provided).

1.4 SUBMITTALS

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NOTE: Review Submittal Description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. The Guide Specification technical editors have classified 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 Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters 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.

The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.

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" or "S" classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

The Fire Protection Engineer, Naval Facilities Engineering Command, [_____] will review and approve all submittals in this section requiring Government approval.

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NOTE: For projects administered by NAVFAC PAC, use the submittal paragraph below in lieu of the above paragraph. Delete the "G" in the asterisk tokens after each submittal item, except under "SD-08, Statements."

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[The Pacific Division, Naval Facilities Engineering Command delegates the

authority for review and approval of all submittals required by this section to the U.S. Registered Fire Protection Engineer employed in the quality control (QC) organization, specified under Section 01 45 00.00 10 01 45 00.00 20 01 45 00.00 40 QUALITY CONTROL. Submit to the Pacific Division, Naval Facilities Engineering Command, Fire Protection Engineer two sets of approved submittals and drawings immediately after approval but no later than 15 working days prior to final inspection.]

SD-02 Shop Drawings

System Floor Plans; G[, [_____]]

System Wiring Diagrams; G[, [_____]]

SD-03 Product Data

Digital alarm communicator transmitter (DACT); G[, [_____]]

Digital alarm communicator receiver (DACR); G[, [_____]]

Wiring; G[, [_____]]

Battery Power Supply; G[, [_____]]

Printers; G[, [_____]]

For digital alarm communicator transmitters, submit data for each configuration required by this section.

SD-05 Design Data

Power Calculations; G[, [_____]]

SD-06 Test Reports

Preliminary Testing; G[, [_____]]

Final Acceptance Test; G[, [_____]]

Submit for inspections and tests specified under paragraph titled "Field Quality Control."

SD-07 Certificates

[Qualifications of installer; G[, [_____]]]

[Qualifications of system technician ; G[, [_____]]]

System UL Listing or FM Approval; G[, [_____]]

SD-10 Operation and Maintenance Data

Digital alarm system, Data Package 5; G[, [_____]]

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

SD-11 Closeout Submittals

System As-built Drawings

1.5 QUALITY ASSURANCE

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NOTE: Include "Qualifications of installer list of prior installations" listed below, only for projects administered by the NAVFAC PAC.
****

1.5.1 Qualifications of Installer

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NOTE: The experience clause in this guide specification has been approved by a Level I Contracting Officer and may be used without further approval or request for waiver.
****

The Contractor or installer shall have satisfactorily installed fire alarm reporting systems of the same type and design as specified herein [and shall be UL certified for the installation and testing of fire alarm systems].

Prior to commencing fire alarm reporting system work, submit data showing that the Contractor or installer has satisfactorily installed three fire alarm systems of the same type and design as specified herein within the past 3 years[and certify that each system has performed satisfactorily in the manner intended for a period of not less than 18 months].[Submit proof of UL certification and a list of installer's personnel.]

For each system installed, submit the following:

a. A detailed summary of the type and design of the system;

b. The contract name or number, completion date of the project, and total cost of the system;

c. The name and telephone number of the facility or installation for whom the work was performed; and

d. The name and telephone number of a supervisory level point of contact at the facility or installation who has knowledge of the performance of the Contractor's or installer's work.

1.5.2 Manufacturer's Representative

****
NOTE: Consult with EFD's Fire Protection Engineer for guidance on when to include the UL certified requirements for the system installer.
****

Provide the services of a qualified manufacturer's representative or technician, experienced in the installation and operation of the type of system being provided to supervise the installation, testing (including final testing), and adjustment of the system. [Ensure that the installer is UL certified for the installation and testing of the fire alarm systems. Provide proof of this listing. A list of installers personnel

shall be provided as part of the submittal package under the subparagraph titled "SD-07, Certificates."]

1.5.3 [Qualifications of System Technician

****
NOTE: For projects administered by the NAVFAC PAC HQ, include the following paragraph requiring the minimum qualification of a NICET Level -III technician for preparation of all fire protection system drawings.
****

Installation drawings, shop drawings, and as-built drawings shall be prepared by, or under the supervision of, a qualified technician. Qualified technician shall be an individual who is certified by the National Institute for Certification in Engineering Technologies (NICET) as an engineering technician with minimum Level III certification in fire alarm system program. Contractor shall submit data showing the names and certification of the technician at or prior to submittal of drawings.

]1.5.4 Regulatory Requirements

Materials and equipment for fire alarm service shall be listed UL Fire Prot Dir or approved by FM APP GUIDE. Provide current materials and equipment of one manufacturer regularly engaged in production of such equipment, and provide items that have performed satisfactorily for at least 2 years prior to bid opening.

1.5.5 Drawing Requirements

1.5.5.1 System Floor Plans

Submit shop drawings of the system floor plans showing locations of fire alarm equipment and devices. Show wire color coding, wire counts, and device wiring order.

1.5.5.2 System Wiring Diagrams

Submit complete wiring diagrams of the system showing points of connection and terminals used for electrical connections in the system. Show modules, relays, switches, and lamps within the equipment.

1.5.5.3 System As-built Drawings

Upon completion, and before final acceptance of the work, furnish to the Contracting Officer [_____][3] complete sets of as-builts drawings, including complete as-built circuit diagrams of the system. The as-built drawings shall be "D" size 850 by 550 reproducible drawings on mylar film drawn to the same scale as the contract drawings and with tile block similar to contract drawings. The as-built drawings shall be furnished in addition to the record drawings required by Division 01.

1.5.6 System UL Listing or FM Approval

Submit copies of current UL Fire Prot Dir listings or FM APP GUIDE approvals for the system in configurations offered, with copies of the actual UL or FM test reports.

1.6 MAINTENANCE

1.6.1 Spare Parts

Furnish the following spare parts:

a. 5 complete sets of system keys

b. 3 sets of fuses of each type and size

1.6.2 Manuals

Submit operation and maintenance data in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA. Inscribe the following identification on the cover: the words OPERATION AND MAINTENANCE MANUAL, the location of the building, the name of the Contractor, system manufacturer and the contract number. The instructions shall be legible and easily read, with large sheets of drawings folded in. The manual shall include: circuit drawings; wiring and control diagrams with data to explain detailed operation and control of each item of equipment; a control sequence describing start-up, operation and shutdown instructions; installation instructions; maintenance instructions; safety precautions, diagrams, and illustrations; test procedures; performance data; and parts list.

PART 2 PRODUCTS

2.1 DIGITAL ALARM COMMUNICATOR TRANSMITTER (DACT)

Each digital alarm communicator transmitter shall be completely assembled, tested at the factory, and delivered ready for installation and operation. The transmitter electronics package shall be contained within the housing as a complete assembly, removable to facilitate servicing and replacement. The DACT shall be capable of seizing a telephone line at the protected premise and sending digital alarm or trouble information over the telephone network to a DACR.[Provide interface device for digital alarm communicator transmitter to be compatible with existing system.]

2.1.1 Transmitter Identity Code

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NOTE: For NAVFAC PAC MIDPAC projects, delete the third sentence and include the bracketed sentence.

****

Each DACT shall include a unique identity code as part of each transmission. Setting the code shall be readily accomplishable in the field. The specific code number for each DACT shall be as shown on the drawings.[Submit in writing, within 30 calendar days after award, the specific code number for each DACT. Obtain the code numbers from the Federal Fire Department, Telephone No. (808) 474-2222.]

2.1.2 Transmission Confirmation

Each DACT shall produce an audible or visual indication that the transmitter is operating and a signal is being sent, when the transmission is initiated by an alarm condition or manual test switch.

2.1.3 Automatic DACT Test

Each DACT shall automatically transmit a test message at least once in each 24 hour period. Test message shall also allow manual actuation by means of a secured (not publicly accessible) switch. Automatic actuation shall be initiated by a solid state programmable electronic device. Stability of the electronic device shall be plus or minus one minute per month or better. Test time(s) shall be programmable without removing the DACT from the enclosure.

2.1.4 Battery Supervision

Each DACT shall constantly monitor and supervise its battery power supply. A low battery or trouble message shall be transmitted when battery voltage under load falls below 85 percent of the rated battery voltage, but in any case prior to the point at which the battery will fail to operate the transmitter. This message shall be included as part of every subsequent transmission until the problem is corrected if the battery is the primary source of energy powering the DACT.

2.1.5 Trouble Supervision

Disarrangement of the DACT wiring which prevents proper operation of the DACT, or the abnormal position of any switch shall cause transmission of a trouble message and actuation of a local audible trouble alarm. DACT shall have a switch to silence the audible trouble alarm, however, while the audible alarm is silenced an amber trouble lamp shall remain lit. Upon correction of the trouble conditions, the audible alarm shall again sound until the silencing switch is returned to normal, or the silencing switch may be the momentary action, self-resetting type.

2.1.6 DACT Power Supplies

****

NOTE: the voltage available at each building must be verified. If 120-volt service is not available at certain buildings, the need for transformers shall be noted on the contract drawings.

****

Each DACT shall be powered by locally available 120 VAC power. Upon loss of AC power, the transmitter shall automatically and instantaneously switch to standby battery power, without loss of any alarm signals. Loss of AC power shall also cause the local audible trouble alarm to sound [and a trouble message to be transmitted if power is not restored within [1] [_____] minute[s]]. Upon restoration of AC power, transfer back to AC operation and silencing of audible trouble alarm shall be automatic. Power supply filtering shall prevent false message transmissions caused by transient or steady-state electrical disturbances.

2.1.6.1 Battery Power Supply

Batteries shall be spillproof, sealed lead acid or lead calcium. The battery package shall be capable of supplying power requirements of the DACT. DACT standby battery capacity shall provide sufficient power to operate the transmitter in a normal standby status for a minimum of 60 hours and be capable of transmitting an alarm signal at the end of that period. Batteries shall be located within the DACT housing.

Converter/float charger: Under presence of 120 VAC power, DACT batteries shall be charged through a converter/float charger. Charger shall recharge a fully discharged battery in not more than 48 hours while the transmitter is operating under normal conditions (presence of 120 VAC power), or provide a charger which maintains a battery at full charge under normal daily testing load and provide batteries having capacity for 6 months field service without recharge.

2.2 OVERVOLTAGE AND SURGE PROTECTION

2.2.1 Power Line Surge Protection

Protect equipment connected to AC circuits from power line surges. Equipment shall meet the requirements of IEEE C62.41.1 and IEEE C62.41.2.

2.2.2 Communications Link Surge Protection

Protect communications equipment against surges induced on communications links. Install surge protection circuits at each end of cables and conductors, except fiber optics, which serve as communications links, to meet the following two waveforms:

a. A 10 microsecond by 1000 microsecond waveform with a peak voltage of 1500 volts and a peak current of 60 amperes.

b. An 8 microsecond by 20 microsecond waveform with a peak voltage of 1000 volts and a peak current of 500 amperes. Provide protection at the equipment. Install additional triple electrode gas surge protectors, rated for the applications, on each wireline circuit within 3 feet of the building entrance. Do not use fuses for surge protection.

2.2.3 Sensor Wiring Surge Protection

Protect digital and analog inputs and outputs against surges induced by sensor wiring installed outdoors and as shown. Test inputs and outputs with the following waveforms:

a. A 10 microsecond by 1000 microsecond waveform with a peak voltage of 1500 volts and a peak current of 60 amperes.

b. An 8 microsecond by 20 microsecond waveform with a peak voltage of 1000 volts and a peak current of 500 amperes. Do not use fuses or surge protection.

2.3 DIGITAL ALARM COMMUNICATOR RECEIVER (DACR)

Provide two identical DACRs or control consoles. Install both consoles at the main fire alarm watch office as indicated. Each system console shall be completely assembled, wired, and tested at the factory, and delivered ready for installation and operation. Each base station console (system) shall perform the receipt, processing, and display of emergency and non-emergency messages transmitted by the DACTs specified herein, independently of the other console. Each console shall contain a complete independent receiving system, decoder, audio devices, visual display, clock, printer, primary and emergency power supplies, power supply monitors, memory devices, and interconnecting cable. If the automatic DACT tests specified under paragraph titled "Automatic DACT Test" are initiated by a polling (interrogation) device located at the base station,

then each of the two required consoles shall have its polling device. One such device shall always be active, with the other in standby status. Failure of the active device shall automatically cause the second device to take over the polling (interrogation) function. Each DACR shall be capable of receiving signals from a minimum of four separate telephone circuits.

2.3.1 Display

Each console shall do the following:

a. Display incoming alarms in alphanumeric format, by means of a light emitting diode, illuminated dot matrix, or cathode ray tube.

   (1) Indicate the identity with a minimum of a four digit 0002-9999, time, date, and type of signal (alarm, trouble) code number assigned to the originating transmitter.

   (2) Include a message of a minimum of 3 lines of 20 characters each for each transmission (minimum 500 transmitter capacity). The message shall be operator-programmable into the memory through a keyboard which shall be provided.

b. Include a means to manually clear and reset the display. If the display is not reset at the time additional alarms are received, the additional alarms shall be retained in memory and a distinctive audible or visual indication given to the operator that additional alarms are waiting to be acknowledged.

   Alarms shall be printed immediately upon receipt.

2.3.2 Memory

Provide each console with a programmable memory capable of retaining at least 500 transmitter codes, together with specific messages, total number of zones possible, and related information associated with each of the 500 transmitters. If memory is operator-programmable, restrict access into the memory for the purpose of making additions or deletions by the use of a key switch for access code to prevent unauthorized changes. Memory shall not be lost in the event of a total loss of primary and emergency power supplies.

2.3.3 Digital Clock

Each console shall incorporate an electronic digital clock. Clock shall display the current time expressed in 24-hour time and date (day and month) and shall transmit to each interconnected printer the time and date that signals are received. Provide manual means of resetting the clock.

2.3.4 Printers

Provide printers of high speed, computer compatible, low noise design, capable of printing incoming messages with no messages being lost. Upon reception of an alarm, each printer shall print on paper the required visually displayed data, including the date and time received. Provide standard size paper for recording messages, commercially available from three or more manufacturers, usable on a computer printer or adding machine, and continuous feed. Include paper take-up devices for storing printouts. Print alarms in a manner to make them readily distinguishable

from acknowledgments and routing messages, or by use of a different color, typeface, type size, or other distinguishable means.

2.3.5 Audible Trouble and Alarm Devices

The audible alarm device used to indicate the receipt of alarms shall produce a sound distinct from other audible trouble signals. The device shall be internally mounted in the console, and activated upon receipt of an alarm. The audible sounds used to indicate trouble messages shall be separate and distinct from the sound used to denote receipt of alarm messages.

2.3.6 Power Supplies

For each console, primary power supply shall be 120 V, 60 Hz AC. Emergency backup power shall be supplied by batteries capable of powering the system for a minimum of 48 hours. The 120 V, 60 Hz AC power supply for each console shall be obtained [through a single connection into the line side of the building's regular AC service circuit] [from the building emergency service circuit as shown] through a lockable fused disconnect switch. Provide a separate disconnect switch for each console.

2.3.7 Emergency Power Source

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Note: Batteries shall not be located in areas where personnel are normally present.

****

Emergency backup power shall be supplied by lead acid type batteries having plastic cases and explosionproof vents. Batteries shall be of sufficient capacity to operate all functions of the console for no less than 48 continuous hours, in the event of loss of AC power. Batteries shall be mounted on rack(s) designed for that purpose. A termination cabinet shall be part of the rack. Battery rack(s) shall be located where shown.

2.3.7.1 Emergency Power Switchover

In the event of loss of normal AC power, transfer to the emergency power mode shall be automatic and without interruption or loss of console memory. When AC power is restored, transfer back to normal mode shall also be automatic.

2.3.8 Console Battery Charger

Battery chargers shall be self-regulating. Each charger shall have the capacity to completely recharge its associated batteries from full discharge within 48 hours with the console fully operational on primary AC power. The console shall remain operational on AC power with the batteries removed.

2.3.9 Console Supervision

Supervisory controls shall provide constant supervision of the operating condition of the console. Individual indicators shall be provided for each major component, and an audible signal shall be produced in the event of failure of any major component. This audible signal shall be distinctly different from the signal used to annunciate alarms. A switch

shall be provided to silence the audible trouble signal.

2.3.10 Power Supervision

Each console shall continuously monitor its primary and emergency power supplies. Any malfunction shall be indicated visually and audibly. In the event of a primary power supply failure, the console shall automatically and without interruption switch to battery backup and indicate the failure within 15 seconds. An "open" in the battery circuit or standby battery voltage below 85 percent of rated voltage (while on AC power) shall cause activation of console trouble signals.

2.3.11 Electrical Connections

Consoles shall be designed with modular components to allow interchange of components for maintenance purposes. Interconnecting cables and connectors shall be compatible with computer quality signal data transmission.

2.4 CONDUIT

2.4.1 Rigid Steel Conduit (Zinc-Coated)

ANSI C80.1.

2.4.2 Intermediate Metal Conduit (IMC)

UL 1242, zinc-coated steel only.

2.4.3 Electrical Metallic Tubing (EMT)

ANSI C80.3.

2.5 OUTLET BOXES

UL 514A, zinc-coated steel. Fittings for conduit and outlet boxes UL 514B, zinc-coated steel.

2.6 WIRING

NFPA 70 and NFPA 72. Wire for 120 V circuits shall be No. 12 AWG minimum. Wire for low voltage DC circuits shall be No. 14 AWG minimum. Color code wiring.

2.7 GROUND RODS

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NOTE: For projects administered by NAVFAC LANT, change 10 ohms to 5 ohms.
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UL 467. Rods shall be the sectional type, copper-encased steel, with a minimum diameter of 19 mm 3/4 inch and a minimum length of 3050 mm 10 feet. The rods shall have a hard, clean, smooth, continuous copper surface, and the proportion of copper shall be uniform throughout the length of the rod. The copper shall have a minimum wall thickness of .33 mm .013 inch at any point on the rod. Ground rods shall not protrude more than 150 mm 6 inches above grade. Non-current carrying metallic parts associated with new fire alarm equipment shall have maximum resistance to solid "earth"

ground not to exceed the following values:

Digital Alarm Communicator Transmitter	10 ohms
Digital Alarm Communicator Receiver	10 ohms
Interface Panels	10 ohms

PART 3 EXECUTION

3.1 INSTALLATION

Installation shall be in accordance with the requirements of NFPA 70 and NFPA 72. Wire for 120 V circuits shall be No. 12 AWG minimum. Wire for low voltage DC circuits shall be No. 14 AWG minimum. Color code wiring. Wiring shall be in rigid steel conduit, intermediate metal conduit, or electrical metallic tubing. Circuit conductors shall be identified within each enclosure where a tap, splice, or termination is made. Conductor identification shall be by plastic coated, self-sticking printed markers or by heat-shrink type sleeves. The markers shall be attached in a manner that will permit accidental detachment. Control circuit terminations shall be properly identified. Unless indicated otherwise, wiring and conduit shall be new. Do not run fire alarm circuits in the same conduit as non-fire alarm circuits. Do not run AC circuits in the same conduit with DC circuits.

3.1.1 Continuity of Protection

During the installation of this system, there shall be no loss of function of the existing base fire alarm system, or of the local building alarm systems connected thereto. Transfer of local alarm system connections from the existing base alarm system shall not result in loss of alarm transmitting or receiving capability. Temporary interruption of individual building alarm connections, not to exceed 8 hours duration, will be permitted at the discretion of the Contracting Officer. No interruption of alarm or communications functions at the fire alarm watch office will be permitted.

3.2 FIELD QUALITY CONTROL

3.2.1 Preliminary Testing

Conduct the following tests during installation of wiring and system components. Correct any deficiency pertaining to these requirements prior to final functional and operational tests of the system.

a. Ground resistance: The resistance of each connection to ground shall be measured and shall not exceed 10 ohms.

b. Each cable shall be checked at the transmitter or receiver connection for continuity, shorts, and grounds on the conductor and on the shield prior to connection to equipment. Assemblies failing these tests shall not be connected to equipment.

c. Operation of each digital alarm communicator transmitter function.

d. Operation of each interface device (where interface panels are

provided).

e. Operation of each local alarm system zone.

f. Operation of each initiating device circuit if connected directly to the digital alarm communicator transmitter.

g. Operation of supervisory features.

h. Operation of all features of each digital alarm communicator receiver.

Tests of system components shall be conducted both with normal power on and with emergency (battery) power on and normal power off.

3.3 FINAL ACCEPTANCE TEST

The system shall have been in service for at least 30 days prior to the final inspection. The Contractor shall notify the Contracting Officer in writing when the system is ready for final acceptance tests. Notification shall be at least 15 days prior to the date of the final acceptance test. The system shall be considered ready for such testing only after necessary preliminary tests have been made and deficiencies found have been corrected to the satisfaction of the equipment manufacturer's technical representative. The system shall be tested for approval in the presence of representative of the manufacturer, the Contracting Officer, and the [_____] Division Fire Protection Engineer. The Contractor shall furnish instruments, labor, and materials required for the tests, and the technician who supervised the installation shall conduct the tests. Any deficiencies found shall be corrected and the system retested at no cost to the Government. Tests specified in paragraph entitled "Tests During Installation" shall be repeated as directed by the Division Fire Protection Engineer during the conduct of final acceptance tests.

3.4 ADDITIONAL TESTS

When deficiencies, defects, or malfunctions develop during the tests required, further testing of the system shall be suspended until proper adjustments, corrections, or revisions have been made to ensure proper performance of the system. If these adjustments, corrections, or revisions require more than a nominal delay, the Contracting Officer shall be notified when the additional work has been completed to arrange a new final inspection and test of the fire alarm system. Tests required shall be repeated prior to final acceptance, unless directed otherwise.

3.5 MAINTENANCE INSTRUCTIONS

Furnish to the Contracting Officer prior to final testing of the system a complete set of reproducible as-built approved wiring diagrams with six sets of copies.

3.6 INSTRUCTION OF GOVERNMENT PERSONNEL

Upon completion of the work and at a time designated by the Contracting Officer, [_____] Government personnel at the activity shall receive a complete training session of 40 hours, comparable to the equipment manufacturer's factory training procedure. The training shall include an explanation and review of the theory of operation, the function, the description, and analysis; and the troubleshooting of equipment provided. Training shall include a review of manuals, drawings, and

lists supplied, together with any clarifications required. At least one period of 8 hours shall be spent demonstrating routine maintenance procedures and troubleshooting equipment with actual faults being introduced for training purposes. The instructional personnel providing requirements above shall be factory certified by the related equipment manufacturer to provide instruction services. The training shall take place at the site.

-- End of Section --