

SECTION 16722

(B)

INTERIOR FIRE ALARM SYSTEM

(A)

PART 1 - GENERAL

1.1 APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

(C)

1.1.1 Factory Mutual System (FM) Publication:

1984 Approval Guide

1.1.2 Federal Communications Commission (FCC) Publication:

47 CFR Rules and Regulations  
Part 90

1.1.3 Federal Standard (Fed. Std.):

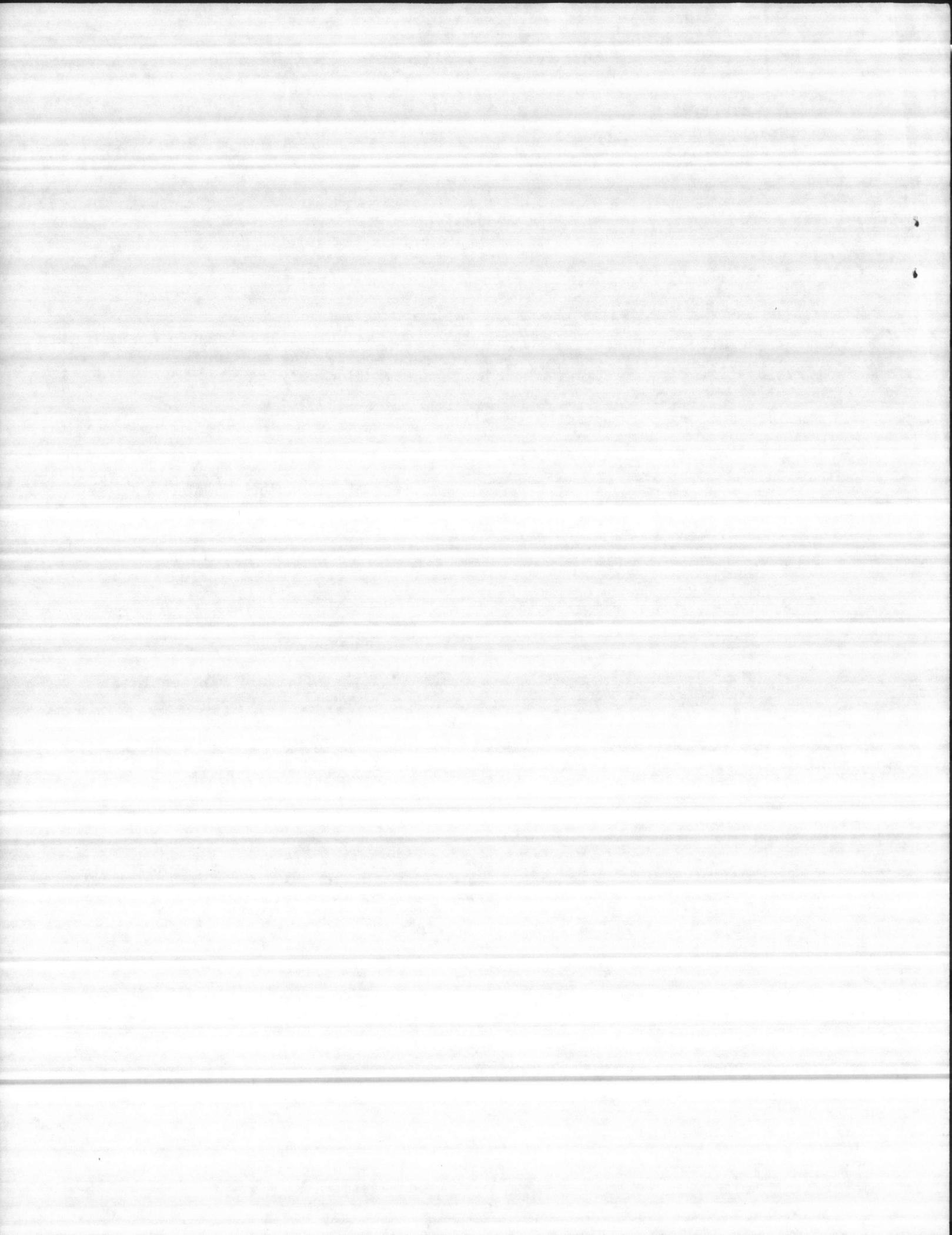
FED-STD-595A Color (Requirements for Industrial Color Chips)  
& Notice 6

1.1.4 National Electrical Manufacturers Association (NEMA) Publication:

ICS 1-78 Industrial Control and Systems  
(R 83)

1.1.5 National Fire Protection Association (NFPA) Publications:

70-84 National Electrical Code  
72A-79 Local Protection Signaling Systems  
72B-79 Auxiliary Protective Signaling Systems  
72E-82 Automatic Fire Detectors  
74-84 Household Fire Warning Equipment  
1221-84 Public Fire Service Communications



## 1.1.6 Underwriters Laboratories Inc. (UL) Publication:

1984

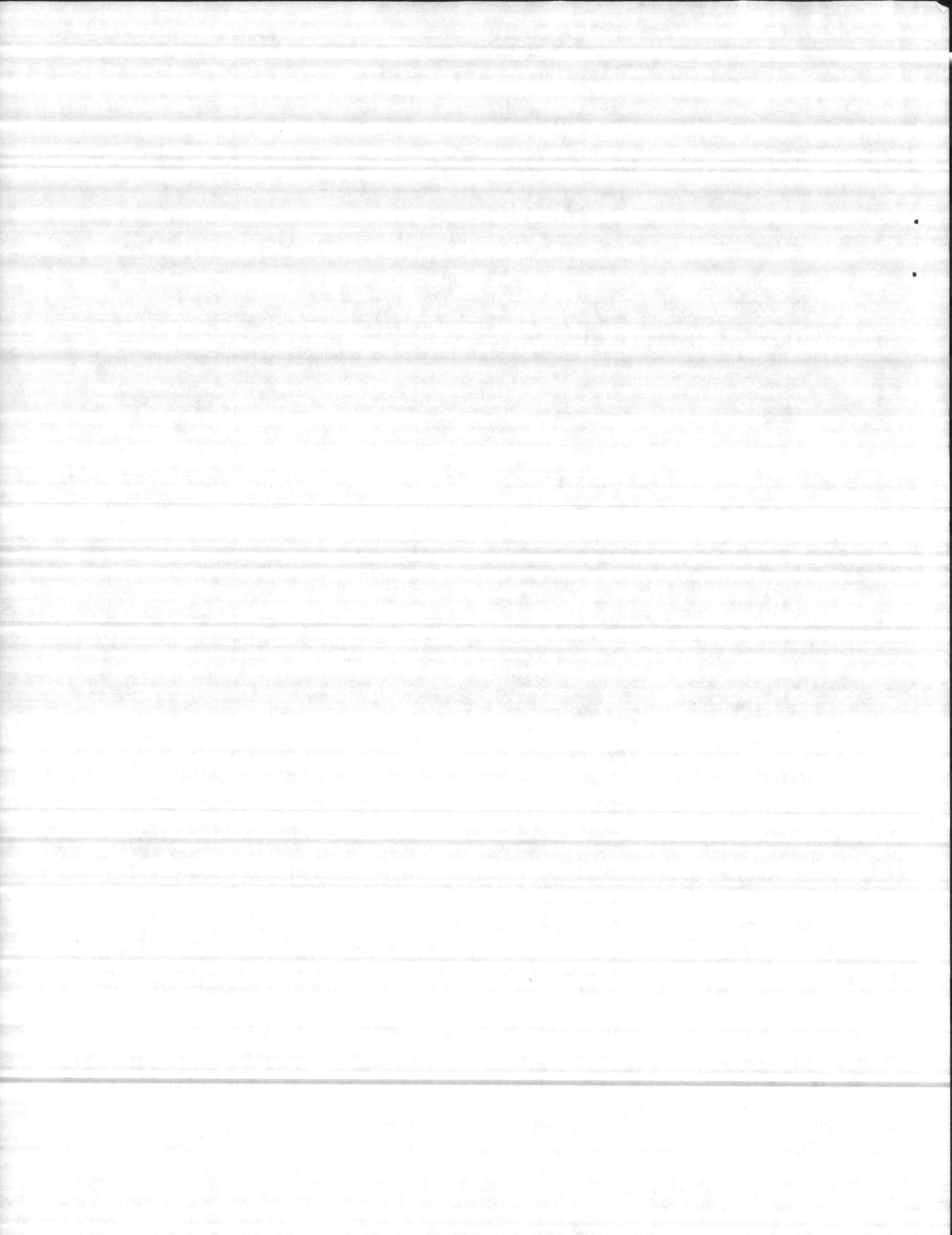
## Fire Protection Equipment Directory

1.2 QUALIFICATIONS OF INSTALLER: Prior to installation, submit data for approval by the \_\_\_\_\_ Division, Naval Facilities Engineering Command, Fire Protection Engineer, showing that the Contractor has successfully installed interior fire alarm systems of the same type and design as specified herein, or that he has a firm contractual agreement with a subcontractor having such required experience. The data shall include the names and locations of at least two installations where the Contractor, or the subcontractor referred to above, has installed such systems. The Contractor shall indicate the type and design of each system and certify that each system has performed satisfactorily in the manner intended for a period of not less than 18 months. (D)

1.2.1 Manufacturer's Representative: Furnish the services of a qualified fire alarm system manufacturer's representative or technician, experienced in the installation and operation of the type of system being provided, to supervise the testing, including formal testing, adjustment of the system, and instruction to Government personnel.

1.3 GENERAL REQUIREMENTS: Section 16011, "Electrical General Requirements," applies to this section, with the additions and modifications specified herein.

1.4 DESCRIPTION OF WORK: The work includes [modifying existing] [and] [providing new] interior fire alarm system including associated equipment and appurtenances. Provide each system complete and ready for operation. Equipment, materials, installation, workmanship, inspection, and testing shall be in strict accordance with the required and advisory provisions of NFPA 72A [and] [\_\_\_\_\_] [and] [NFPA 72E], except as modified herein. Devices and equipment for fire alarm service shall be listed by Underwriters Laboratories Inc., or approved by the Factory Mutual System. In the NFPA publications referred to herein, the advisory provisions shall be considered to be 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, Naval Facilities Engineering Command, Fire Protection Engineer. [Existing interior system was manufactured by \_\_\_\_\_, and new equipment shall be compatible with and shall operate accurately and reliably with the existing system.] Provide wiring materials under this section as specified in Section 16402, "Interior Wiring Systems," with the additions and modifications specified herein. Equipment and devices shall be compatible and operable in all respects with existing station fire alarm system and shall not impair reliability or operational functions of existing station fire alarm system. Existing station fire alarm system is a [\_\_\_\_\_] [radio] [positive], [shunt], [noninterfering, closed-circuit] system. Furnish materials and equipment that are current products of one manufacturer regularly engaged in the production of such equipment. (E)



1.5 SUBMITTALS: The \_\_\_\_\_ Division, Naval Facilities Engineering Command, Fire Protection Engineer, will review and approve submittals. Shop drawings and descriptive data shall be approved prior to procurement, fabrication, and installation.

1.5.1 Manufacturer's Data:

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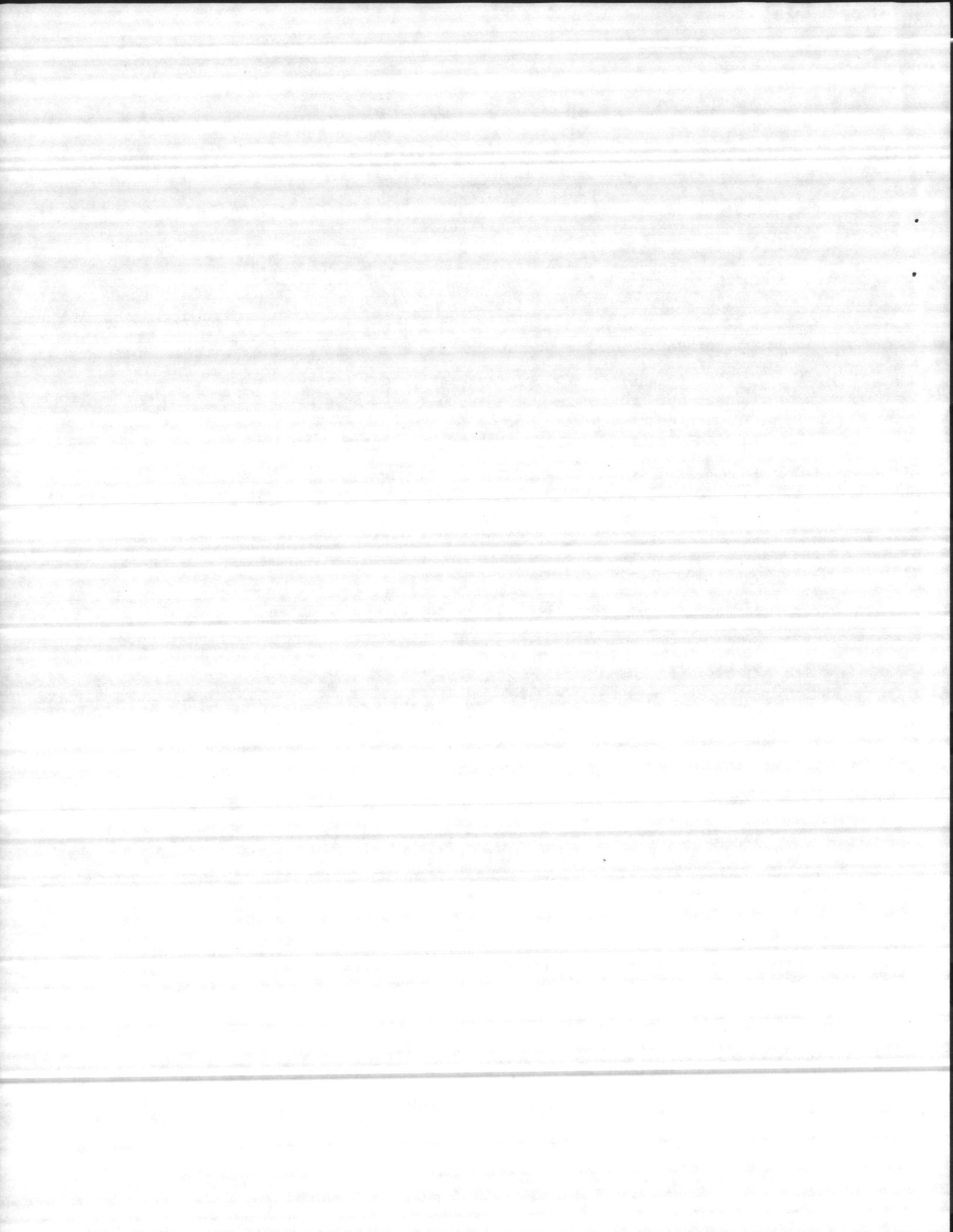
a.	Control panel	___	Alarm horns
b.	Manual stations	___	[Master] [Radio] fire alarm boxes
c.	Cabinets	___	[Master] [Radio] box pedestals
___	Batteries	___	[Master] [Radio] box location lights
___	Battery charger	___	Automatic code transmitters
___	Heat detectors	___	Remote annunciator panel
___	Smoke detectors	___	Smoke detector annunciator
___	Alarm bells	___	Interface panel
___	Remote trouble bell	___	_____
___	_____	___	_____

1.5.2 Shop Drawings: Provide drawings that clearly and completely indicate the function of the control panel and devices connected thereto. Indicate termination points of devices and indicate the interconnection of modules required for proper operation of the system. Indicate interconnection between modules and devices connected thereto. Drawings shall be not less than [18 inches by 24] [\_\_\_\_\_] inches.

1.5.3 Calculations: Verify that battery capacity exceeds supervisory and alarm power requirements.

1.5.4 Operation and Maintenance Manual: Provide six copies, bound securely in durable, hard cover, water-resistant binders. Include instructions for operating and maintaining system components, assemblies, and accessories; include a detailed description of the control panel and system operation under both routine and emergency conditions. Include as-built circuit diagrams complete with conductor color codes, a parts list by name, model number, and manufacturer, and a listing of smoke detector locations, with the serial number and firing voltage for each. General system descriptions included in manufacturer's catalogs or advertising media will not be acceptable in meeting the operation and maintenance manual requirement.

1.6 SPARE PARTS: [Spare parts shall be directly interchangeable with the corresponding components of the installed system. Spare parts shall be suitably packaged and identified by nameplate, stamping, or tagging. Keys and locks for equipment shall be identical where possible.] Furnish the following:



- a. Four keys or tools for resetting manual stations
  - b. Four keys for locks of control panels or cabinets
  - c. Two of each type heat detector
  - d. Two of each type smoke detector
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PART 2 - PRODUCTS

2.1 SYSTEM DESIGN:

2.1.1 Alarm System: Provide a complete, electrically supervised, noncoded, manual [and automatic], annunciated fire alarm system. The actuation of any manual station [or] [automatic sprinkler system,] [automatic heat detector,] [automatic smoke detector,] [carbon dioxide system,] [or] [\_\_\_\_\_] shall cause:

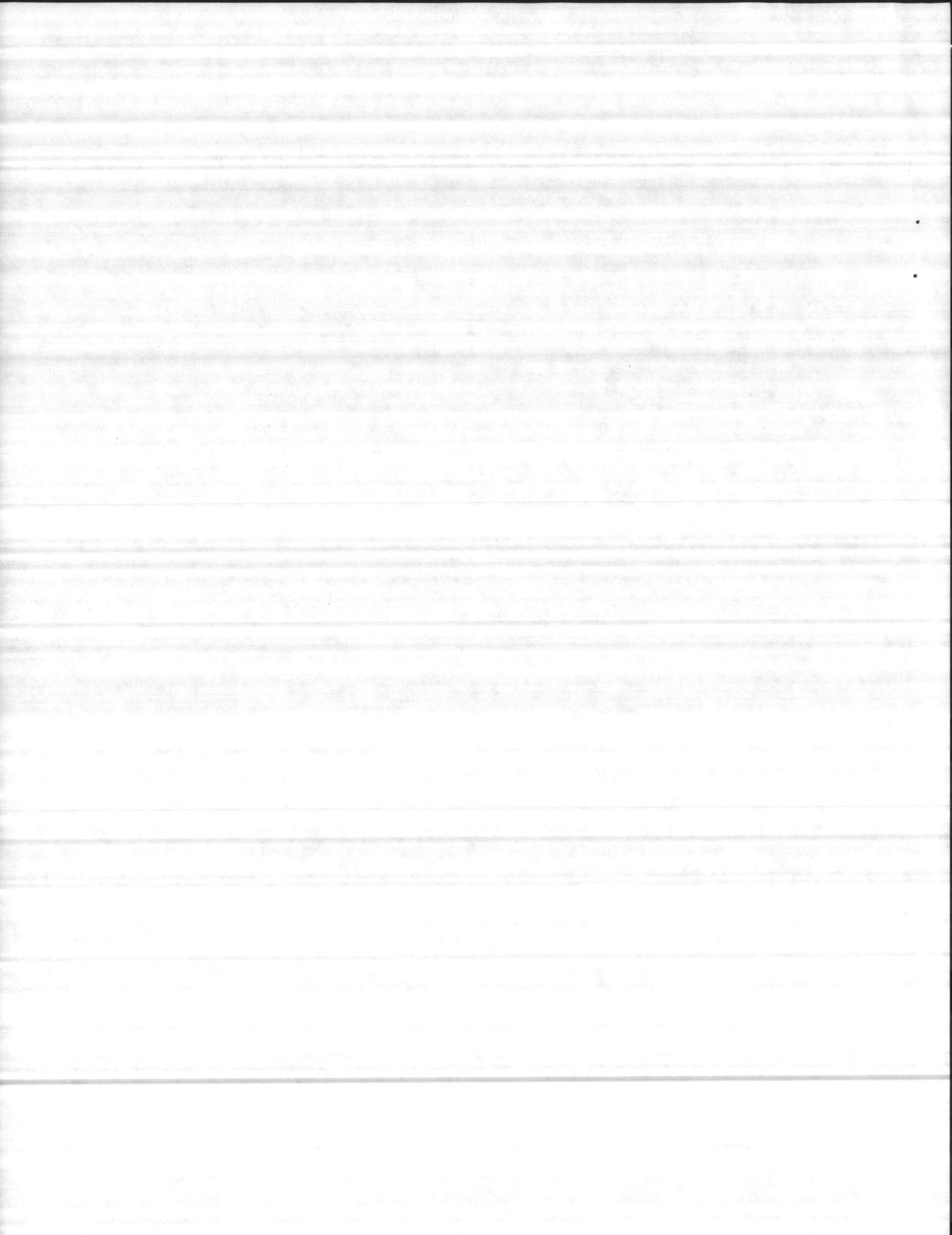
- a. Building alarm devices to sound
  - b. Appropriate annunciator lamps to light
  - c. Actuation of the station fire alarm system
  - d. Air handling units Nos. \_\_\_\_\_ to shut down
  - e. Electromagnetic door hold-open devices to be deenergized
  - f. Smoke detector annunciator lamp(s) to indicate the detector(s) in alarm
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(G)

2.1.2 Operations: A ground fault condition which prevents system operation or a single break or open condition in any circuit shall result in activation of system audible trouble signals. Loss of ac power shall also result in operation of system trouble signals. Trouble signals shall sound continuously until system has been restored to normal at the control panel or manually switched to a trouble indicating lamp. Upon correction of the trouble condition, trouble signals shall automatically resound until the control panel is restored to the normal position. [Electrical supervision of wiring external of control panel for mechanical equipment shutdown and magnetic door-holding circuits will not be required.] System shall be electrically supervised for:

- a. Signal initiating circuits
- b. Alarm signal notification (audio or visual) circuits  
[, including circuits powering flashing warning lights]
- c. Battery supply circuits, including low and no voltage across the standby battery terminals
- d. [Master box] [Transmitter] tripping circuits

2.1.3 Zones to which smoke detectors are connected shall require alarm verification to minimize nuisance or unwanted alarms prior to going into alarm condition.



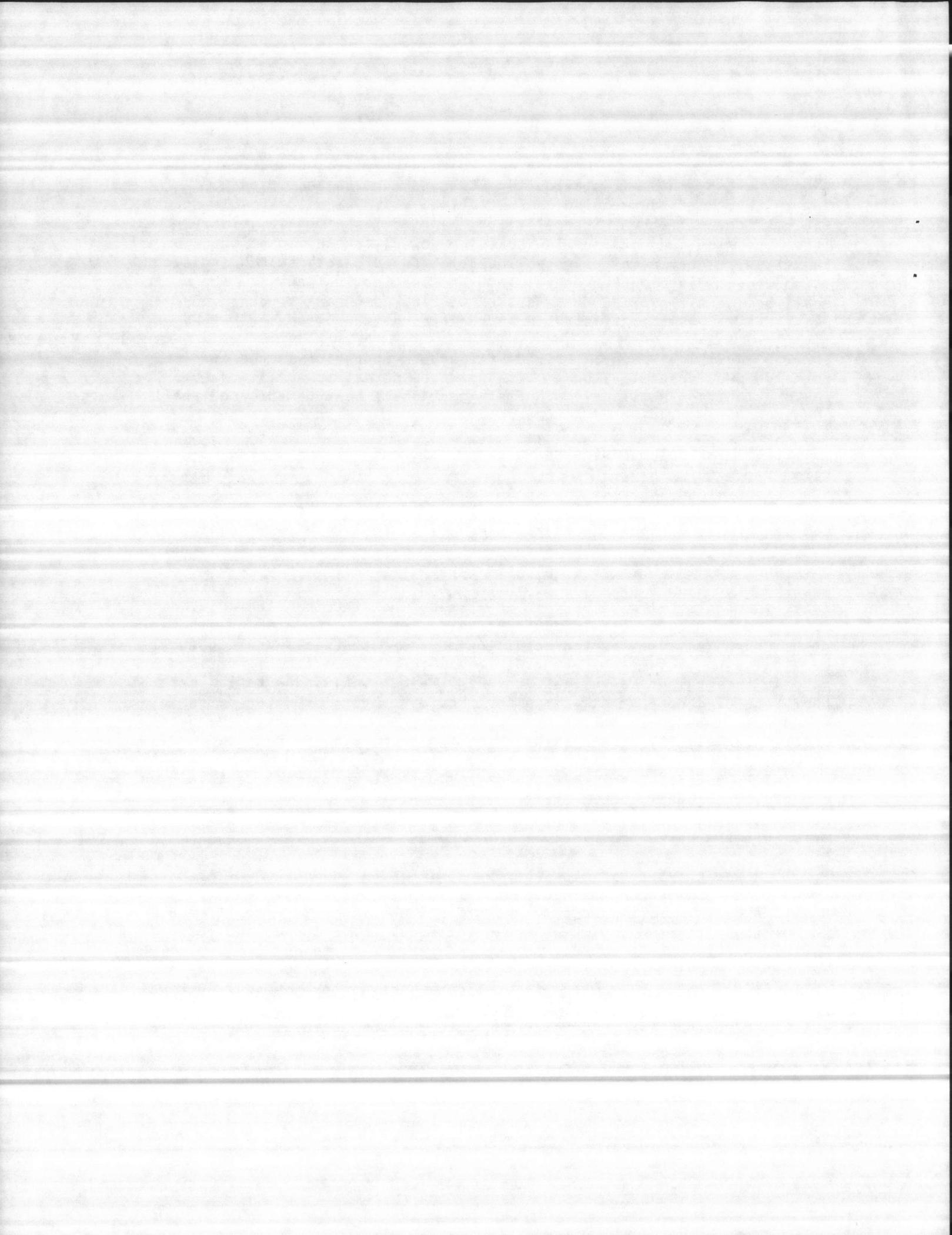
2.1.4 Primary Power: Provide 120 volts ac service, transformed through a two-winding isolation-type transformer and rectified to low-voltage dc for operation of initiating, alarm signal, trouble signal, and [master box] [transmitter] [tripping] circuits. Obtain primary power [from the line side of incoming building power] [at the location indicated]. Provide a separate, lockable, fused safety switch [adjacent to the power distribution panel] [at the location indicated]. The switch shall be identified FIRE ALARM SYSTEM with a red and white engraved plastic sign permanently affixed to the face of the switch.

2.1.5 Auxiliary Power: Provide for system operation in the event of primary power source failure. Transfer from normal to auxiliary power or restoration from auxiliary to normal power shall be automatic and shall not cause transmission of a false alarm.

2.1.5.1 Batteries: Provide rechargeable lead calcium or sealed lead acid type with sufficient ampere-hour rating to operate the system under supervisory [and trouble] conditions [, including audible trouble signal devices] for [24] [ ] hours and audible [and visual] signal devices under alarm conditions for an additional [10] [ ] minutes. House batteries [either within the control panel or] in a separate substantial steel cabinet [with glass or plastic window, and]; finish on inside and outside with enamel paint; equip with a noncorrosive base and cylinder lock. Separate cells to prevent contact between terminals of adjacent cells and between terminals and other metal parts. [Locate cabinet to allow convenient viewing and servicing of the batteries. Cabinet shall have twice the volume of batteries it will contain. Each battery shall have an integral device visible through the cabinet window to indicate the state of charge at all times, or provide a hydrometer for determining the state of charge. Batteries shall have a clear or transparent battery shell which clearly displays the liquid level within the battery.]

2.1.5.2 Battery Charger: Provide solid state automatic two rate type, capable of recharging completely discharged batteries to fully charged condition in 24 hours or less. Locate charger within the control panel or within the battery cabinet.

2.1.6 Wiring: Provide in accordance with NFPA 70 and NFPA 72A. Conductors shall be copper. Conductors for 120-volt circuits shall be No. 12 AWG minimum; single conductors for low-voltage dc circuits shall be No. [14] [16] AWG minimum. Conductors shall be color-coded. Provide wiring in rigid metal conduit or intermediate metal conduit, except electrical metallic tubing conduit may be provided in dry locations not enclosed in concrete or where not subject to mechanical damage. Conceal conduit in finished areas of new construction and wherever practicable in existing construction. Identify conductors within each enclosure where a



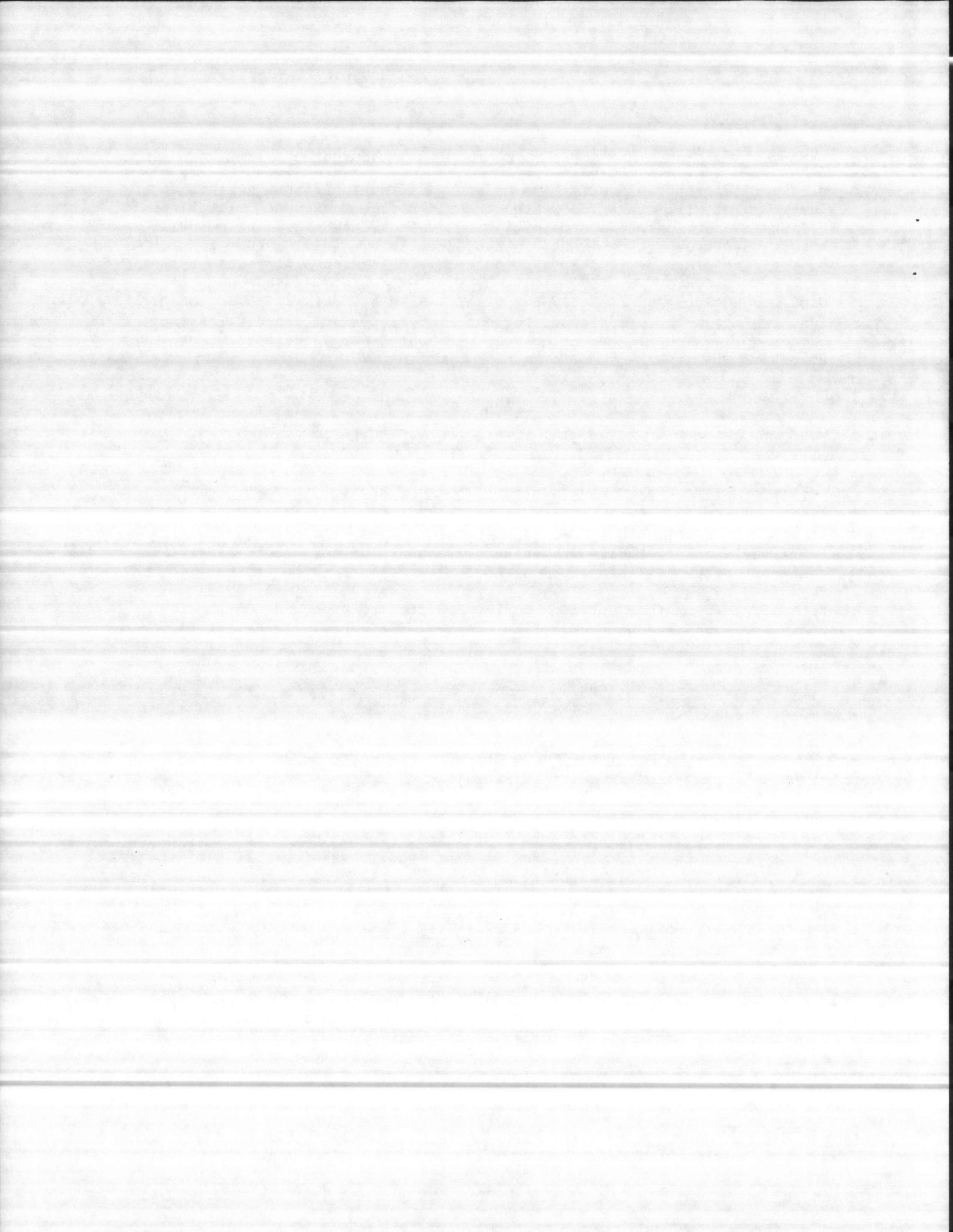
tap, splice, or termination is made. Identify conductors by plastic-coated, self-sticking, printed markers or by heat-shrink type sleeves. Wire the alarm initiating and notification signal devices so that removal will cause the system trouble device to sound. Pigtail or "T" tap connections to alarm initiating devices, evacuation alarm bells, horns, and fire warning light are not acceptable. [Wiring from the master fire alarm box to the station telegraphic fire alarm circuit shall be a two-conductor No. [12] [ ] AWG, Type UF cable.] Each conductor used for the same specific function shall be distinctively color coded. [Use two different color codes for each interior alarm circuit; one for each loop.] Each circuit color code wire shall remain uniform throughout circuit.

## 2.2 COMPONENT DESIGN:

2.2.1 Colors: Provide finish colors under this section in accordance with Fed. Std. FED-STD-595.

2.2.2 Main Control Panel: Modular type, installed in a [flush] [surface]-mounted steel cabinet with hinged door and cylinder lock. [Mount with panel base 4 feet above finished floor elevation.] Control panel shall be a factory-wired assembly containing components and equipment necessary to perform specified operating and supervisory functions of the system. In addition, the panel shall contain one set of normally-open and one set of normally-closed alarm-operated dry contacts. The Set-Unset condition of the [master box] [transmitter] shall be indicated by devices incorporated as part of the control panel or by a separate local supervisory panel. The panel shall be provided with the following switches:

- a. Trouble silencing switch which transfers trouble signals to an indicating lamp.
- b. Evacuation alarm silencing switch which, when activated during alarm, shall silence alarm devices and, upon clearing the alarm, cause operation of the system trouble signals until the switch is returned to the normal position. Operation of the switch when there is no evacuation alarm shall cause operation of the system trouble signals.
- c. [Master box] [Transmitter] disconnect switch which, when activated, shall disconnect the transmitting device and cause operation of the system trouble signals.
- d. Fan shutdown bypass switch which will bypass the automatic fan shutdown capabilities of each zone. Operation of the switch shall cause the operation of the system trouble signal.



2.2.2.1 Trouble Bell: [Provide a 4-inch trouble bell at the control panel and arrange to operate in conjunction with the panel's integral trouble signal.] [In addition,] [provide a remote 4-inch trouble bell and arrange to operate in conjunction with the panel's integral trouble signal. Locate remote trouble bell as indicated. Provide remote trouble bell with a rigid plastic, white on red engraved identification sign which reads FIRE ALARM TROUBLE. Lettering on the identification sign shall be a minimum of 1.0 inch high.]

(H)

2.2.2.2 Annunciator: \_\_\_\_\_  
 -zone annunciation shall be integral with the control panel. Provide separate alarm and trouble lamps for each zone alarm initiating circuit. Lamps shall be provided in the face of the control panel door or shall be visible through the door. Each annunciator lamp shall provide specific identification of the [area] [and] [or] [device] by means of a permanently affixed rigid plastic or metal sign with either raised or engraved letters. Letters shall be a minimum of 0.18-inch in height. Identification shall include zone number and a description of the specific [area] [and] [or] [device] involved.

2.2.2.3 Annunciation Zones: Arrange as follows:

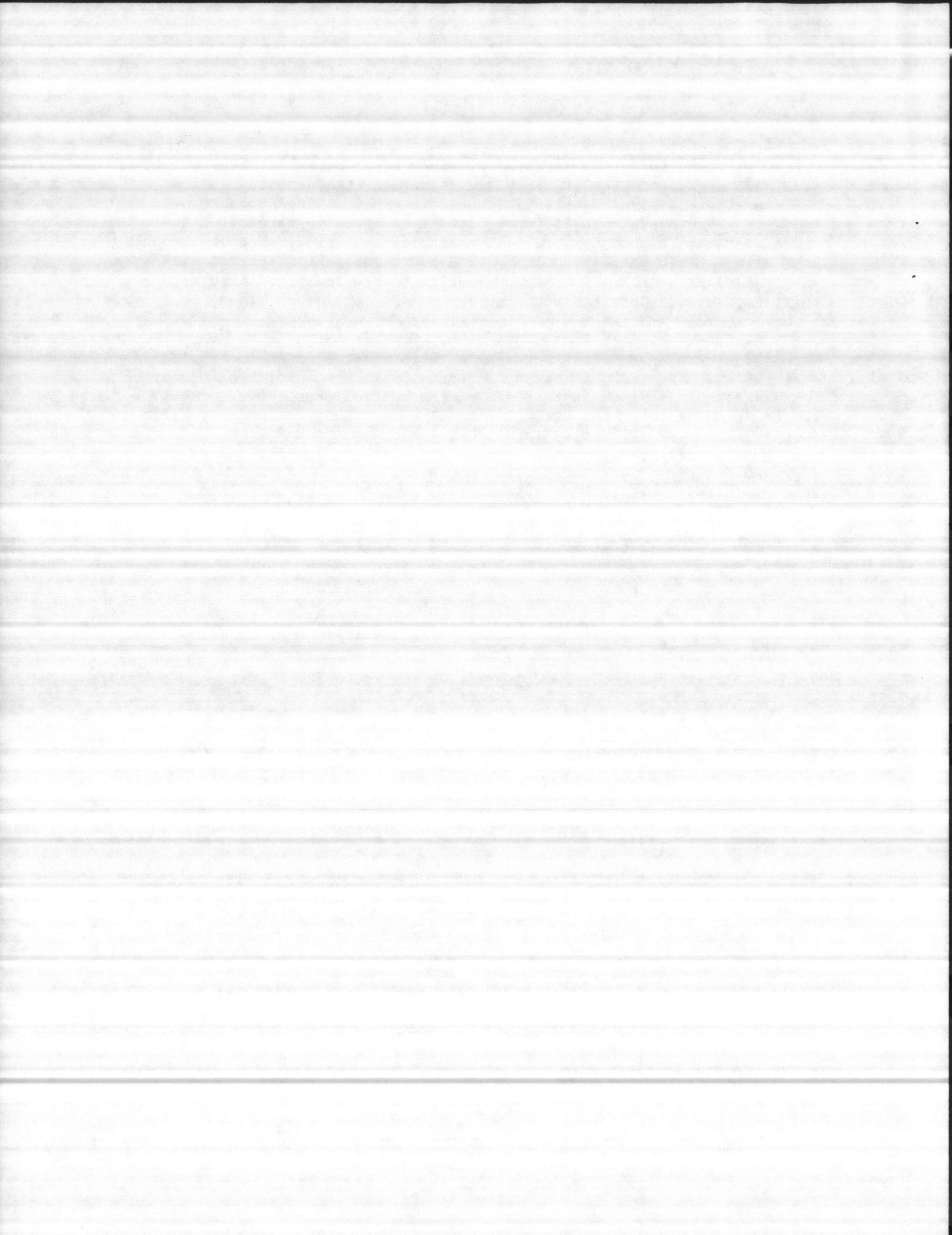
ZONE NO.	DESCRIPTION
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

2.2.3 Remote Annunciator: Locate as indicated. [Mount with panel base 4 feet above finished floor elevation.] Panel shall duplicate annunciation functions performed by the main control panel. Panel shall contain \_\_\_\_\_ active and \_\_\_\_\_ spare zones. Fire alarm zone descriptions shall correspond to the fire alarm control panel zones and light when the corresponding fire alarm control panel zones are activated. Remote annunciator shall include a lamp test switch which, when operated, shall cause zone lamps to light. Panel shall be [flush] [surface]-mounted.

(I)

2.2.4 Smoke Detector Annunciator: Locate as indicated. [Mount with panel base 4 feet above finished floor elevation.] Panel shall include an annunciator lamp for each [under-floor] [ceiling] [duct] [and] [above-ceiling] smoke detector. Lamps shall be either light-emitting diode (LED) or neon lamp. Annunciator shall be a graphic type, with appropriately labeled lamps, located on a professionally-drawn, scaled,

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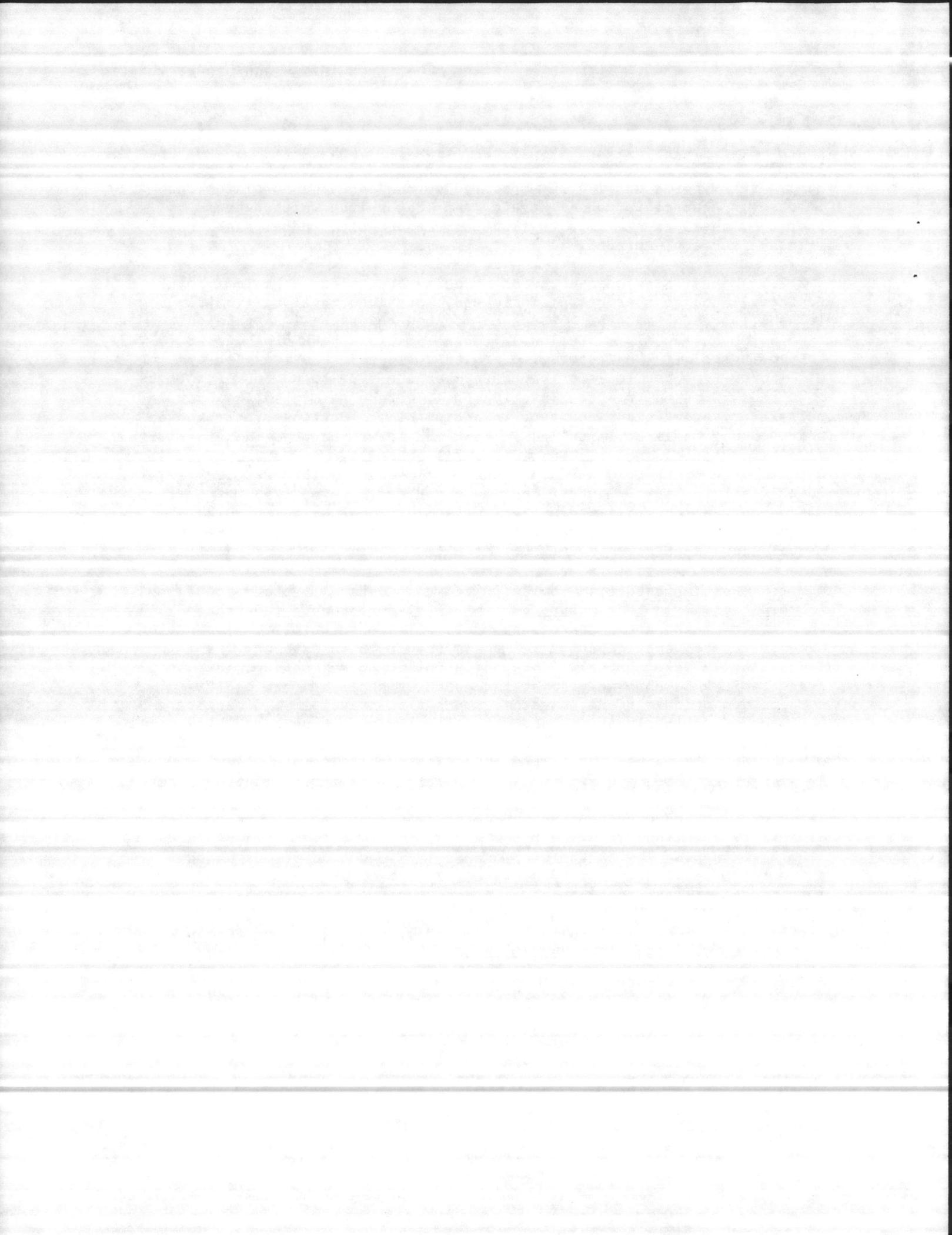


and framed drawing with protective glass cover. Annunciator lamps shall illuminate upon actuation of corresponding smoke detector and shall remain illuminated until a key-operated switch on the annunciator panel is reset. Annunciator shall have a lamp test switch which, when operated, shall cause lamps to light simultaneously. Panel shall be [flush] [surface]-mounted.

2.2.5 Manual Stations: Provide noncoded type with mechanical reset features. Locate stations as indicated. Stations shall be [semiflush] [flush] [surface]-mounted. [Surface-mounted boxes shall be painted the same color as the alarm station.] [Mount stations with the base at [4 feet 6 inches] [ ] above the finished floor.] Provide each station with screw-type terminals of proper number and type to perform functions required. Break-glass-front stations will not be permitted; however, a pull-lever, break-glass-rod type is acceptable. [Stations indicated as weatherproof shall be installed in cast metal, weatherproof housings with side-hinged access doors. Housings shall be painted red and labeled FIRE ALARM using permanently affixed, engraved, red and white plastic identification signs. Identification signs shall be affixed to the face of the housing cover; letters shall be a minimum of 0.75-inch high.] [Provide separate screw terminal for each conductor connected to the manual alarm station.]

2.2.6 Heat Detectors: Provide [fixed temperature] [rate compensated] [combination fixed temperature rate of rise] detectors. [Contacts shall be self-resetting after response to rate of rise principle.] [Operation under fixed temperature actuation shall result in an external indication.] Detector units located in boiler rooms, showers, or other areas subject to abnormal temperature changes shall operate on [fixed temperature principle only] [rate compensating principle]. [Detectors shall be hermetically sealed and automatically resetting type which shall operate when ambient air temperature reaches detector setting regardless of rate of temperature rise]. Locate detectors [in accordance with UL or FM listing and the requirements of NFPA 72E] [and] [as indicated], except that detector spacing shall not exceed [900] [ ] square feet per detector. If the proposed type of detector has an area coverage capability less than required by NFPA 72E, revise detector layout and submit for approval with the shop drawings. [Mount detectors at the underside of ceilings or roof decks unless otherwise indicated.] [Detectors shall be [surface] [semiflush]-mounted.] Each detector shall be designed for outlet box mounting, shall be supported independently of wiring connections, and shall be connected by separate screw terminal for each conductor. [Temperature rating of detectors shall be in accordance with NFPA 72E.] No detector shall be located closer than 12 inches to any part of any lighting fixture. Detectors, located in areas subject to moisture or exterior atmospheric conditions, or hazardous locations as defined by NFPA 70, shall be types approved for such locations. Detectors shall be provided with screw-type terminal connections.

(K)



[ 2.2.7 Smoke Detectors: Designed for detection of abnormal smoke densities by the [photoelectric] [ionization] principle. Control or power panels required for operation of the device shall be provided either as individual units or integral with the main control panel. Detectors and associated panels shall be compatible with main control panel that is provided and shall be suitable for use in a supervised circuit. Malfunction of the electrical circuitry to the detector or detector control or power units shall actuate the system trouble devices. Detector spacing and location shall be in accordance with manufacturer's recommendations, the requirements of NFPA 72E, and as indicated. Each detector shall contain an alarm lamp which shall illuminate when the detector is activated into an alarm condition. Detector base shall be provided with screw-type terminals for wiring connections. [Provide remote indicator lamp for each detector located above suspended ceilings, beneath raised floors, or otherwise concealed from view.] [Mount detector on a 4-inch outlet box with a minimum depth of 2 inches. When audible evacuation alarm bells or horns are used in conjunction with ionization type smoke detectors, install the conductors for the audible evacuation alarm devices in a separate conduit. Detector base shall be connected by separate screw terminals for each conductor used.]

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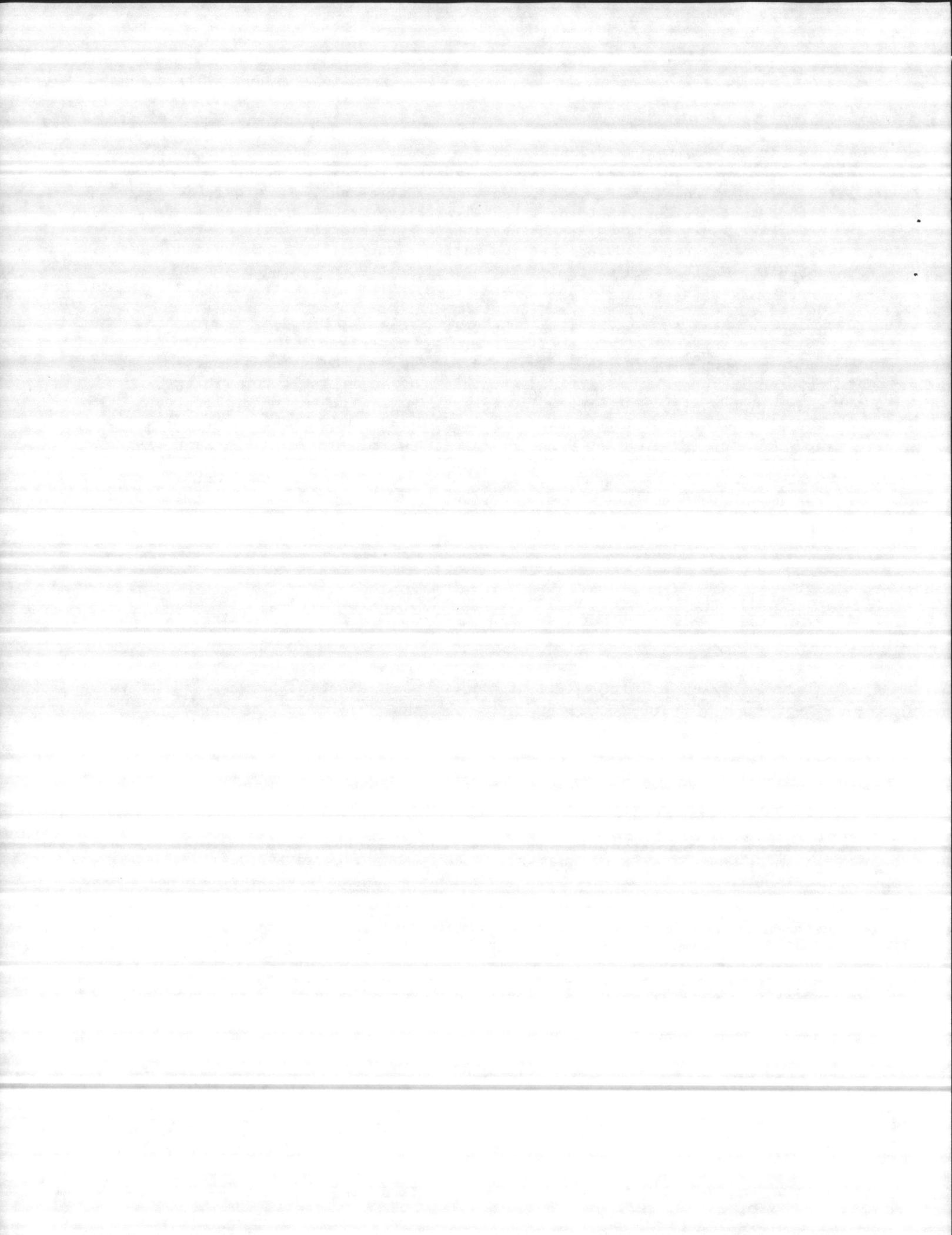
(M)

2.2.7.1 Ionization Detectors: Multiple chamber type which is responsive to both invisible and visible particles of combustion. Detectors shall not be humidity sensitive. The sensitivity of each detector shall be field adjustable to compensate for operating conditions.

2.2.7.2 Photoelectric Detectors: Operate on a multiple cell concept using a LED light source. Failure of the LED shall not cause an alarm condition but shall operate the detector indicating lamp. [Detectors shall be factory set for sensitivity and shall not require field adjustments.]

2.2.7.3 Duct Smoke Detectors: Detectors in ducts shall be [photoelectric] [ionization] type and listed by UL or FM for duct installation. Duct detectors shall be provided with approved duct housing, mounted exterior to the duct, and shall be provided with perforated sampling tubes extending across the width of the duct. [Activation of duct detectors shall cause actuation of the fire alarm control panel in the same manner as other alarm initiating devices.] [Activation of detectors shall cause shutdown of the associated air-handling unit, annunciation at the control panel, and tripping of the [master box] [transmitter] [, but shall not cause sounding of the building interior alarm devices]. [Detector head shall contain amplifier switching circuitry. The amplifier switching circuit shall be entirely solid-state and operate with a nominal detector line voltage of 24 volts dc.]

(N)



2.2.7.4 Single Station Detectors: In sleeping rooms of Unaccompanied [Enlisted] [Officer] Personnel Housing [UEPH] [UOPH] Building(s)

120-volt ac, single station ionization [photoelectric] type smoke detectors shall be installed as indicated. Each smoke detector shall be UL listed, produce 85 dBa at 10 feet (minimum), and provided with an integral alarm test device. Detector installation and power supply shall be in accordance with NFPA 74. Primary source of electric power shall be a dependable commercial light and power source. Detector shall be hard wired into the electrical source and shall not be subject to loss of power by a wall switch.

2.2.8 Alarm Bells: Provide [10-inch] [6-inch minimum] [\_\_\_\_\_], [recessed] [surface-mounted] type with matching back box. Provide underdome vibrating type bells, suitable for use in an electrically-supervised circuit, with a sound output rating of at least 90 decibels at 10 feet. [Provide bells specifically listed for outdoor use in exposed locations.] Bells shall have a separate screw terminal for each conductor connection.

(O,P)

2.2.9 Alarm Horns: Provide [recessed,] [surface-mounted,] [single] [double] [projector] [grill] vibrating type, suitable for use in an electrically-supervised circuit. Horns shall have a minimum sound output rating of at least [84] [90] decibels at 10 feet. [Recessed grill-type horns shall be provided with a heavy wire-mesh screen or louvered, heavy gauge steel, anti-tamper cover over the horn and recess.] [Horns in locations exposed to the weather shall be approved weatherproof type.]

(O,P)

2.2.10 Audiovisual Alarms: Provide [recessed] [surface-mounted] approved audiovisual alarm devices consisting of a [single] [double] [projector] [grill] vibrating type alarm horn suitable for use in an electrically-supervised circuit and top-mounted integral flashing strobe light. Horn shall have a sound rating of at least 90 decibels at 10 feet. Strobe light shall have a [ruby][\_\_\_\_]-colored lens [and shall pulse in march-time sequence].

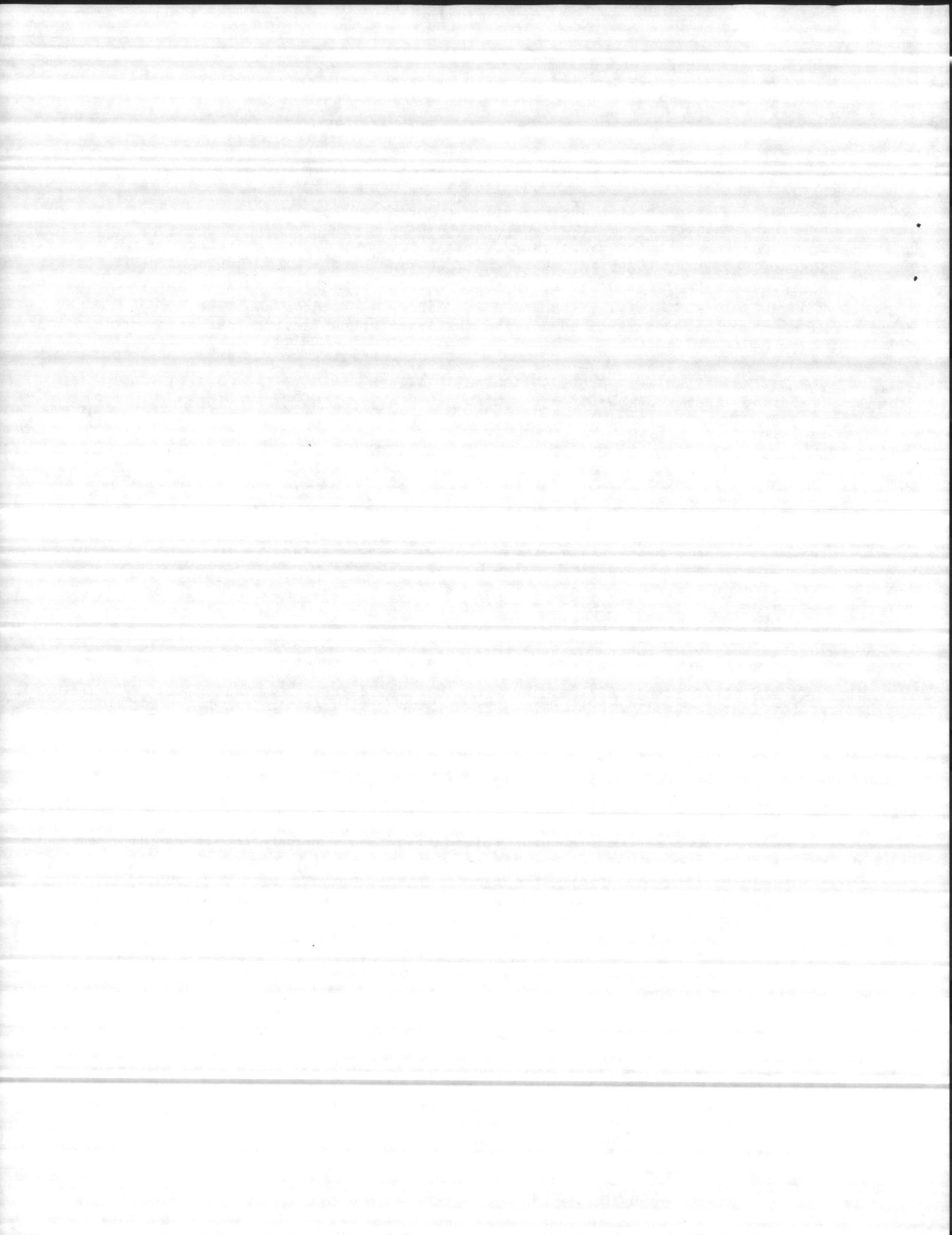
(P)

2.2.11 Visual Alarms: Provide [flush] [surface-mounted] lamp assembly suitable for use in an electrically-supervised circuit. Provide lamps of the flashing [stroboscopic] [incandescent] type, powered from the control panel alarm circuit. Lamps shall produce a minimum of 50 candlepower and flash between 60 and 120 times per minute. Lamps shall be protected by a [red][\_\_\_\_], thermoplastic lens and shall be labeled FIRE.

(P)

2.2.12 Master Fire Alarm Boxes: Provide by the same manufacturer as other master fire alarm boxes on the station system. Provide fire alarm boxes of the coded, [shunt] [positive] noninterfering type with succession features having a [shunt] [local energy] type auxiliary

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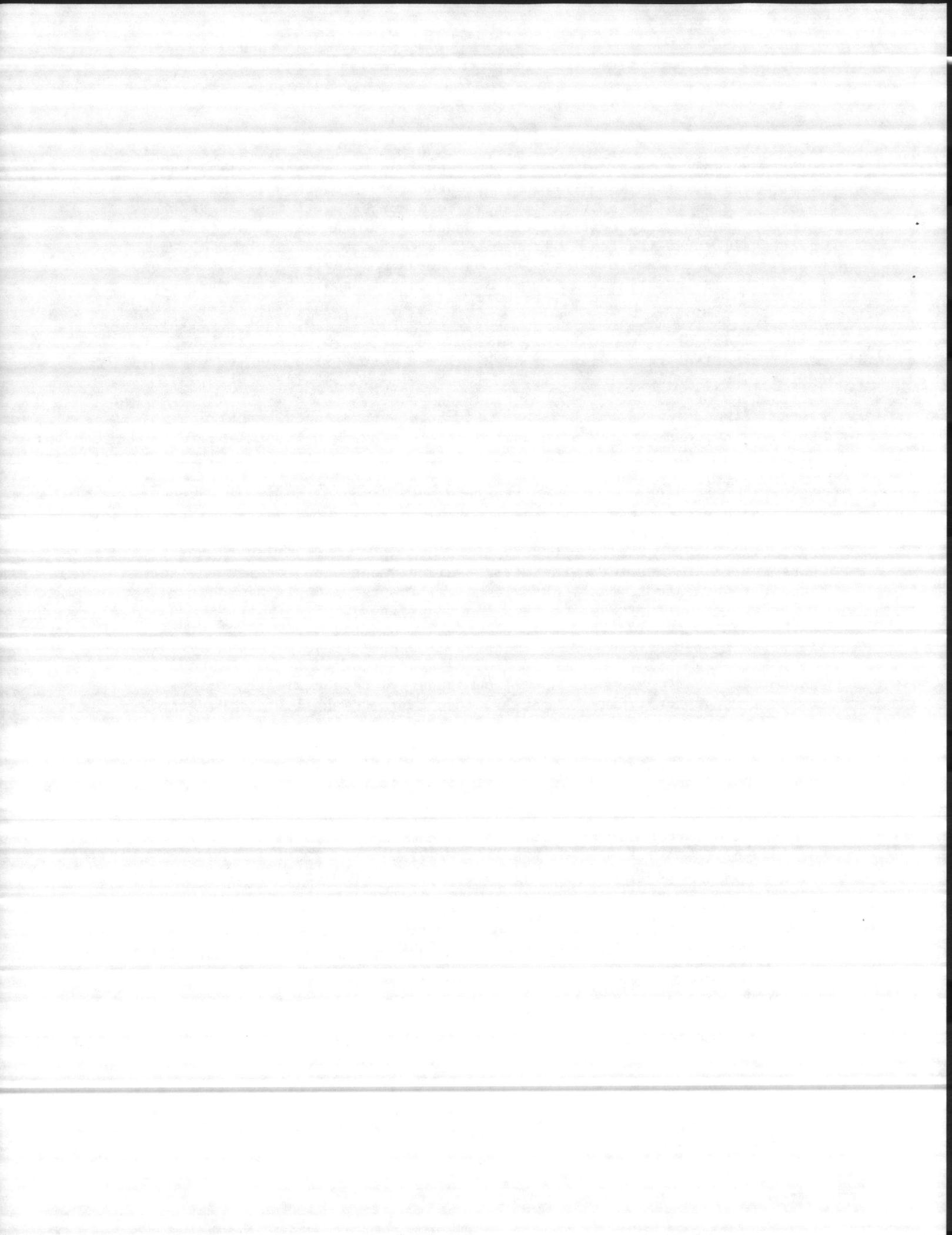


tripping device. Provide boxes of the prewound, open-door, pull-lever type. Mechanism shall be housed in a weatherproof cottage shell type of housing with metallic or rigid plastic code number plate mounted on the exterior face of the cottage shell. Operation of the actuating pull lever shall cause the box to transmit four complete rounds of code to gongs, recorders, and other devices on the same circuit. Driving springs shall have the capability to transmit not less than eight complete four-round groups of code before being rewound. Design boxes for operation of 100 milliamperes dc, but with capability of full operation of 70 milliamperes and up to 120 milliamperes. Equip each box with manual signaling key, telephone jack, silent test device, and box shunt device. Box shall be [wall] [pole] [pedestal]-mounted [as indicated] with center of box 5 feet above grade, and provided with lighting fixture. Mounting bolts, brackets, fastenings, and conduit shall be copper alloy, cadmium, or zinc-coated steel. Code wheel shall be metallic and box code shall be as directed.

2.2.13 Automatic Code Transmitter: Provide transmitter that responds to the actuation of the fire alarm control panel. Provide transmitter of the electric motor-driven or prewound spring mechanism type which shall transmit not less than four rounds of code. When motor-driven transmitters are provided, the motor shall be connected to a supervised circuit in a control panel. Provide metallic or rigid plastic code number plates on the exterior face of transmitters. Transmitters shall be designed to provide the same features as the fire alarm boxes for electrically-supervised, coded [positive] [shunt] noninterfering type and shall have the ability to transmit signals on grounded or open circuits. Transmitter shall have a [shunt] [local energy] type auxiliary tripping device. Code wheel shall be metallic and box code shall be as directed. (Q)

2.2.14 Radio Alarm Transmitters: Provide by the same manufacturer as other radio alarm transmitters on the station. Transmitters shall be compatible with base receiving equipment. Each radio alarm transmitter shall be the manufacturer's recognized commercial product, completely assembled, wired, factory tested, and delivered ready for installation and operation. Provide transmitters in accordance with applicable portions of [NFPA 72A,] [NFPA 72B,] [NFPA 72E,] NFPA 1221, and FCC rules and regulations published in Title 47, Part 90, Code of Federal Regulations. Transmitter electronics module shall be contained within the physical housing as an integral, removable assembly. (Q,R)

2.2.14.1 Environmental Operating Requirements: Provide corrosion-resistant radio alarm transmitter designed for reliable operation under inclement conditions, including [100] [ ] mph winds and in ambient temperatures from minus 40 to plus 140 degrees F.



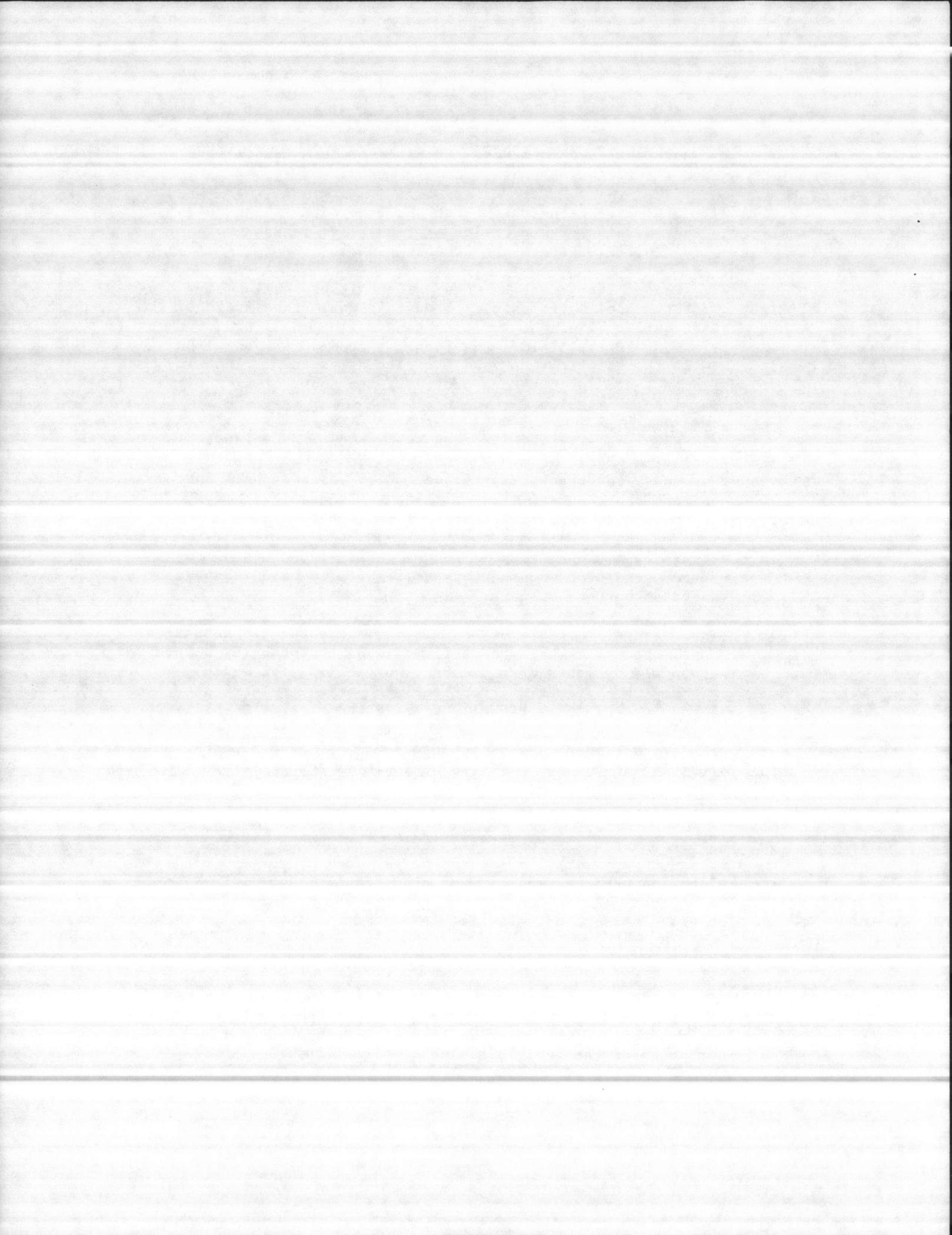
2.2.14.2 Functional Requirements: Each radio alarm transmitter shall meet or exceed the following minimum requirements:

2.2.14.2.1 Signals: Each transmitter shall be of a design which permits the transmission or generation of [manually] [and] [automatically] initiated alarm and trouble signals.

2.2.14.2.2 Transmitter Identity Code: Transmitter shall emit a distinct identity code number as part of each signal transmission. The method used in setting the code for each transmitter shall be suitable for accomplishment in the field. The identity code number shall be consistent with the existing base radio fire alarm system. Identity code number assignments are subject to approval by the Contracting Officer, in consultation with the Station Fire Chief.

2.2.14.2.3 Message Designations: Transmitter shall emit a distinct and individually identifiable message designation in response to an occurrence or cause for transmitter actuation. Messages shall correspond to those designations standard with existing radio fire alarm system. [Specifically required message designations shall be:]

- [a. Battery Condition Message: Automatically indicates a low battery condition when battery voltage falls below 85 percent of the rated battery voltage.]
- [b. Test Message: Capable of both manual and automatic actuation. Manual actuation shall be performed when necessary by authorized personnel, by means of a secured (not publicly accessible) switch. The automatic actuation is to occur at least once each 24-hour period, at optionally preselected times. Stability of the electronic device shall be within 1.0 minute per month, and within the temperature range stipulated for system operation. Actuation of the test message designation, regardless of initiating means, shall cause no less than one complete message to relay.]
- [c. Tamper Message: Automatically transmitted when a transmitter is tilted to or over 45 degrees from vertical or suffers violent vibration through vandalism or other conditions. Actuation of the tamper message designation shall cause no less than one complete message to relay.]
- [d. Trouble Message: Automatically transmitted in the event of a failure, in excess of 1.0 minute duration, of the transmitter's main operating power source or any interface device connected thereto. Additionally, disarrangement in the wiring of the transmitter [or interface device] shall cause automatic actuation of the trouble message designation.]



[e. Alarm Message: Provide a sufficient number of message designations, each individually identifiable, to allow the number of alarm and trouble signals indicated to be transmitted plus a minimum of \_\_\_\_ additional messages. [Where the total number of messages exceeds the maximum manufacturer's standard equipment, multiple transmitters will be acceptable.] Separate identifiable message designations shall be automatically actuated from the respective connected fire alarm panel or other alarm-initiating device.]

[f. Fire Message for Master Box Type Transmitter: Manually actuated by a street box pull lever or push button located on the front of each transmitter.]

2.2.14.2.4 Power Output: The radio frequency (RF) power output of each radio alarm transmitter shall be a minimum of [1.0] [2.0] [\_\_\_\_] watt nominal, but shall be sufficient to transmit all signals reliably under the topographic conditions at the installation site.

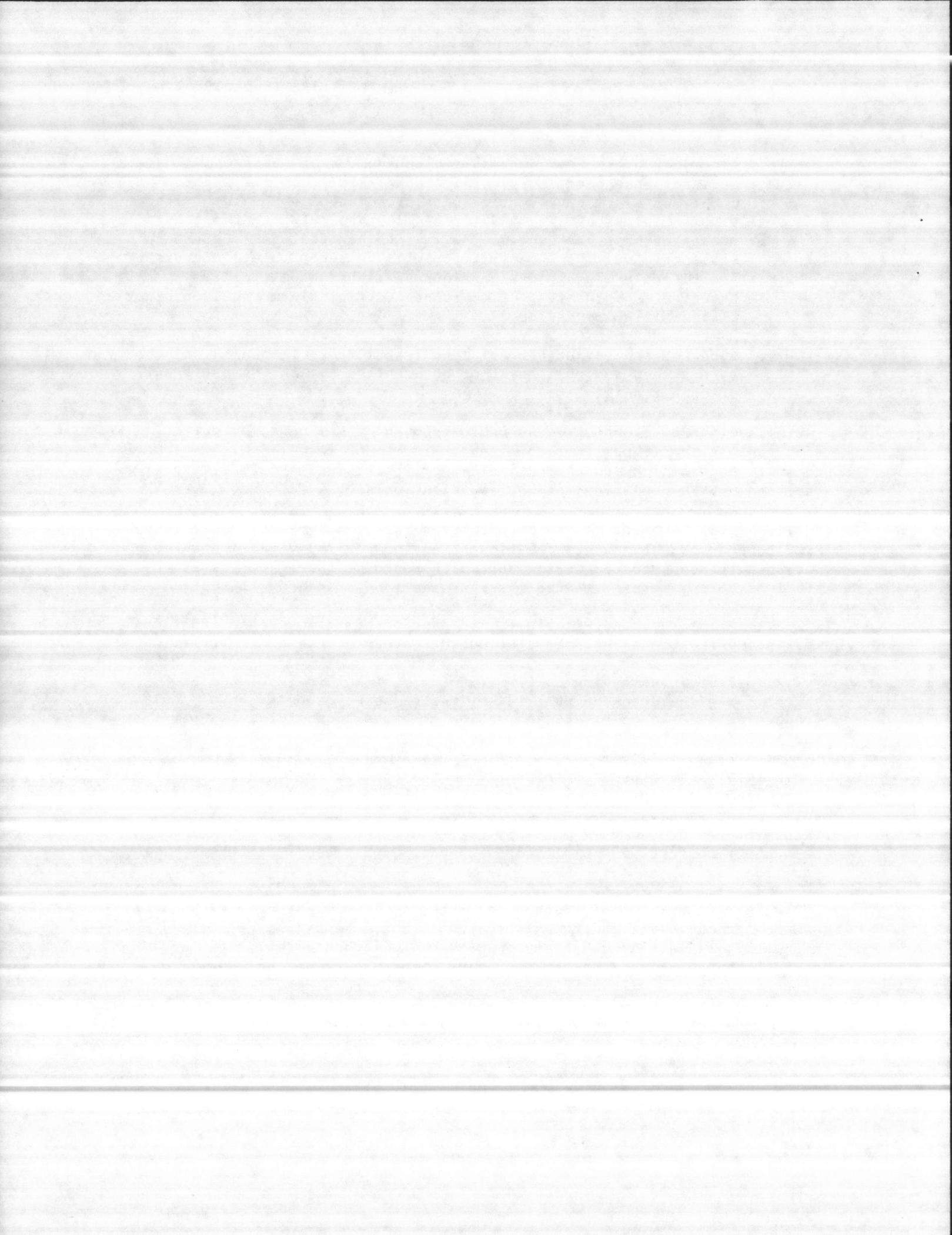
2.2.14.2.5 Memory: Provide transmitters with full memory capability. Simultaneous or subsequent actuation of any or all individual messages, including those actuated during "off air" periods, shall not result in the loss of any message. Such messages shall be stored until transmitted.

2.2.14.2.5.1 Message Priority: Field prioritization of the individual message designations shall be a standard feature of the transmitter.

[ 2.2.14.2.6 Transmission Confirmation: If signal is initiated at street box push button or pull lever, master box type transmitter shall produce an audible or visual indication that the transmitter is operating and a signal is being transmitted.]

2.2.14.3 Transmitter Power Supply: Each radio alarm transmitter shall be powered by a combination of locally available 120-volt ac power and a spill-proof, sealed lead-acid or lead-calcium battery. [If indicated, transmitters used only in manually-operated street box configuration may be battery powered, in compliance with paragraph titled "Battery Duration."]

2.2.14.3.1 Operation: Each transmitter shall operate from 120-volt ac power. In the event of 120-volt ac power loss, the transmitter shall automatically switch to battery operation. Switchover shall be accomplished with no interruption of protective service, and shall automatically transmit a trouble message. Upon restoration of ac power, transfer back to normal ac power supply shall also be automatic. Each transmitter shall meet the following requirements:



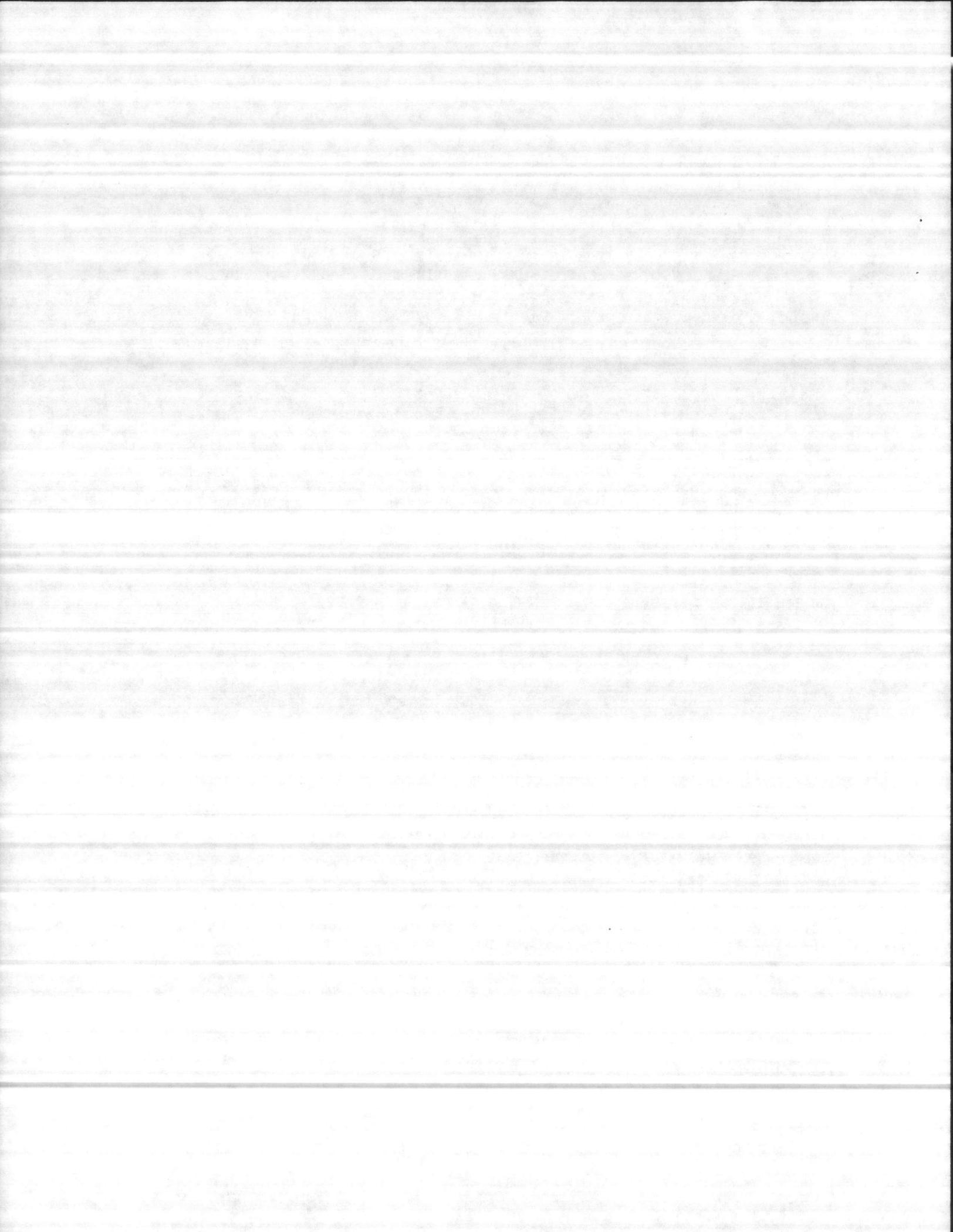
- a. Converter/Float Charger: Under presence of 120-volt ac power, radio alarm transmitter shall be powered through a converter/float charger. Converter/float charger shall recharge a fully discharged battery in not more than 12 hours while simultaneously operating the transmitter. The converter/charger shall operate from 60 Hz, 120-volt ac (plus 10, minus 15 percent). If converter/charger is installed within the transmitter housing, provide a double pole switch for disconnecting the 120-volt ac power for test purposes. Provide power supply filtering to prohibit any false message transmittal occasioned by transient or steady state electrical disturbances.
- b. Power Source: Obtain power supply through a single connection into the line side of the building's regular 60 Hz service circuit. [Obtain power supply as indicated.]
- c. AC Safety Switch: Provide a properly fused, safety-type switch and box with provisions for locking the cover and operating handle in the "power on" position for the connection to the power supply. The switch box shall be painted red and shall be located [near the building panel] [as indicated]. AC safety switch shall be labeled RADIO FIRE ALARM TRANSMITTER.

2.2.14.3.2 Battery Power: The battery package shall supply power requirements in a given transmitter and meet the following requirements:

- a. Battery Duration: Transmitter 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 alarms during that period.
- b. Battery Connection: Each battery shall have an integral cable with receptacle for connection to the transmitter. Disengagement of the connection shall be readily accomplished without the use of tools.

2.2.14.4 Radio Alarm Transmitter Housing: Provide [cottage shell] [rectangular] type housing, corrosion resistant, cast metal, having sufficient strength to ward off physical damage caused by vandalism. [Housing shall be sealed against the entry of moisture, dust, dirt, insects, and other foreign objects.] [Interior transmitter housing shall be NEMA Type I.] Provision shall be made for conduit (minimum 0.75 inch) entry and attachment at no less than one place on the top surface of the housing backplate and one place on the bottom of the backplate.

2.2.14.4.1 Battery Compartment: If battery is vented, the battery compartment shall be drip-proof and sealed from the rest of the enclosure.



2.2.14.4.2 Lock: Provide a tamper-proof lock on transmitter housing to protect internal components from vandalism. Locks for transmitters provided shall be keyed the same as existing. Housing shall allow access to internal components for testing, servicing, and replacement at the installation site.

2.2.14.4.3 Painting: Radio alarm transmitter housing shall be factory painted with a suitable priming coat and not less than two coats of a hard, durable weatherproof enamel. The finish color shall be [Lime Yellow, similar to color number 23793, Fed. Std. FED-STD-595] [Fire Engine Red, similar to color number 11105, Fed. Std. FED-STD-595]. Control boards shall be treated and painted in accordance with the manufacturer's standard practice. Painted surfaces damaged during installation shall be repainted to match existing paint.

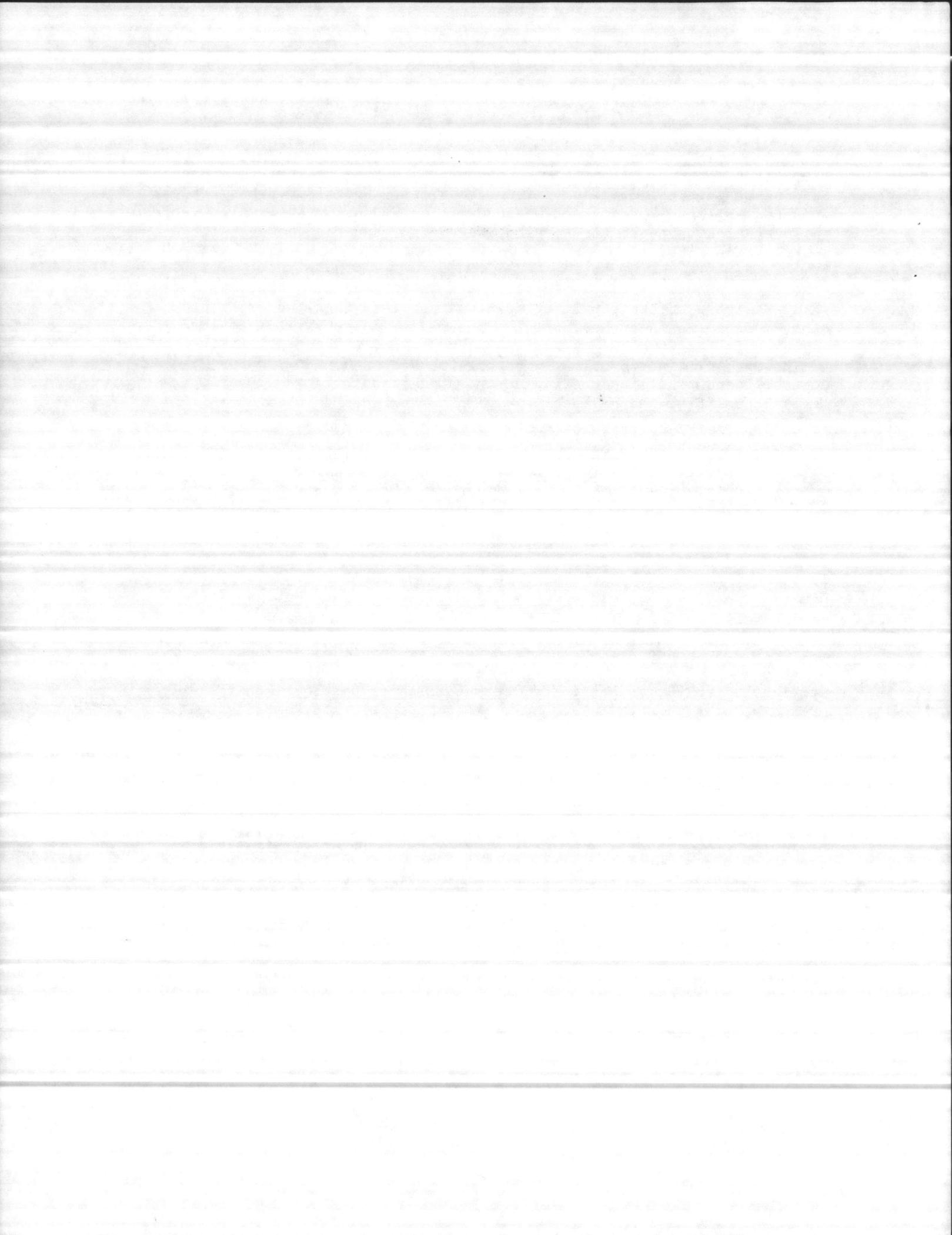
2.2.14.4.4 Marking: Each master box type transmitter housing shall include a reflective, highly visible label imprinted with the word FIRE in minimum 2-inch block characters on both side surfaces of the box.

2.2.14.4.5 Operating Panel: Each master box transmitter housing shall include an operating panel, which shall incorporate one push button, pull lever, or hook clearly labeled FIRE both in words and graphic symbols. Labeling shall also include appropriate operating instructions in words and graphic symbols.

2.2.14.4.6 Mounting: Transmitter housings shall be designed for universal mounting on walls, light poles, or pedestals. Mounting shall utilize lag bolts, anchor bolts, stainless steel banding, mounting brackets, or a shackle/bolt combination, as applicable to the specific installation.

[ 2.2.14.4.7 Box Location Light: Provide each master box type transmitter with a vaportight, incandescent type light fixture constructed of a cast aluminum housing and unbreakable, heat resistant, threaded ruby globe. The light shall be supported with 0.5-inch galvanized steel conduit, and shall be located approximately 1.0 foot above the box. The light shall be provided with an incandescent, 25-watt, 130-volt ac, extended service lamp.]

2.2.14.5 Antenna: Provide [omnidirectional, coaxial, halfwave dipole antennas] [\_\_\_\_\_] for radio alarm transmitters with a driving point impedance to match transmitter output. The antenna and antenna mounts shall be corrosion resistant and designed to withstand wind velocities of [\_\_\_\_\_] [100] mph and physical damage caused by vandalism. Antennas shall not be mounted to any portion of the building roofing system.



2.2.14.6 Antenna Cables for Transmitters: Provide coaxial cable in lengths as required. Cable shall utilize PL-type fittings or connectors, properly protected against moisture. Cables shall match the output impedance of the transmitters.

[ 2.2.15 Radio Transmitter Interface Devices: Provide interface panels, modules, circuit boards, or other auxiliary devices as required for actuation of radio transmitters by building fire alarm systems or other detection devices. Interface devices shall be produced by the manufacturer of the radio transmitters.]

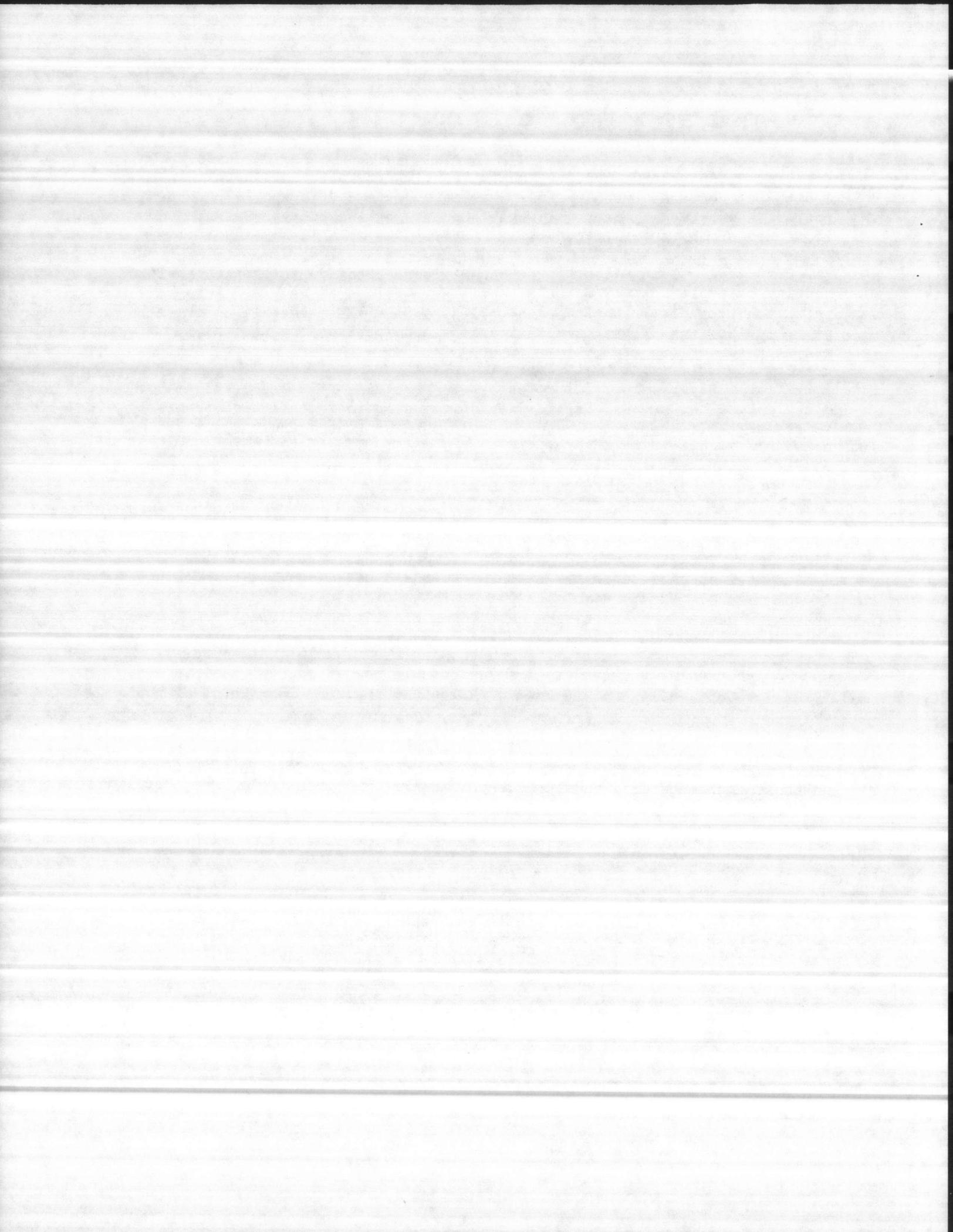
[ 2.2.15.1 Supervision: Circuits between building fire alarm systems or other detection devices, including respective radio transmitters, shall be electrically supervised. Any circuit open or ground fault shall cause a trouble signal to be transmitted by the radio transmitter. In addition, the zone in which the trouble condition has occurred shall be indicated by a distinctive and identifiable radio signal or by a designated lamp on the optional interface panel described in paragraph entitled "Interface Panel."]

[ 2.2.15.2 Interface Panel: Provide with enclosure type conforming to NEMA ICS 1, as required by location. Provide a red alarm light, an amber trouble light, and an audible signal device. Access to controls shall be by unlocking and opening a panel or door. Provide an audible alarm silencing switch to silence the audible alarm. The visual alarm and trouble lights shall remain lit when the audible signal is silenced. Upon correction of the system alarm or trouble condition, the audible trouble signal shall again sound to indicate the abnormal position of the switch.]

[ 2.2.15.3 Power Supply: Provide precision regulated power supply for float charging the battery and simultaneously supplying operating power to the interface unit. The input voltage shall be 120 volts ac at 60 Hz.]

[ 2.2.15.3.1 Power Supply Source: Obtain through a single connection into the line side of the building's regular 60 Hz ac service circuit. [Obtain power supply as indicated.]]

[ 2.2.15.3.2 AC Safety Switch: Provide a properly fused, safety-type switch and box with provision for locking the cover and operating handle in the "power on" position for the connection to the power supply. The switch box shall be painted red and shall be located [near the building service panel] [as indicated]. Provide padlocks for locking the box cover and operating handle. Padlocks shall be keyed alike, or master keys shall be provided. AC safety switch shall be labeled RADIO FIRE ALARM INTERFACE PANEL.]



[ 2.2.15.3.3 Emergency Power Source: Provide a battery or batteries capable of powering the interface panel in a normal standby status for 60 hours and capable of transmitting alarms during that period. In the event of normal ac power loss, transfer to the emergency power mode shall be automatic and without interruption. Upon restoration of ac power, transfer back to normal power shall also be automatic.]

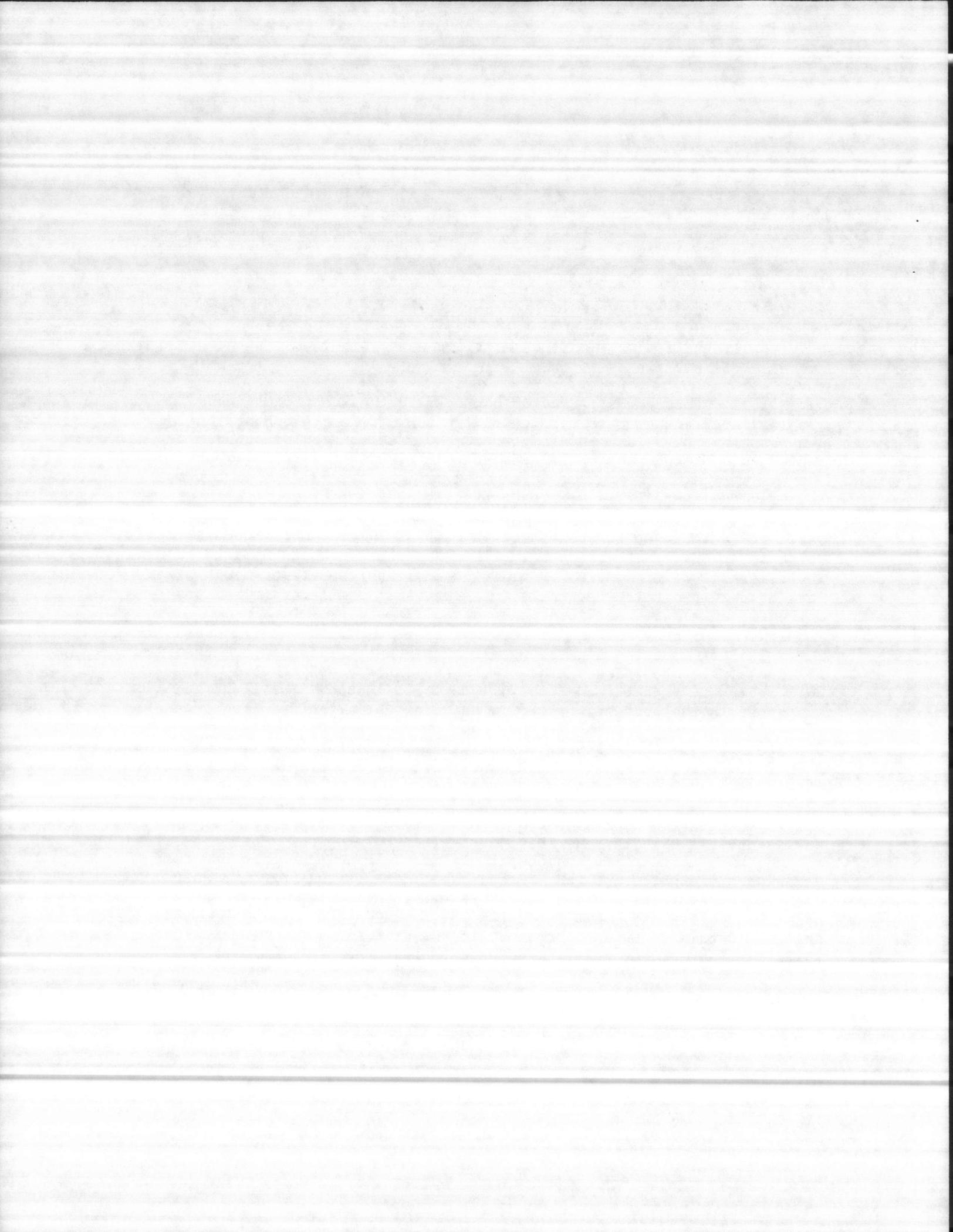
2.2.16 Grounding: Each [master box] [transmitter] shall be grounded by connection from the grounding terminal connection of the box to either a driven ground rod or a buried, metallic water pipe. Resistance to ground shall not exceed 10 ohms. (S)

2.2.16.1 Ground Rods: Provide copper-weld type copper clad steel rods with diameter adequate to permit driving to full length of the rod, but not less than 0.75 inch in diameter and 10 feet long unless otherwise indicated. Ground rods shall not protrude more than 6 inches above grade.

2.2.17 Box Pedestal: Construct of galvanized sheet metal with cast iron base, designed to support the fire alarm box and light. The shaft shall be rectangular in cross section with a hollow compartment inside. Compartment shall be readily accessible and shall contain facilities for installing cable terminals. Facilities shall be capable of mounting no less than 10 two-point terminals. The pedestal shall have a red and white finish as used for fire alarm boxes. (T)

2.2.18 Box Location Light: Provide vaportight, incandescent type fixture constructed of a cast aluminum housing and unbreakable, heat-resistant, and threaded ruby globe as indicated. The light shall be supported in the pendant position with 0.5-inch galvanized steel conduit screwed into the hub on the top of the box or into the special mounting supplied by the manufacturer. Light shall be located approximately 1.0 foot above the master box. Light shall be provided with an incandescent, 25-watt, 130-volt ac, extended service lamp. (U)

2.2.19 Electromagnetic Door Hold-Open Devices: Attach to the walls unless otherwise indicated. Device shall operate on power from the fire alarm control panel. Attach compatible magnetic component to the door. Under normal conditions, the magnets shall attract and hold the door open. Upon activation of the building fire alarm system, the devices shall be deenergized, thus releasing the doors on the circuit. Devices shall be furnished under Section 08710, "Finish Hardware," and shall be installed, connected, and placed in operation under this section. (V)



## PART 3 - EXECUTION

3.1 INSTALLATION: Equipment, materials, installation, workmanship, inspection, and testing shall be in accordance with NFPA publications and as modified herein.

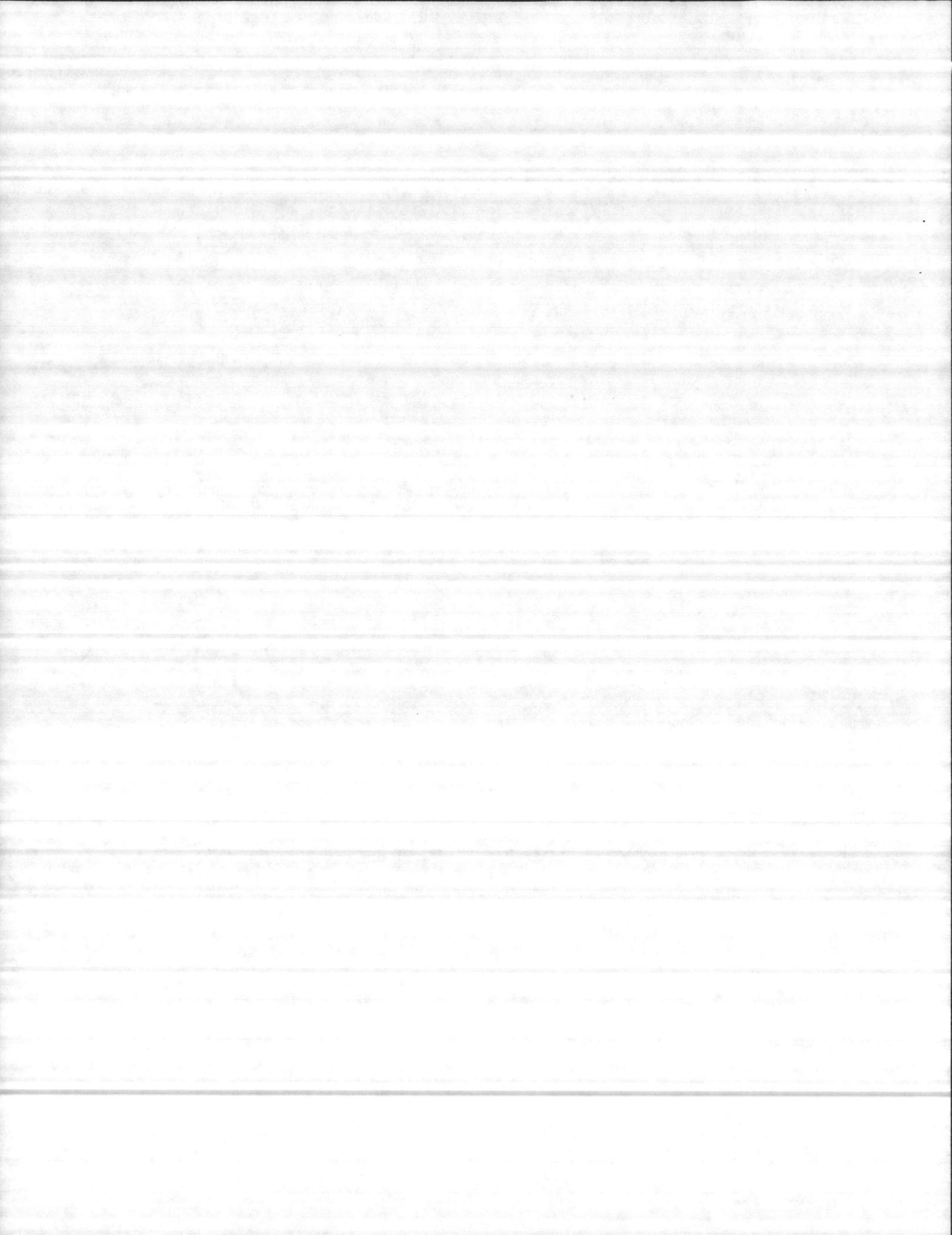
3.2 PRELIMINARY TESTS: Conduct the following tests during installation of wiring and system components. Correct any deficiency pertaining to these requirements prior to formal functional and operational tests of the system.

3.2.1 Ground Resistance: Measure the resistance of each connection to ground. Ground resistance shall not exceed 10 ohms.

3.2.2 Dielectric Strength and Insulation Resistance: Test the dielectric strength and the insulation resistance of the system interconnecting wiring by means of an instrument capable of generating 500 volts dc and equipped to indicate leakage current in 1000 megohms. For the purpose of this test, the instrument shall be connected between each conductor on the line and between each conductor and ground at the control panel end of the line, with the other extremity open circuited and devices disconnected. The system shall withstand the test without breakdown and shall indicate a resistance of not less than 500,000 ohms, the measurement being taken after an electrification of not more than 1.0 minute with a dc potential of not less than 100 volts nor more than 550 volts.

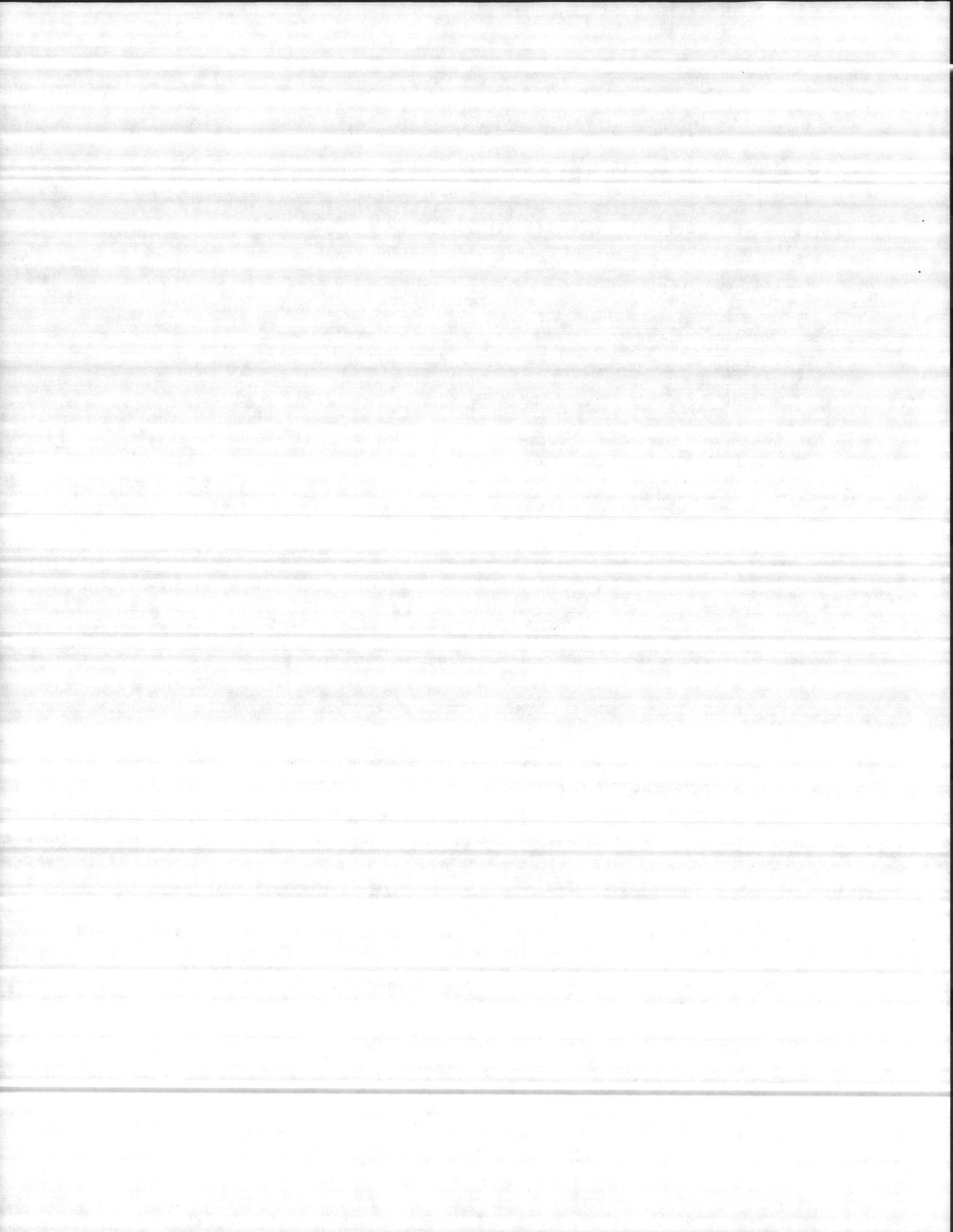
3.2.3 Smoke Detector Tests: Prior to formal inspection and tests, clean and perform sensitivity tests on each smoke detector. Clean the smoke detectors in accordance with the manufacturer's recommended procedures. [Perform voltage activation sensitivity test on each detector and record the results. Remove detectors with a sensitivity level above or below the UL accepted sensitivity range for that detector and replace with new detectors.] Present recorded data at the formal inspection for verification. Approved copies shall become part of the operations and maintenance manual for the fire alarm system.

3.3 FIELD INSPECTION AND TEST: Before final acceptance of the work, test each system to demonstrate compliance with the contract requirement. Each system shall be subjected to complete functional and operational tests [including tests in place of each [heat] [and] [smoke] detector]. When tests have been completed and corrections made, submit a signed and dated certificate with a request for formal inspection and tests.



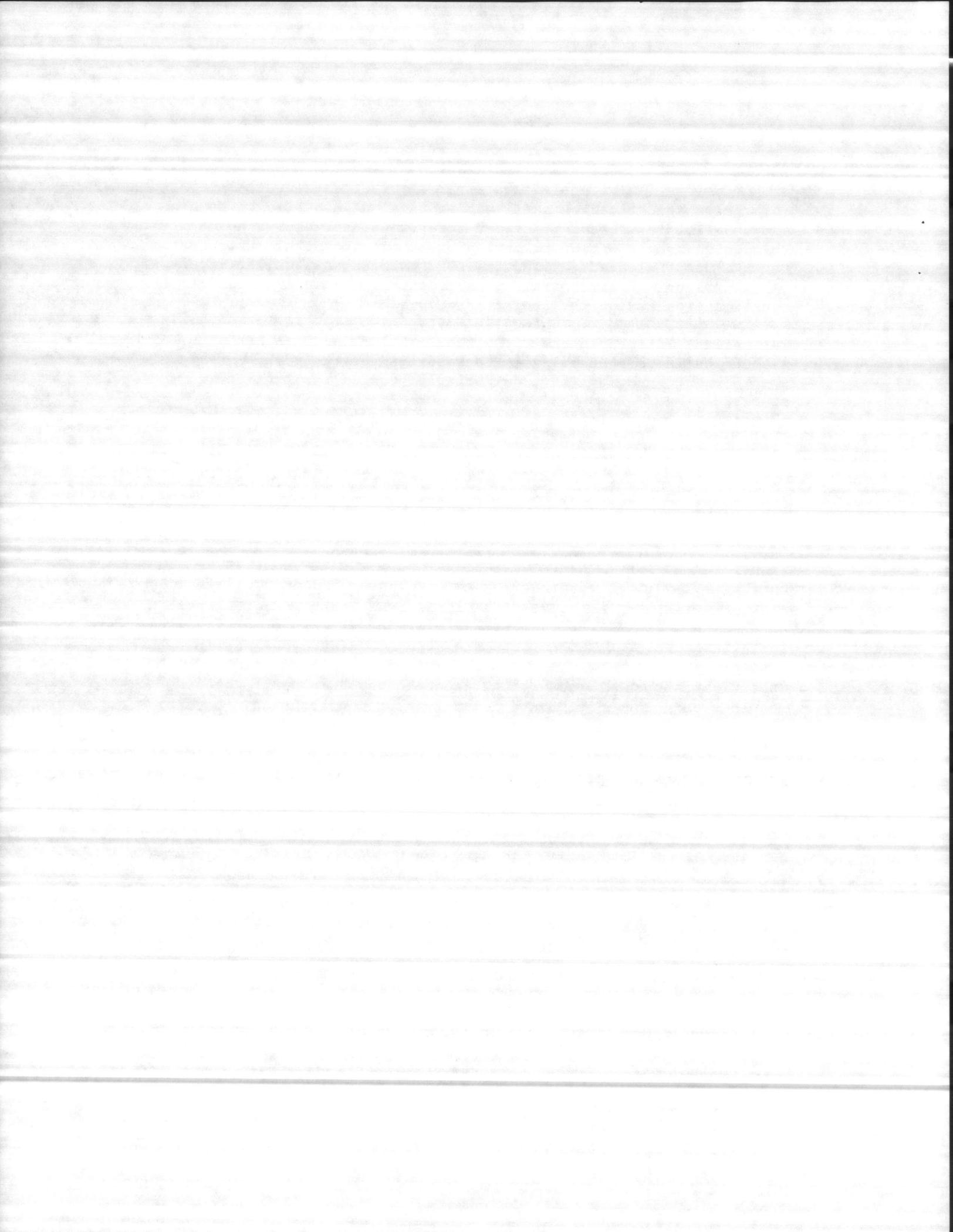
3.4 FORMAL INSPECTION AND TEST: The \_\_\_\_\_ Division, Naval Facilities Engineering Command, Fire Protection Engineer, will witness formal tests after receipt of written certification that preliminary tests have been completed and that the system is ready for final inspection. The system manufacturer's technical representative shall be present for the final inspection and test. Preliminary tests shall be repeated, and functional and operational tests conducted, as requested by the Fire Protection Engineer. Correct defects and conduct additional tests to demonstrate that the system conforms to contract specifications.

\*\*\* END OF SECTION \*\*\*



## GENERAL NOTES

1. This guide specification shall not be referenced but is to be used as a manuscript in preparing project specifications. Edit and modify this guide specification to meet project requirements. Where "as shown", "as indicated", "as detailed", or words of similar import are used, include all appropriate requirements in the project specification and on the project drawings.
2. The capital letters in the right hand margins indicate that there is a technical note pertaining to that portion of the guide specification. Do not include these letters in the project specification.
3. Where numbers, symbols, words, phrases, clauses, or sentences in this specification are enclosed in brackets [], a choice or modification must be made; delete inapplicable portion. Delete publications not referenced in the project specification. Where blank spaces occur, insert appropriate data. Delete inapplicable paragraphs.
4. CAUTION: Coordination of this section with other sections of the specification and with the drawings is mandatory. If materials or equipment are to be furnished under this section and installed under other sections or on the drawings, state that fact clearly for each occurrence. Review the entire specification to ensure that language is included to provide complete and operable systems and equipment.
5. Specifications should not repeat information shown on the drawings. Drawings only should indicate dimensions of construction, quantities, location, and capacity of equipment. Specifications should supplement the drawings by specifying the quality of materials and workmanship, method of installation, equipment functions, and testing required for the project.
6. Do not include Table of Contents, General Notes, and Technical Notes in this section in any submittal.
7. Project drawings should indicate the following information:
  - a. On electrical power floor plans, show location of control panel, battery and charger, transmitter, annunciator, fusible safety switch, remote trouble device, alarm devices, and each actuation device including fire extinguishing system switches.
  - b. On electrical site plan, show location of master fire alarm box, annunciator, circuit run to the connection to the base fire alarm circuit, circuit run into the building and connection to control panel, and circuit run for master box marker light. Circuit runs should show conduit size and numbers and size of conductors.



- c. Show single line fire alarm riser diagram. Connection of equipment should be indicated by circuit runs in lieu of conduit runs. Do not indicate number and size of conductors for interconnection of fire alarm components.
  - d. Show mounting height for panels on elevation or detail drawings, if critical.
8. Suggestions for improvement of this specification will be welcomed; fill in and mail the attached DD Form 1426. Send original of DD Form 1426 to the preparing activity, with a copy to:

COMMANDER  
Naval Facilities Engineering Command  
Code O4M2B  
200 Stovall Street  
Alexandria, VA 22332

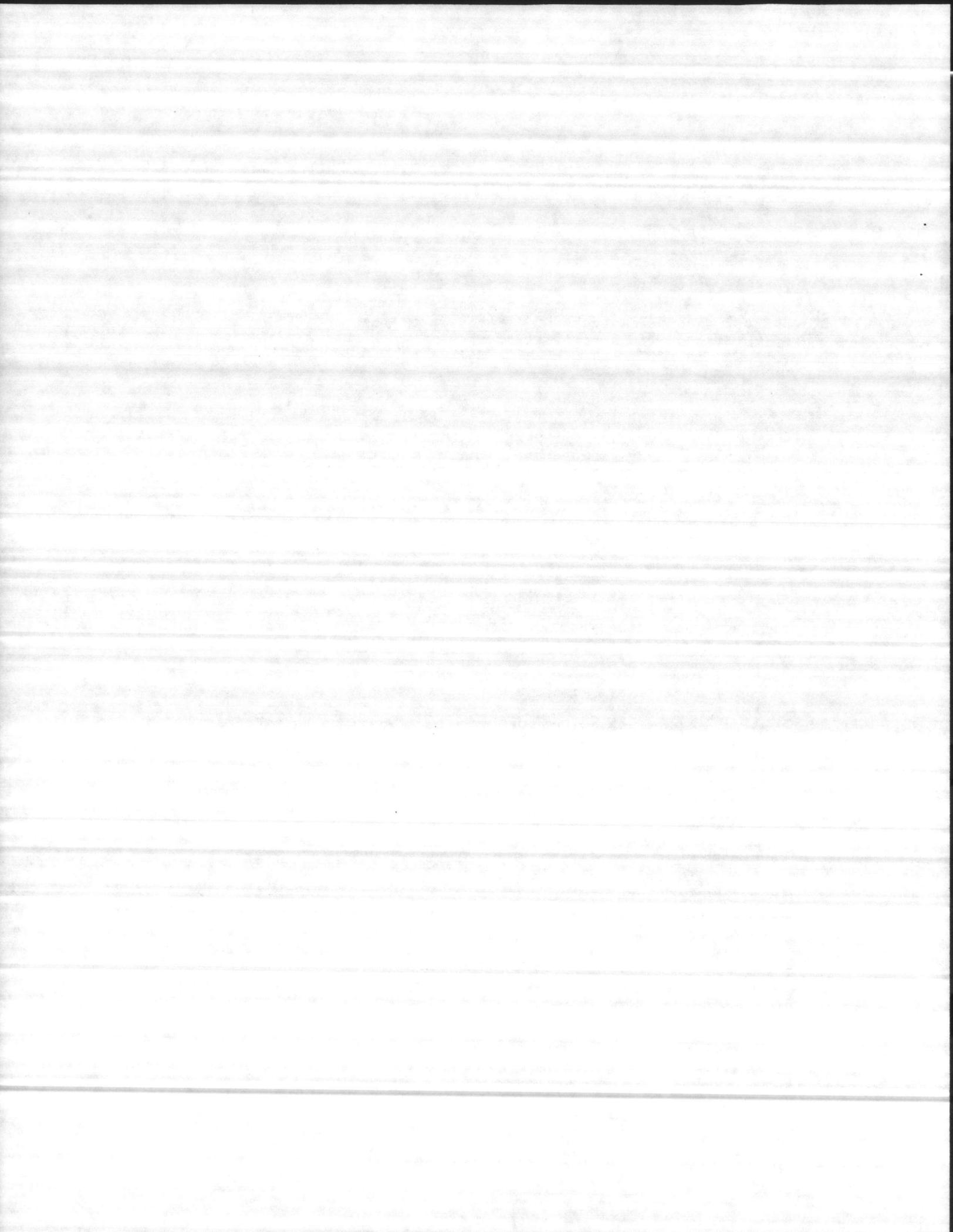
#### TECHNICAL NOTES

- A. This guide specification covers the requirements for interior fire alarm systems including manual and automatic, noncoded, interior, fire and evacuation alarm systems. System requirements must conform to NAVFAC DM-8. If there are questions concerning system design, the Engineering Field Division, Naval Facilities Engineering Command, Fire Protection Engineer, should be consulted.
- B. Specification, section, and page numbers shall be centered at the bottom of each page of this section.

#### EXAMPLE:

05-81-1776  
16722-1

- C. Paragraph 1.1: The latest issue of these publications must be used if they meet the requirements of the project under design. If the latest issue of the referenced publication does not meet project requirements, resolve the problem in the most efficient way; reference the listed publication issue, incorporate data in project specification or do whatever is appropriate. Immediately complete DD Form 1426 in duplicate to the EFD specifications branch.
- D. Paragraph 1.2: The experience clause in this guide specification has been approved by NAVFACENGCOM HQ in accordance with the requirements of NAVFAC P-68. The paragraph in this guide specification may be used without any other NAVFACENGCOM HQ approval of request for waiver.

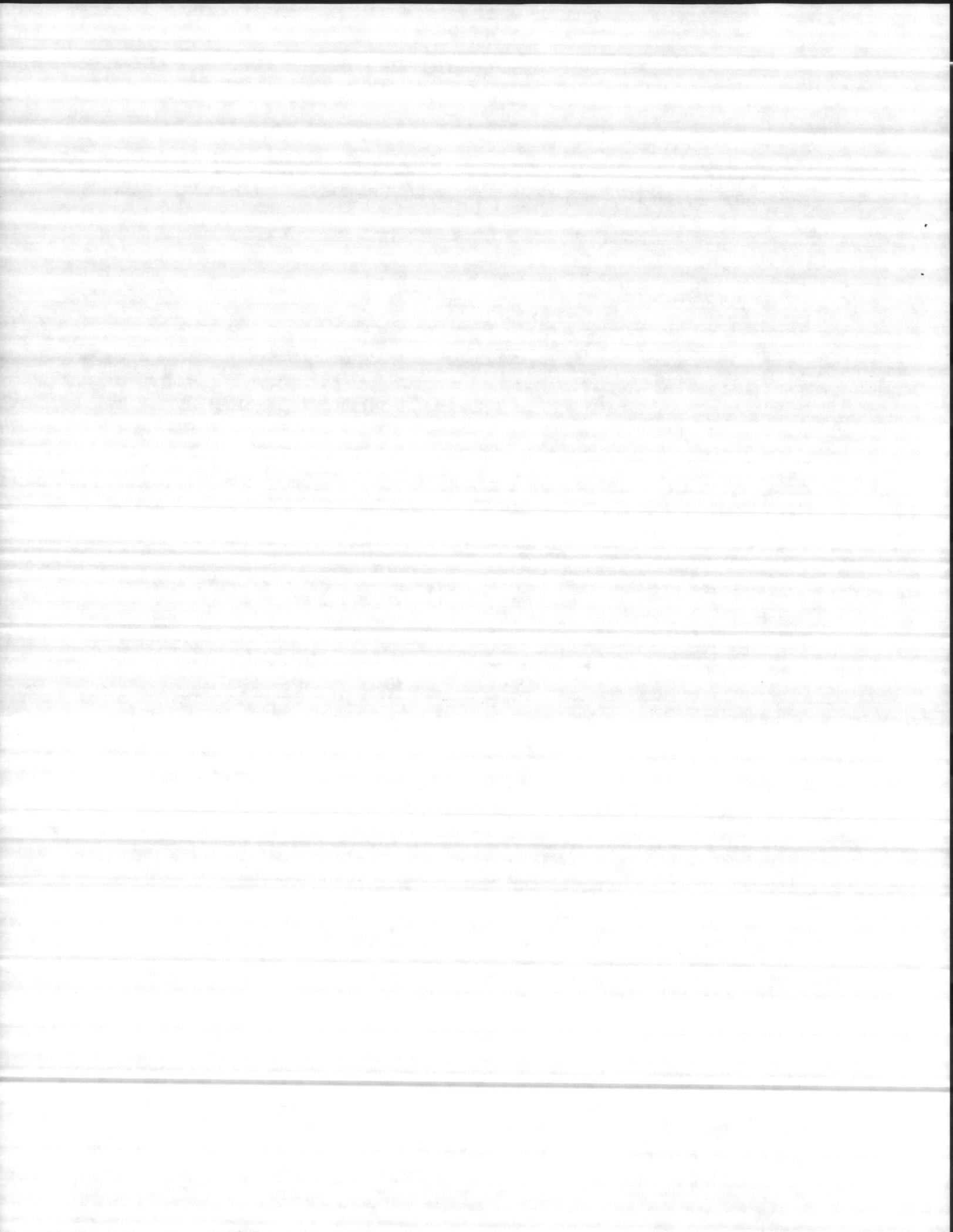


- E. Paragraph 1.4: The manufacturer and type of station fire alarm system should be indicated.
- F. Paragraphs 1.5.1 and 1.6: Delete equipment which is not applicable. Letter-designate, in alphabetical order, items required.
- G. Paragraph 2.1.1: Building interior alarm systems are required to transmit a signal to the activity fire station whenever an activity-wide fire reporting system exists. Delete items which are not applicable. Letter-designate, in alphabetical order, items required.
- H. Paragraph 2.2.2.1: Do not provide a 4-inch trouble bell at the control panel when the panel is located in an office or other reasonably attended location unless the location can be expected to have a high ambient noise level. Provide a remote 4-inch trouble bell when the panel is located in a mechanical equipment room or similar location where the possibility of building occupants becoming aware of a system trouble condition is unlikely.
- I. Paragraph 2.2.3: Remote annunciators may be used in complex structures in cases where the fire alarm control panel is not readily accessible to building occupants. Locate remote annunciator panels in the main entranceway or adjacent to the principal entranceway so that it will be readily obvious to responding firefighters. Avoid exterior (weatherproof) panels where practicable and possible.
- J. Paragraph 2.2.4: Smoke detector annunciators will not be required in every instance where smoke detectors are provided. Use when concealed (under raised floor or above a ceiling) in large areas or in a multiplicity of rooms or areas.
- K. Paragraph 2.2.6: Use this paragraph to describe precisely what is to be provided whenever heat (thermal) detectors are to be provided.
- L. Paragraph 2.2.7: Use only when smoke detectors connected into the building fire alarm system are required.
- M. Paragraph 2.2.7: Provide detail on drawings for mounting detectors in underfloor areas. Detectors must not be mounted at floor level and facing upward.
- N. Paragraph 2.2.7.3: Provide duct detectors when required by NFPA 90A.
- O. Paragraphs 2.2.8 and 2.2.9: Choose either alarm bells or alarm horns. Wherever possible, signals shall be of the same type as most common to the naval base/station. Give consideration to other noise levels within the building and the types of other audible signals which may be used within the building. The fire alarm signal should



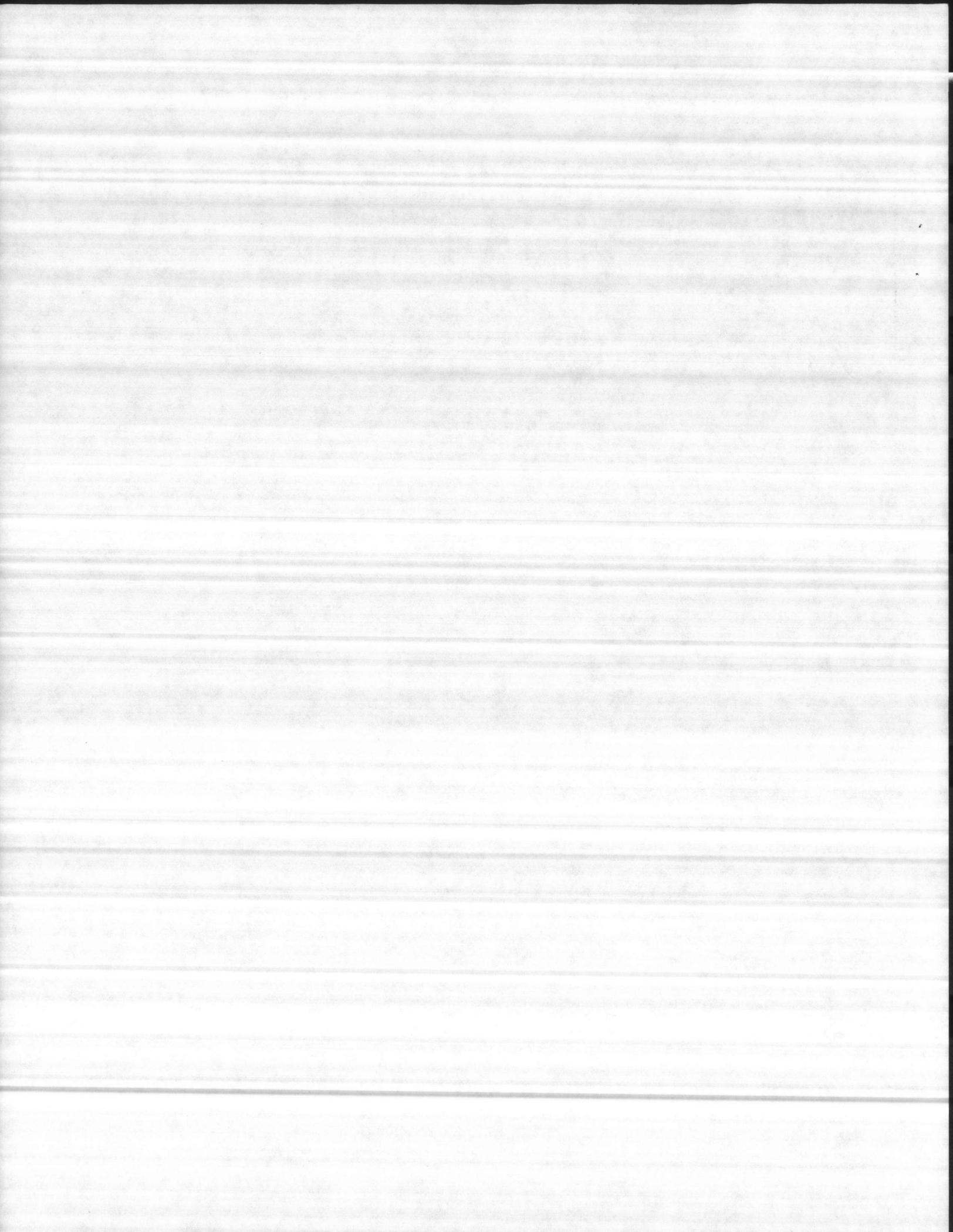
be distinct from other signals. In sleeping occupancies such as barracks, UEPHs, BOQs, etc., use recessed alarm horns with vandalproof screens or plates whenever possible.

- P. Paragraphs 2.2.8, 2.2.9, 2.2.10, and 2.2.11: Audible and visual alarms shall be provided in buildings subject to occupancy by the handicapped and hearing impaired and in occupancies with high ambient noise levels.
- Q. Paragraphs 2.2.12, 2.2.13, and 2.2.14: The choice of master box, code transmitter, or radio transmitter depends upon the type of existing fire reporting system at the activity. When telegraphic systems exist, use either a master box or code transmitter. When existing fire alarm boxes are located within 500 feet or less of the building under consideration, an indoor code transmitter adjacent to the fire alarm control panel will generally be adequate. When it is desirable to have the master box also serve as a street box, generally a pedestal mount will be required. Determine the type of activity reporting system (i.e., positive noninterfering or shunt). In most cases a local energy-tripping device will be required.
- R. Paragraph 2.2.14 and accompanying subparagraphs: Provide in cases where radio fire alarm transmitters are used. Additionally, specific radio alarm system requirements and peculiarities associated with existing systems at a particular naval base/station should be discussed and coordinated directly with the Engineering Field Division, Naval Facilities Engineering Command, Fire Protection Engineer. Local transmission characteristics, emergency power needs, established surveillance features, and distinctive criteria associated with a given project are to be incorporated in the project specification.
- S. Paragraph 2.2.16: Grounding is required whenever a master box, code transmitter, or radio code transmitter is used.
- T. Paragraph 2.2.17: Use pedestal mounting whenever the code transmitting device is to be located outdoors and also serves the general area as a street box. Use wall or pole mounting when land space or use makes the use of a pedestal impractical.
- U. Paragraph 2.2.18: Provide a location lamp over outdoor street and master boxes.
- V. Paragraph 2.2.19: Insert the following paragraph into Section 08710, "Finish Hardware," and add ANSI A156.15-81, "Closer Holder Release Devices," to the "Applicable Publications" paragraph of that section:



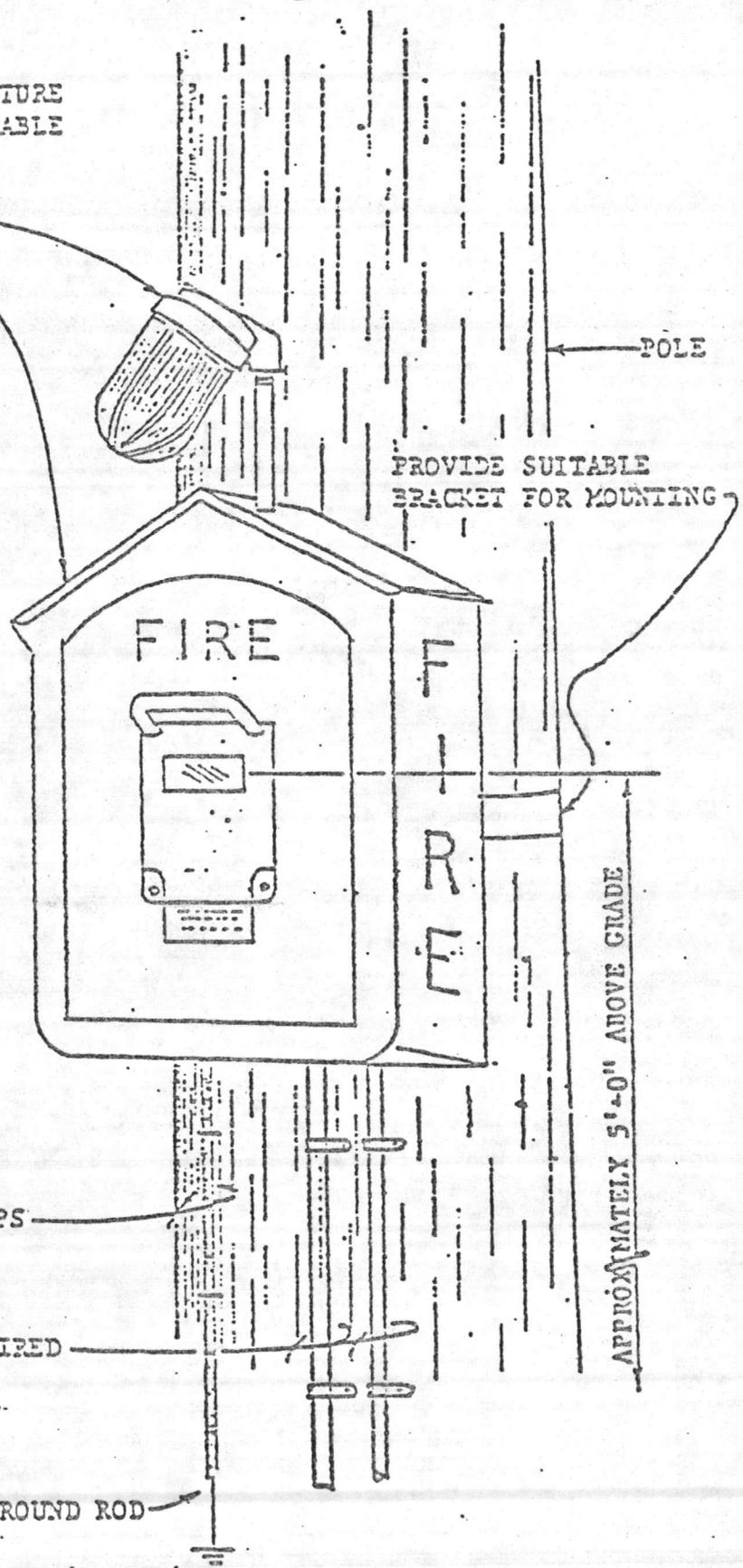
"ELECTROMAGNETIC DOOR HOLDERS: ANSI A156.15, Type [C00011, wall-mounted single for] [C00021, floor-mounted single for] [C00031, floor-mounted double unit for back to back] swinging doors. Magnets shall have a holding force of approximately 25 pounds. Devices shall be UL or FM approved. [Exposed and visible parts of holder devices shall have finish to match lock and door trim.] [Housing for device shall be brushed aluminum.] [Provide door holders as [specified under "Hardware Sets"] [indicated].]

\*\*\* E N D \*\*\*



CAST ALUMINUM, VAPORTIGHT FIXTURE  
WITH 25 WATT LAMP AND UNBREAKABLE  
RUBY GLOBE. SEE SKETCH  
NFGS-16722-3

FIRE ALARM  
BOX WITH RED ENAMEL FINISH



POLE  
PROVIDE SUITABLE  
BRACKET FOR MOUNTING

APPROXIMATELY 5'-0" ABOVE GRADE

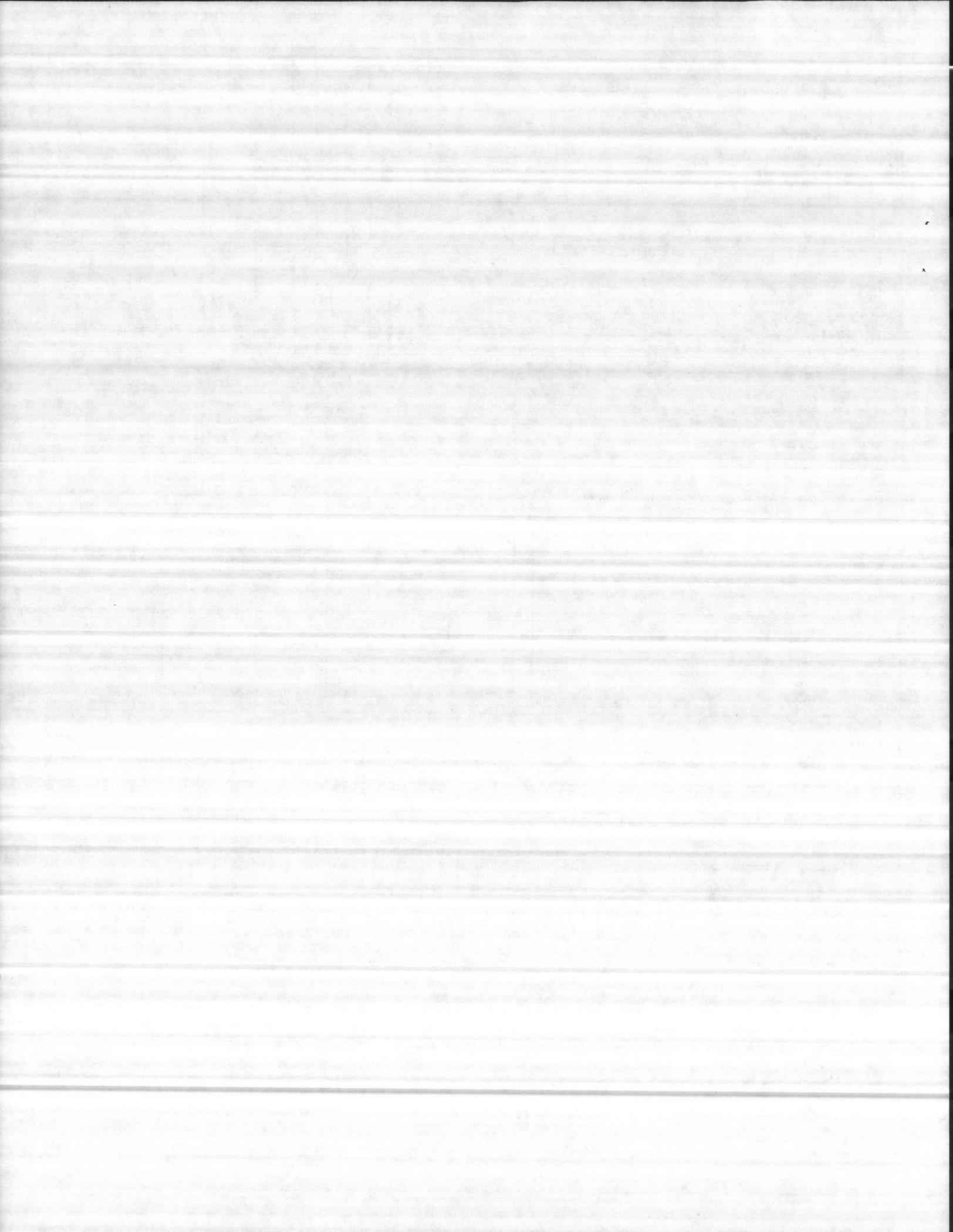
COVER EXPOSED #8 GROUND WITH  
1/2" GROUNDING MOULDING.  
PROVIDE GALVANIZED PIPE STRAPS

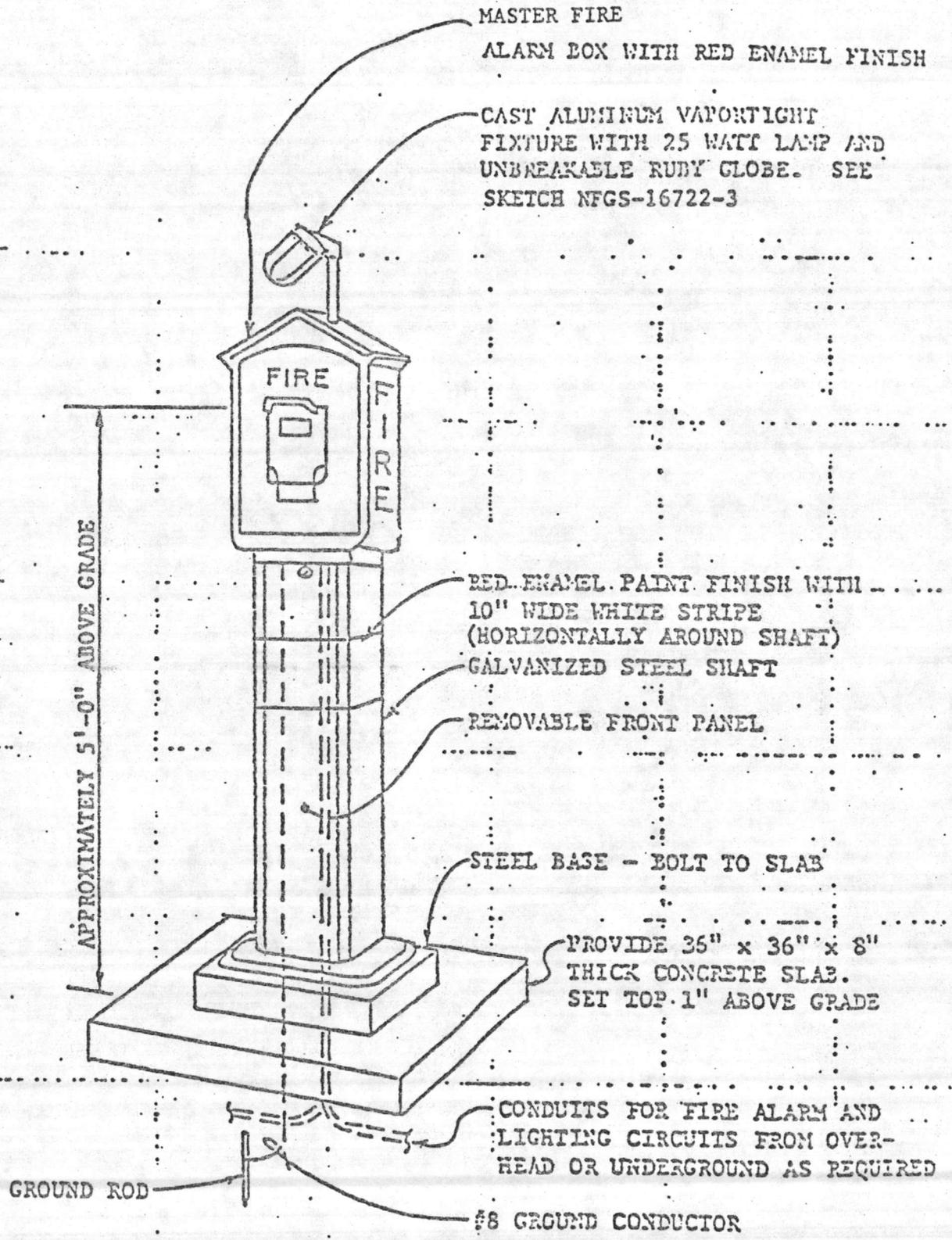
CONDUITS FOR FIRE ALARM AND  
LIGHTING CIRCUITS FROM OVER-  
HEAD OR UNDERGROUND, AS REQUIRED

CLAMP TO GROUND ROD

MASTER FIRE ALARM BOX  
POLE MOUNTED

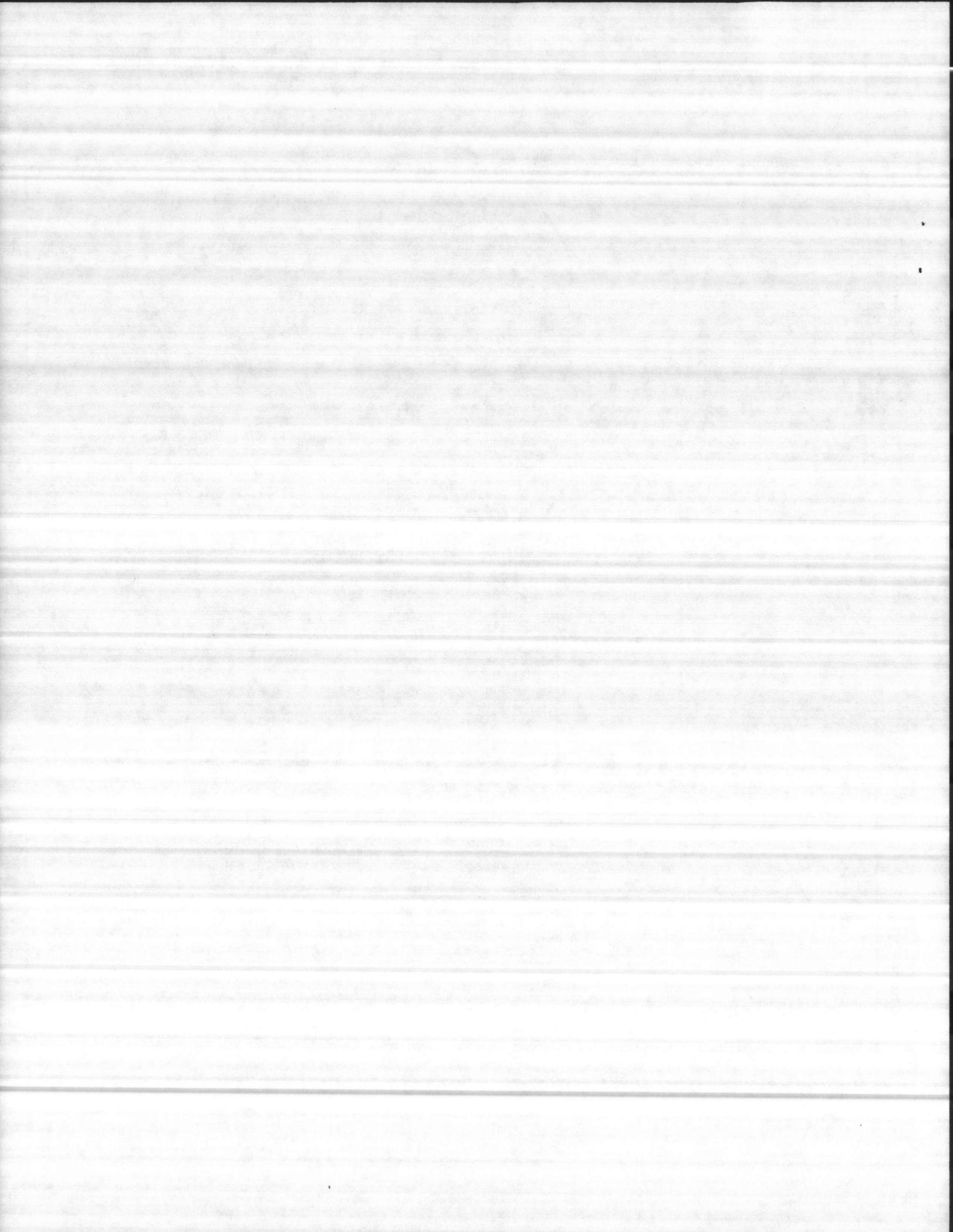
SKETCH NFGS-16722-1

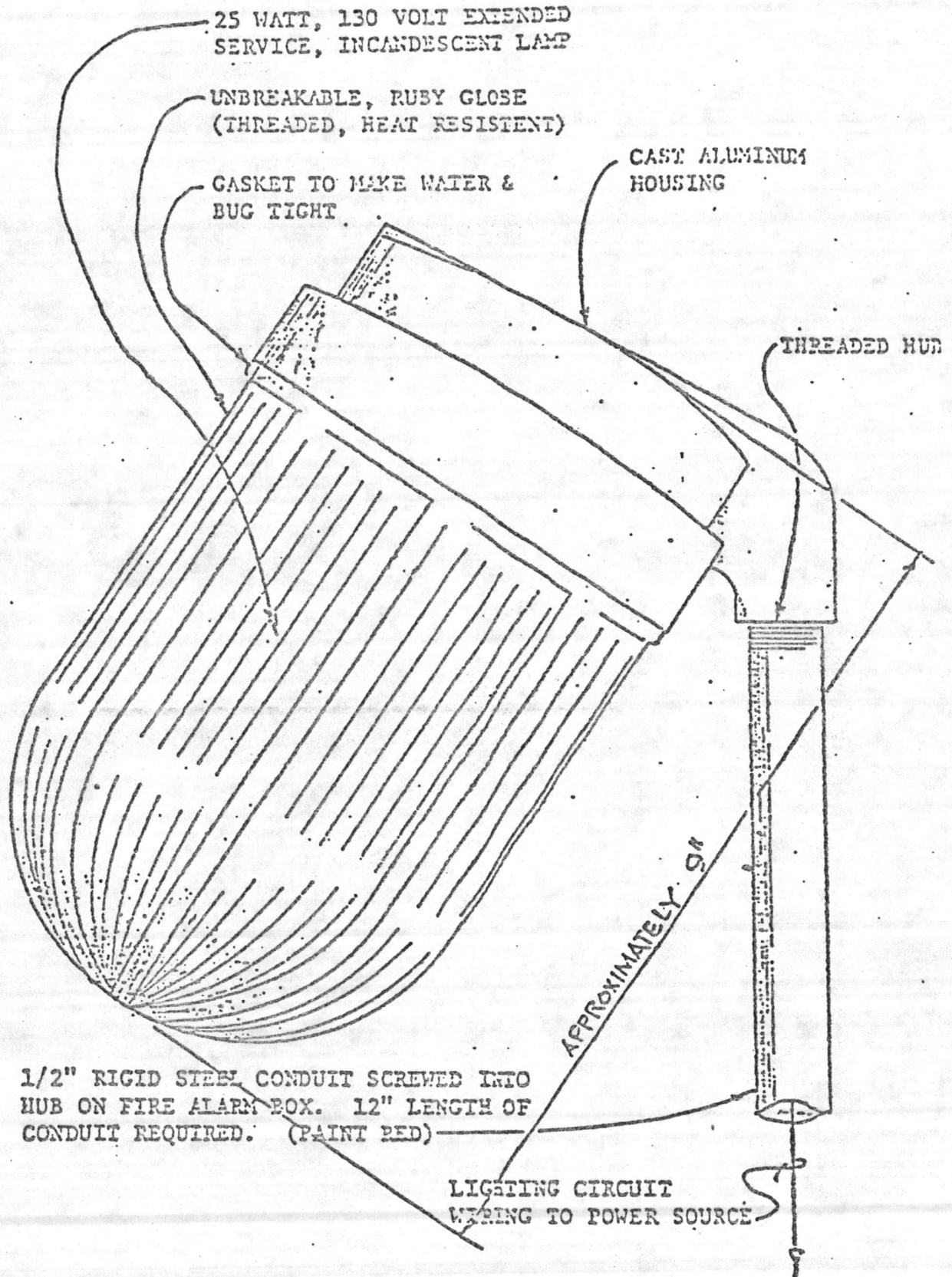




MASTER FIRE ALARM BOX  
PEDESTAL MOUNTED

SKETCH NFGS-16722-2





BOX LOCATION LIGHT

SKETCH NFGS-16722-3

