

SECTION D4000

FIRE PROTECTION SYSTEMS

4/02

PART 1 GENERAL

Fire Protection Systems designed, furnished, installed, tested and demonstrated under this section of the Request for Proposals shall comply with minimum standards and criteria contained in the Southwest Division Technical Guide for Fire Protection Systems which may be accessed at the following website:

[Fire Protection Systems Technical Guide](#)

Fire Protection Systems designed and installed by the Design-Build Contractor that do not meet the minimum standards and criteria described in the above referenced internet website and which do not comply with the additional and more specific requirements set forth in this RFP will be deemed to be unacceptable under this Contract. Should the Contracting Officer determine that Fire Protection Systems designed, furnished, installed, tested and demonstrated under this section of the Request for Proposals are unacceptable under this Contract due to the Design-Build Contractor's failure to meet minimum standards and criteria, said Fire Protection Systems shall be redesigned and replaced by the Design-Build Contractor at no expense to the Government.

Provide Y2K compliant computer controlled facility components (CCFC) for systems specified in this section. CCFC's have software driven technology and embedded microchip technology and include any facility control system utilizing microcomputer, minicomputer, or programmable logic controllers. Y2K compliant, by definition, means "computer controlled facility components that accurately process date and time data, including but not limited to, calculating, comparing, and sequencing from, into, and between the twentieth and twenty-first centuries, and the years 1999 and 2000 and leap year calculations."

1.1 SYSTEM DESCRIPTION

Provide an integrated fire alarm and fire suppression system capable of notifying building occupants and controlling a fire, which may start inside the facility.

1.2 SYSTEMS REQUIREMENTS

a. Provide wet pipe automatic sprinkler protection, [including fire pump,] provided throughout each facility. Design systems for earthquake protection.

b. Fire alarm system provided shall include, but shall not be limited to manual stations, [system smoke detectors,] [duct smoke detectors,] [line voltage single-station smoke detectors,] audio/visual alarms, [fire alarm radio interface panel and transmitter,] [digital alarm communicator

transmitter][Gamewell master box] electrical supervision of all sprinkler system alarm and supervisory devices [, and electrical supervision of fire pump controllers].

c. Provide fire extinguishers.

d. Provide fire stopping systems and fire dampers where required for penetrations of rated assemblies.

[e. Provide standpipe systems for each building four stories or more in height.]

[f. Provide spray-applied fire proofing as required to protect steel structures.]

[g. Provide a wet chemical extinguishing system for kitchen hoods.]

[h. Provide fire hydrants.]

1.3 CRITERIA

The design of the project shall be in compliance with, but shall not be limited to, applicable and advisory portions of National Fire Codes (NFC), and shall comply with other criteria as follows:

a. MIL HDBK 1008[C][D] Fire Protection for Facilities Engineering, Design, and Construction

b. Southwest Division Technical Guide for Fire Protection Systems

c. NFPA 10 Portable Fire Extinguishers (1998)

d. NFPA 13 Installation of Sprinkler Systems (1999)

e. NFPA 24 Installation of Private Service Mains and Their Appurtenances (1995)

f. NFPA 70 National Electrical Code (2001)

g. NFPA 72 National Fire Alarm Code (1999)

h. NFPA 90A Installation of Air Heating and Air Conditioning Systems (1999)

i. NFPA 101 Life Safety Code (2000)

[j. ASME/ANSI A17.1 Safety Code for Elevators and Escalators (1996 with addenda 1997)]

[k. NFPA 75 Protection of Electronic Computer/Data Processing Equipment (1999)]

[l. NFPA 13R Installation of Sprinkler Systems in Residential Occupancies Up To and Including Four Stores in Height (1999)]

[m. NFPA 20 Centrifugal Fire Pumps (1999)]

- [n. NFPA 14 Installation of Standpipe and Hose Systems (2000)]
- [o. NFPA 22 Water Tanks for Private Fire Protection (1998)]
- [p. NFPA 17A Wet Chemical Extinguishing Systems]
- [q. NFPA 96 Ventilation Control and Fire Protection of Commercial Cooking Operations.]
- [r. NAVFAC ELEVATOR DESIGN GUIDE]

Project Leader shall consult with the Senior Fire Protection Engineer to determine whether or not additional standards and/or criteria references should be cited in the RFP.

1.4 COMPLIANCE VERIFICATION

Compliance with Fire Protection Systems design and construction requirements will be determined by over-the-shoulder review of the Design-Build Contractor's design and construction and by field observation. See Section 00911, Design Requirements, for submittal requirements during the design phase of the Contract. See Section 01330, Submittal Procedures, for Submittal Descriptions and requirements during the construction phase of the Contract.

1.4.1 Fire Protection Engineer

The Design-Build Contractor's Architect/Engineer of Record (A/EOR) shall provide the services of a Registered Fire Protection Engineer (FPE). The A/EOR's FPE shall review and approve all submittals and shall witness the final acceptance tests for Fire Protection Systems. Review and approval of submittals and witnessing of Fire Protection Systems testing by an FPE employed by the contractor or by the subcontractor who furnishes and installs the Fire Protection Systems will not be acceptable to the Government. The A/EOR's FPE shall have obtained professional registration in the field of fire protection and shall be in the business of working exclusively in the FPE field.

1.4.2 Submittal Reviews and Documentation

The A/EOR's FPE shall forward one information copy of each submittal with review/approval comments and annotated transmittal sheets through the Design-Build Contractor to:

SOUTHWESTNAVFACENGCOM
 ATTN: CODE 5[]CN
 1220 PACIFIC HIGHWAY
 SAN DIEGO, CA 92132,

immediately upon completion of the review/approval and at least 14 calendar days prior to actual construction.

1.4.3 Acceptance

Acceptance of Fire Protection Systems shall be by the Contracting Officer, under the advice of a Southwest Division Fire protection Engineer.

1.5 DESIGN SUBMITTALS

1.5.1 Design Analyses and Drawings

a. Drawings shall comply with the respective NFPA codes. Provide complete submittal data for all components proposed to be utilized. On data submittal sheets where more than one product is described, clearly annotate which product(s) are to be supplied. Do not procure equipment or start installation prior to receiving system approval.

b. Drawings shall be stamped by the Design-Build Contractor's A/EOR FPE and also shall be signed by the installing subcontractor's National Institute for Certification in Engineering Technologies (NICET) level III technician. The installing subcontractor may provide an FPE signature in lieu of the NICET technician. **The Southwest Division FPE reserves the right to overrule any and all approvals.**

c. Shop Drawing submittals shall include:

Sprinkler System

Show layout and arrangement of fire protection systems including water supply.

Fire Alarm Device Placement and Layout

Identify conduit runs and junction box locations with wire type and count. Identify location of system field devices, relays, end-of-line resistors, power supply connections, and location of field terminations necessary for auxiliary control and supervision functions.

Fire Alarm System Plans

Show the location of fire alarm control panels, fire alarm system initiating and indicating devices, single station smoke detectors, relays, door closures, sprinkler system alarm and supervisory devices, fire pump controllers. Provide a Sequence of Operations for the Fire Alarm Control panel in the form of an input/output matrix. See Fire Protection Systems Technical Guide example.

Fire Alarm Riser Diagram

Show hierarchy, arrangement and interlocks necessary for associated controls [and radio transmitter zone schedule].

Fire Alarm Control Panel Interior Wiring Diagram

Identify module model number and placement within panel. Identify module interconnections and terminations of all field wiring, including external component interfaces.

[Detail plan view of pump room including elevations and sections

Show fire pumps, associated equipment, and piping. Show piping schematic of pumps, devices, valves, pipe, and fittings. Show point-to-point electrical wiring diagrams. Show piping layout and sensing piping arrangement. Include:

- 1) Pumps, drivers, and controllers
- 2) Hose valve manifold test header
- 3) Circuit diagrams for pumps
- 4) Wiring diagrams of each controller]

d. Design Data submittals shall include:

Hydraulic calculations demonstrating water supply sizing and expected performance

Computer program generated fire sprinkler system hydraulic calculations to substantiate compliance with hydraulic design requirements. Submit name of software program used.

Fire alarm system battery power calculations verifying that battery capacity exceeds supervisory and alarm power requirements. Submit voltage drop calculations for signaling circuits.

[Calculations supporting selected rated capacity and pressure of fire pump.]

Power calculations

[Fault current calculations at the fire pump controller.]

Electrical flicker analysis

e. Certificates

Code/Criteria Search List (see Southwest Division A-E Guide, Attachment C)

Year 2000 (Y2K) Compliance Warranty: For each product, component, and system specified in this section as a "computer controlled facility component," provide a statement of Y2K compliance warranty for the specific equipment. If the specific listed equipment must perform as a system to exchange date and time data, then that warranty shall apply to those specific equipment as a system. [The Contractor FPE shall stamp drawings for conformance with NFPA codes, and contract requirements.] Submit design drawings, in accordance with Document 00911, "Design Requirements" indicating the following:

1.5.2 Design Specifications

Submit design specifications, in accordance with Document 00911, "Design Requirements," to specify the quality, characteristics, performance factors, efficiency, installation procedures, testing, and certification requirements for all items of the Fire Protection System. The Design-Build Contractor's A/EOR Fire Protection Engineer shall write design specifications.

Use the Submittal Description numbers and corresponding headings contained in Section 01330, "Submittal Procedures," when listing construction submittal requirements in design specifications. Annotate descriptive data to show the specific model, type, and size of each item. Data, which describes more than one type of item, shall be clearly marked to indicate which type the Contractor intends to provide. Data sheets shall indicate proper field connections, power requirements and limitations. Submit one original for each item and clear, legible, first-generation photocopies for the remainder of the specified copies. Incomplete or illegible photocopies will not be accepted. Partial submittals will not be accepted.

a. Product Data

Suppression Systems:

- 1) Valves, including gate, check, riser, globe and relief
- 2) Sprinklers
- 3) Pipe
- 4) Fittings
- 5) Fire department connections
- 6) Water flow and tamper switches
- 7) Pipe hangars and support
- 8) Flow and tamper switches
- 9) Back-flow preventer
- [10) Fire Pump]
- [11) Jockey Pump]
- [12) Drivers]
- [13) Controllers]
- [14) Flow meter]
- [15) Low Air Pressure Supervisory Switch]
- [16) Air Compressor, air maintenance device]

Fire Alarm Systems:

- 1) Control panel and all integral components
- 2) Manual pull stations
- 3) Smoke detectors
- 4) Audio/visual devices
- 5) Line voltage surge suppressors
- [6) Local sprinkler water flow alarm bell]
- [7) Heat detectors]
- [8) Remote annunciator]
- 9) [Radio][DACT][Master Box] transmitter
- [10) Sleeping room alarm sounders]

Passive Fire Protection Systems:

- 1) Firestopping materials and systems
- 2) Fireproofing systems

1.6 CONSTRUCTION SUBMITTALS

a. Test Reports

Preliminary test reports on piping systems

b. Manufacturer's Field Reports

Y2K Demonstration: For each product, component, and system specified in this section as a "computer controlled facility component," provide a field test to demonstrate Y2K compliance.

c. Operation and Maintenance Data

Valves

[Dry-pipe sprinkler system equipment]

Fire alarm control panel

Fire alarm system field devices (all)

Fire pumps

[Driver]

[Controller]

[Flow meter]

d. Closeout Submittals

[Posted operating instructions for fire pump components]

As-built drawings of each system: After completion, but before final acceptance, submit complete set of as-built drawings of each system for record purposes. Submit 841 x 594 mm (22 by 34 inch) drawings on reproducible mylar film with title block typical to other full size contract drawings for the project. Furnish the as-built (record) working drawings in addition to as-built contract drawings required by Document 00911, "Design Requirements." For electronically prepared drawings, also provide a copy of drawing file on CD-ROM in format as specified in A-E Guide, Attachment B.

1.7 ACCEPTANCE TESTING

The Southwest Division FPE shall witness final acceptance tests of all systems. Contractor shall perform complete functional preliminary tests of all systems to assure operable status before requesting the final acceptance tests. Preliminary tests shall include ground resistance testing, dielectric strength and insulation resistance testing, smoke detector sensitivity testing, manometer testing of all duct smoke detector housings and operational testing of all system control features. Smoke detector sensitivity tests shall be conducted and recorded. When preliminary tests have been completed and corrections made submit a signed and dated certificate with a request for formal inspection and tests. Final acceptance tests shall be scheduled only after all discrepancies discovered during the preliminary testing have been rectified. All systems shall be operated to demonstrate compliance with contract requirements and respective NFPA codes. Test procedures shall be in full compliance with the respective NFPA codes, the equipment manufacturer recommendations, and SWDIV TG-1008. Complete functional testing of the fire alarm system includes but is not limited to supervision of wiring, detector sensitivity, manometer testing

and sound level measurement. Provide all personnel, equipment, and materials for tests. The systems manufacturer technical representative shall be present for the final inspection and test. Make any changes in panel software as directed during the tests. [Fire pumps tests shall be conducted in the presence of the pump, controller, and engine manufacturer technical representatives.] Return trips for the Southwest Div. FPE to witness repeat acceptance test due to failure of previous tests will be at the Contractor expense for time and travel. The Contractor's FPE shall prepare a written report detailing compliance of any outstanding submittal review comments, summarizing the results of all tests, detailing all discrepancies discovered, corrective action taken, all forms as required by the respective NFPA codes, and recommendations/certifications for acceptance. Forward one copy of the report with attachments to SOUTHWESTNAVFACENCOM, CODE 5_CN, 1220 PACIFIC HIGHWAY, SAN DIEGO, CA 92132. Beneficial occupancy of the facility cannot occur until all fire protection systems have been accepted. [The Southwest Division FPE reserves the right to become the accepting authority in the event of unsatisfactory performance of the Contractor FPE.]

1.8 FIRE ALARM SYSTEM WARRANTY AND MAINTENANCE SERVICE

Provide an 18-month warranty on all components, or the manufacturer standard warranty, whichever is longer. Service calls made during the warranty period shall be answered within 12 hours by a technician of the equipment distributor. One month prior to warranty expiration, the equipment distributor shall perform all maintenance including complete smoke detector cleaning and sensitivity checking as recommended on an annual basis by the manufacturer and NFPA 72. Any defective or damaged equipment shall be replaced, any user requested software changes shall be made, and the system re-certified. Spare parts provided under this contract shall not be consumed during the warranty period.

1.9 FIRE ALARM SYSTEM TRAINING

The equipment distributor shall provide a minimum of 3 training sessions as follows:

Provide two 2-hour sessions to train facility staff as to operations of the system. Training shall be scheduled to the user's convenience to allow training of personnel on all shifts. This training shall provide all attendees with a thorough understanding of system operation and control including bypass operations. Provide a third 6-hour training session for facility maintenance personnel. Panel programming, troubleshooting, and arrangement, field device testing and replacement, and field wiring troubleshooting shall be demonstrated. Provide complete operations and maintenance packages at these sessions including but not limited to operations, maintenance, repair, and spare parts manuals, accurate as-built drawings showing all control panel and field wiring terminations, and software programming. [All training sessions shall be professionally videotaped with the original copy turned over in standard VHS format.]

1.10 SYSTEM SOFTWARE

Provide all necessary programming/setup/initialization software necessary to write initial and edit existing software. Provide all access codes to allow complete access to all maintenance, testing, and programming levels. Provide 2 copies each of all complete software/programming and installation,

maintenance, troubleshooting, repair, and operation manuals. Provide factory patchcord necessary to interface control panel to a personnel computer serial port connector. Provide original licensed manufacturer copies of all software on CD-ROM.

PART 2 SYSTEM COMPONENTS

All components utilized must be Underwriters Laboratories listed or Factory Mutual approved for the intended use. Manufacture shall provide parts and technical support for this product for a minimum of 15 years after installation. Coordinate work performed under this section with fire alarm system work performed under [Section D1000, "Conveying Systems" and] Section D5000, "Electrical Systems".

2.1 FIRE SPRINKLER SYSTEM (D4010)

2.1.1 WET [DRY] PIPE SPRINKLER SYSTEM

System shall be designed for [residential,][light and] ordinary hazard occupancies in accordance with the required and advisory portions of NFPA 13 [13R]. A dedicated floor control valve assembly consisting of a supervised control valve, check valve, and water flow switch shall supply each floor. Sprinkler rate of applications shall be [_____] L/min/m² ([_] gpm/ft²). Area of application shall be [279 m² (3,000 ft²)]. Reductions in operating areas per NFPA 13 (i.e.: paragraphs 7-2.3.2.4 & 7-2.3.2.7) are not allowed. Hydraulic calculations shall include a minimum 0.35 bar (5 psi) or 10% (whichever is greater) safety factory (overage). Sprinkler system design shall include earthquake protection. Include a [946 L/min (250 gpm)] [1,892 L/min [500 gpm] [2839 L/min (750 gpm)] exterior hose allowance.

2.1.1.1 SPRINKLERS

Locate sprinkler heads in a consistent pattern with ceiling grid, lights, and air supply diffusers. Locate sprinklers free of obstructions to spray pattern (exception 1 to NFPA 13, paragraph 5-6.5.2.2 is not allowed). [Utilize residential type sprinklers in all living modules and quick response type sprinklers in all other areas. Systems shall be designed to NFPA 13R (or the residential section of NFPA 13 for buildings over 4 stores in height) modified as follows: the minimum rate of application shall be 4.07 L/min/m² [0.10 gpm per sq. ft.] Utilize glass rod type quick response sprinklers in all light and ordinary hazard occupancies. Utilize concealed sprinklers in all spaces with finished ceilings that contain electrical, electronic, and other water sensitive equipment. Provide polished stainless steel ceiling plates or chromium-plated finish on copper alloy ceiling plates, and chromium-plated pendent sprinklers below suspended ceilings. Utilize chrome-plated sprinklers with matching finishing in all finished areas. Deflector shall not be more than 80 mm (3 inches) below suspended ceilings. Ceiling plates shall not be more than 15 mm (0.5 inches) deep. Ceiling cups shall not be permitted. **Sprinklers that utilize "o-ring" sealed plungers are not acceptable.**

2.1.1.2 PIPING

a. Locate all piping to eliminate risk of freeze damage. [Do not run piping in attics unless located between ceiling and ceiling insulation system in areas subject to freezing only. No piping shall be exposed to

exterior conditions.] All piping in areas with finished ceilings shall be concealed.

b. Utilize steel piping. [Listed CPVC piping and fittings may be utilized in residential occupancies]. Make changes in pipe sizes with fittings that feature tapered reducing passageways. Sprinkler pipe and fittings shall be metal. Steel piping shall have a UL corrosion resistance ratio (CRR) of not less than 1.00. Fittings into which sprinkler heads, sprinkler head riser nipples, or drop nipples are threaded shall be welded, threaded, or grooved-end type. Plain-end fittings with mechanical couplings and fittings that use steel gripping devices to bite into the pipe when pressure is applied will not be permitted. Rubber gasketed grooved-end pipe and fittings with mechanical couplings shall be UL listed under the category of Fittings, Rubber Gasketed (VIZM) and shall be approved for use in wet or dry pipe sprinkler systems as appropriate. The same manufacturer shall supply fittings, mechanical couplings, and rubber gaskets. Side outlet tees using rubber gasketed fittings shall not be permitted. Utilize internally hot dip galvanized pipe and fittings on dry pipe systems. Roll grooved fittings shall not be used with internally galvanized steel pipe.

c. [Provide a post indicator control valve on the underground lead in supply line.]

2.1.1.3 Field Painting

[Painting of sprinkler systems above suspended ceilings and in crawl spaces is not required.] Clean surfaces prior to painting. Immediately after cleaning, prime metal surfaces with FS TT-P-664 or SSPC Paint 25 metal primer applied to a minimum dry film thickness of 1.5 mils. Exercise care to avoid painting sprinkler heads and operating devices. Upon completion of painting, remove materials, which were used to protect sprinkler heads, and operating devices, which have been inadvertently painted and provide new sprinkler heads and operating devices of the proper type. Finish primed surfaces as follows:

2.1.1.3.1 Systems in Finished Areas

Finished areas are defined as areas where walls or ceilings are painted or are constructed of a prefinished material. Paint primed surfaces with two coats of paint to match adjacent surfaces, except paint valves and operating accessories with two coats of gloss red enamel. [Provide piping with 5.08 mm [2 inch] wide red bands spaced at maximum 6.10m [20 feet] intervals throughout the piping system. Bands shall be gloss red enamel or self-adhering plastic.]

2.1.1.3.2 Systems in Unfinished Areas

Paint piping in valve rooms, [and] mechanical rooms, [and] [attics] [and] [crawl spaces] with FS TT-E-489 gloss red enamel applied to a minimum dry film thickness of 1.6 mils.

2.1.1.4 PENETRATIONS

Provide thrust rod and sleeves for all pipe penetrations of grade floor slab. Provide sleeves for all penetrations of piping through walls and floors.

2.1.1.5 WATER SUPPLY

a. The following water supply information is provided for bidding purposes. Point of Connection from other locations shall require the approval of the Contracting Officer. The Contractor will be permitted to conduct additional flow tests after contract award. [Any additional tests shall be conducted under the supervision of the Contracting Officer].

b. The water test was taken from the [___] inch main on [___] street. Base hydraulic calculations on a water supply of [___] Bars ([___] PSI) static, [___] Bars ([___] PSI) residual available at a flow of [___] LPM ([___] GPM) at the point of connection to the base water main. Minimum lead in size shall be 150mm (6 inches).

2.1.1.6 BACKFLOW PREVENTION

Provide a [double check type] [reduced pressure type] backflow preventer with indicating type valves in the base of the sprinkler riser in a mechanical or accessible interior space. Backflow preventer shall be listed for vertical installation if installed vertically. [Pipe intermediate chamber drain to an adequately sized floor drain or the building exterior.] Pipe test connection for the backflow prevention device to an adequately sized floor drain or to the exterior of the building. Attach field test reports to valve. Submit copy of test report to Contracting Officer prior to final acceptance. Devices shall have been approved by the Foundation for Cross-Connection Control and Hydraulic Research at the University of Southern California for intended applications.

2.1.1.7 INSPECTOR'S TEST CONNECTION

Provide inspector test connection at most hydraulically remote section of system for each floor. Test valves as well as all auxiliary drain valves shall be located in accessible areas.

2.1.1.8 FIRE DEPARTMENT CONNECTIONS

[Provide a fire department connection for each building.] Provide connections approximately one meter (3 feet) above finish grade with 65 mm (2½ inch) National Standard female hose threads with plug, chain and identifying fire department connection escutcheon plate.

[2.1.1.9 LOW AIR PRESSURE SUPERVISORY SWITCH

Provide switch for each sprinkler system and connect to building fire alarm system to activate the system supervisory alarm when air pressure in system drops halfway from the normal pressure to the tripping point. Provide a bleeder valve in the airline ahead of the switch for testing operation of the switch. The valve shall be normally open. Closing the valve shall shut off the air supply to the switch and exhaust the pressure between the switch and valve.]

[2.1.1.10 TANK MOUNTED AIR COMPRESSOR

Provide an approved, automatic type, electric motor-driven air compressor including pressure switch, air piping, and 10-gallon minimum capacity tank. Compressor shall have a minimum capacity capable of charging the complete sprinkler system to normal system air pressure within 30 minutes. Minimum

rated run life of the compressor shall be 4000 hours. Provide an approved automatic air maintenance device for each system. Direct drive and "oil-less" air compressors are not acceptable.]

[2.1.2 FIRE PUMPS

a. Provide a fire pump and pressure maintenance pump for each system sized to supplement the available water supply to provide sufficient pressure for the fire protection systems specified under this section. Mount all pumps on cast in place concrete pads.

b. Provide UL Listed or FM Approved centrifugal fire pumps. Select pump based on the maximum sprinkler demand not exceeding 120% of pumps nominal rated capacity and maximum churn pressures not to exceed 6.89 Bars (100 psi).

c. Pumps and controllers shall not be exposed to exterior conditions and must be protected from freezing conditions.

2.1.2.1 SEQUENCE OF OPERATION

Pumps shall start manually or automatically upon loss of system pressure. Pumps shall continue to run until shutdown manually. Include run timers to permit easy field conversion to automatic shutdown operation. Include sequencing timers when multiple pumps are utilized.

2.1.2.2 POSTED OPERATING INSTRUCTIONS

Provide for pumps, drivers, controllers and flow meters. Instructions shall show all modes of operations and the respective valve, switch and related equipment positions for each mode of operation. These instructions shall be part of the operations and maintenance manuals and also laminated and permanently mounted in each of the respective rooms where the respective equipment is installed. All referenced valves, switches and related equipment shall be labeled with plastic, engraved lettered placards, permanently attached, and coordinated with each mode of operation. Computer print paper (laminated or not), vinyl strip labels (or like kind) and handwritten labels are prohibited.

2.1.2.3 PUMP DRIVERS

Motor power shall be not less than pump power requirements at all points on the pump-operating curve. Maximum speed of drivers shall be 2,300 rpm, radiator cooled engine drivers are not acceptable. Pump driver shall be [electric][engine driven].

2.1.2.4 CONTROLLERS

Controllers shall be listed for fire pump service and arranged for automatic and manual push-button pump starting and manual push-button pump shutdown. Controller shall be completely terminally wired, ready for field connections, and mounted in a moisture resistant enclosure arrange so that controller current carrying parts will not be less than 305 mm (12 inches) above the floor. [Controller shall be across the line starting type.] [Controller shall be a solid-state soft start reduced voltage type.] Base fault current interrupting capacity on calculations provided by a Registered Electrical Engineer. Controller shall have supervisory contacts for pump

running, loss of electrical power, phase reversal on line side of motor starter, and controller trouble conditions. Connections to and supervision of contacts shall be performed under Section D5000, "Electrical Systems."

2.1.2.5 FLOW METER

Flow meter shall be UL listed or FM approved for fire pump installation with direct flow readout device. Locate flow meters such that both test loop and flows through the header are metered. The valve downstream of the meter shall be a globe valve. Test header shall be a straight-line manifold type so located and thrust braces so as to allow full flow testing without laying of hose or damaging surrounding property.]

2.1.3 ALARMS

Connections to the building fire alarm system and electric alarm bell shall be made. [Flow switches serving elevator sprinklers shall have SPDT contacts for connection to the building fire alarm system and respective elevator controller. Connections to the elevator controllers shall be under Section D1000, "Conveying Systems."]

2.1.4 CONCRETE SPLASH BLOCKS

Provide concrete splash blocks at all drain discharge points subject to high water velocities, such as the main drain and inspector test connection discharges.

2.4 FIRE ALARM SYSTEMS

2.4.1 DESIGN REQUIREMENTS

Provide a complete, electrically supervised, addressable intelligent, manual and automatic, annunciated fire alarm system. Provide systems in full compliance with the required and advisory portions of NFPA 72 National Fire Alarm Code, the UL listings or Factory Mutual approvals, the ADA, and the recommendations of the equipment manufacturer, MIL-HDBK 1008[C][D], and SWDIV TG-1008 except as modified herein. The current type of fire alarm transmitting equipment is used at this activity - [Gamewell Positive Non-Interfering Successive System] [King-Fisher Radio Fire Alarm System] [Harlow Radio Fire Alarm System] [Radionics D6500 Receiver (DACR) utilizing a primary and secondary phone lines]

2.4.1.1 COVERAGE

a. Systems shall monitor all initiating circuits, indicating circuits and supervisory circuits including those for valve tamper switches. Each device shall have a unique address. Activation of any manual station, smoke detector, heat detector or sprinkler system flow switch shall cause:

- 1) Building alarm devices to sound.
- 2) Actuation of the station fire alarm reporting system.
- [3) Electromagnetic door hold-open devices to be de-energized.]
- [4) Living/sleeping room alarm sounders to sound.]

b. Activation of any valve tamper switch shall initiate a dedicated sprinkler supervisory signal per NFPA 72.

[c. Activation of any elevator lobby, machine room or hoistway smoke detector shall initiate Phase I elevator recall specified under Section D1010 in addition to sounding the building general alarm. Smoke detectors are required in elevator hoistways only if sprinklers are provided at the top of the hoistway. (See Chapter 7 of NAVAFAC elevator design Guide available at [NAVFAC Elevator Design Guide](#) for additional requirements)]

[d. Activation of any elevator machine room or hoistway heat detector shall cause illumination of the elevator car warning sign specified under Section D1010 in addition to sounding the building general alarm.]

[e. Activation of any elevator system water flow switch shall cause shutdown of the associated elevator in addition to sounding the building general alarm.]

[f. Activation of a fire pump running or controller trouble condition shall only transmit the appropriate signal as indicated in Subparagraph entitled "Radio Transmitter".]

2.4.1.2 MAIN PANEL

Fire alarm system shall be fully addressable with 160 character programmable alphanumeric displays. Panel shall be modular type installed in steel cabinet with hinged door and cylinder lock. Panel shall be a factory-wired assembly containing components and equipment necessary to perform specified operating and supervisory junctions of the system. Provide each fire alarm control panel with a fan shutdown bypass switch. When operated, the switch will bypass the automatic fan shutdown capabilities of each zone. Operation of the switch shall cause the operation of the system trouble signal. Use of signaling circuit power extender panels is prohibited. Integral rechargeable set shall be sized for 60 hours minimum of standby service.

[2.4.1.3 REMOTE ANNUNCIATOR

Provide an alphanumeric remote annunciator at a location to be determined by the base fire department. Annunciator panel shall be capable of alarm silence and reset functions by operation of a keyed switch. Keys shall match that of the fire alarm panel cabinet.]

[2.4.1.4 RADIO TRANSMITTER.

a. Provide a minimum [___] zone combination interface and radio transmitter for each system for automatic transmission of signals to the fire department. Combination panel and radio transmitter shall be manufactured by [King Fisher][Signal Communications][Monaco Enterprises][Seaboard Electronics][Motorola][G H Harlow Co]. Transmitter shall be factory assembled and tested complete with manufacturer's locking cabinet, [60] [24] hour rechargeable battery set, automatic battery charger, [omni-directional][directional] antenna with mounting system, antenna surge arrestor, and coaxial cable. Installation shall be in strict accordance with the manufacturer's recommended practices, product listing or approvals, and NFPA 70, and NFPA 72. Ground transmitter and antenna to a driven ground rod and the facility electrical ground system. Supply power to transmitter through a line voltage surge arrestor from the fire alarm circuit. Transmitter frequency and identity shall be as directed by the Contracting

Officer. Notwithstanding any other provisions of this contract, no other product will be accepted.]

[2.4.1.4 DIGITAL ALARM COMMUNICATOR TRANSMITTER.

a. Provide a 24 dc, communicator transmitter with a minimum 3 zone reporting capability. It shall have a built-in DataLock programming security feature, with dual phone line operation with built-in phone line monitor capability, and automatic 24-hour test feature. It shall have a capability to transmit signals in both Modem 3 and Contact ID format.]

[2.4.1.4 GAMEWELL MASTERBOX

Provide a local energy type master box. The equipment shall be completely compatible with the existing station reporting system. The master box shall have the ability to transmit a fire alarm signal when the station fire alarm loop is open and or grounded on either leg. A test key shall be supplied to permit testing of the master box and fire dispatch center. Enclosure shall be cottage style, painted red, weatherproof and corrosion resistant. The master box shall be [wall] [pole] [pedestal] mounted with center of the box 5 feet above grade, and provided with a lighting fixture. Provide a metallic or a rigid plastic code number plate mounted to the exterior face of the box. The box number shall be assigned by the activity fire department.]

b. Transmit the following signals from the fire alarm panel [and fire pump controller]:

- 1) Fire alarm initiating devices per floor (including sprinkler system flow switch). Transmit as alarm condition per respective floor.
- 2) Fire pump running. Transmit as an alarm signal.
- 3) Sprinkler system supervisory signals. Transmit all as one common trouble signal.
- 4) Fire pump controller trouble [loss of power or phase reversal]. Transmit as a trouble signal.
- 5) Fire alarm control panel trouble condition. Transmit as a trouble signal.]

2.4.1.5 MANUAL STATIONS

Provide addressable at each stairwell entrance on every floor and at every exterior man door for all common spaces. Keys shall match that of the fire alarm panel cabinet. Stations located on building exterior or covered walkways shall be NEMA 3 rated (Simplex BG-50W/FCI MS-WS) or enclosed in a cast fire alarm station enclosure with side-hinged door (Faraday F001 or approved equal).

2.4.1.6 SPOT SMOKE DETECTION

Provide addressable photoelectric type on ceilings of all spaces containing electrical and electronic equipment, under any raised floor systems, and in other areas as required by code or SWDIV TG-1008. Detectors shall have

twist lock base with wiring connections made in the base. "Baseless" smoke detectors are not acceptable. Provide detector manufacturer's protective wire guard over each device, secure with tamper proof mechanical fasteners when located in areas subject to tampering. Detectors shall remain covered until beneficial occupancy to prevent contamination with construction dust and debris.

2.4.1.7 DUCT TYPE SMOKE DETECTORS

Provide photoelectric type in all air-handling units as required by NFPA 90A. Activation of any duct smoke detector shall cause shut down of all air handler units in the associated floor or zone. Duct detector shall utilize sampling tubes that extend the width of the duct. Provide manometer testing of all housings to demonstrate satisfactory airflow.

2.4.1.8 SINGLE STATION SMOKE DETECTORS

Provide single station (photoelectric) line voltage powered smoke detectors with battery back up in each living/sleeping room and kitchen area in each module. All detectors in each module shall be tandem interconnected for simultaneous operation.

[2.4.1.9 HEAT DETECTORS

Provide 57 degrees C (130 degrees F) rate-compensated heat detectors. Mount heat detector adjacent to and level with each sprinkler head in elevator machine room and hoistway. Heat detectors are only required in elevator hoistways that are protected with automatic sprinklers. Heat detector shall have two sets of alarm contacts for dedicated connections to building's fire alarm system and elevator controller. Where sprinkler heads are equipped with heat collection/protection devices, similarly equip the heat detectors. Connections to the elevator controller shall be under Section D1000. Provide signs mounted on the ceiling adjacent to heat detectors stating "ELEVATOR CAR WARNING SIGN CONNECTION".]

2.4.1.10 SLEEPING ROOM ALARM SOUNDERS

Provide sleeping room notification devices that shall be electrically polarized electronic piezo fire alarm sounders (mini horns), which flush mount using a single gang box. Units shall produce a minimum of 83 dBa at 3 meters with an 18 ma maximum current draw and shall be powered by the building fire alarm system. Unit face shall measure 7 cm wide by 11.4 cm high (2.75 inches by 4.5 inches) and shall be white or beige in color.

2.4.1.11 LINE VOLTAGE SURGE SUPPRESSION

Provide line voltage surge arresters to suppress all voltage transients that might damage fire alarm panel/transmitter components. Unit shall wire in series with the power supply of the protected equipment with screw terminations. Unit shall be UL 1449 listed with a 330-volt suppression level and have a maximum response time of 5 nanoseconds. Unit shall also meet IEEE C62.41 category B tests for surge capacity. Device shall feature multi stage construction that includes inductors and silicon avalanche zener diodes. Device shall feature a long life indicator lamp (light emitting diode or neon lamp) that extinguishes upon failure of protection components. Any unit fusing shall be externally accessible when this feature is available. One such acceptable product is a model HSP-121BT-1RU as

manufactured by Edco of Florida (Ocala, FL). Provide detailed manufacturer's submittal data demonstrating compliance with all the above listed requirements.

2.4.1.12 LOW VOLTAGE SURGE SUPPRESSION

Provide low voltage surge arresters to suppress all voltage transients on initiating, signaling, transmitter tripping, and auxiliary control circuits. Provide protection for all circuits that leave the building shell. When circuits interconnect two or more buildings provide an arrester at the conductor entrance to each building. Unit(s) shall be UL 497B listed with a 30 volt-clamping level and have a maximum response time of 5 nanoseconds. Device shall feature multi stage construction and both differential/common mode protection. Install units in strict accordance with the manufacturer's recommendations. One such acceptable product is a model P264 (audible/visual device circuits) and model PC-642030XLC (initiating circuits) as manufactured by Edco Inc. of Florida (Ocala, FL). Provide detailed manufacturer's submittal data demonstrating compliance with all the above listed requirements.

2.4.1.13 AUDIBLE-VISUAL DEVICES

Provide combination devices throughout the facility as required by NFPA 72 and the ADA to provide NFPA 72 "public mode" stipulated sound levels in all spaces. Visual devices shall be synchronized when more than one device is located in a common field of view.

2.4.1.14 LOCAL SPRINKLER WATER FLOW ALARM BELL

Provide a 25.4 cm (10 inch) diameter weatherproof rated bell and backbox for local annunciation of sprinkler water flow conditions in accordance with NFPA 13. Bell shall be powered and supervised by the fire alarm panel and shall sound continuously upon activation of the main sprinkler system riser flow switch. Alarm panel signal silence and reset functions shall not affect bell operation until water flow switch has reset to normal position. Locate bell on the exterior building wall approximately 2.4 meters (8 feet) above grade adjacent to main sprinkler riser unless otherwise directed by the Contracting Officer.

[2.4.1.15 VOICE EVACUATION SYSTEMS

Provide a voice annunciation type fire alarm and evacuation system in full compliance with the mandatory and advisory portions of NFPA 72 and 101. System shall feature a synthesized human voice type message that is stored on a double e-prom chip. Message shall be proposed and subject to changes and approval by the contracting officer. System shall provide a spare power amplifier and automatic switching circuitry that will substitute the redundant amplifier for a failed unit. Amplifier circuits shall be loaded to no more than 70% of rated continuous capacity when producing sound levels as required by NFPA 72 against normal ambient background noise levels for this occupancy. Speaker strobes shall be multiple tap units tapped no higher than the second from the highest tap. Provide manual over ride (public address mode) operation via a microphone at the control panel and a second command center located as directed by the Contracting Officer.]

2.4.2 WIRING

All wiring shall be in metallic conduit. Conceal conduit in finished areas. Pigtail or "T" tap connections to, evacuation alarm bells, horns, and fire warning lights are not acceptable. Pull all conductors splice free. All wiring shall be of solid conductor and shall be 12 AWG for A>C circuits and 14 AWG for D.C circuits. Make all conductor connections under screw terminals. Provide insulated barrier type terminal strips at junction points. Use of wire nuts, crimped connectors, or twisting of conductors is prohibited. All control panels shall be dressed out in a professional manner with all wires running in the vertical or horizontal plane, cut to exact length, making all turns at 90 degree angles, and tightly bundled and wire wrapped. Conduit shall not enter the top of control panel cabinet. Provide panel in the manufacturer's NEMA 4 enclosure for panels subject to water spray/runoff and/or located in damp/dirty locations or relocate to a suitable dry location at the direction of the Contracting Officer.

2.4.2.1 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, prior to connection of system field devices. 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. When tests have been completed and corrections made submit a signed and dated certificate to the Contracting Officer prior to installation of system field devices.

2.4.3 SPARE PARTS

Provide as a minimum the following in factory-sealed packaging:

Two addressable manual stations, four smoke detectors, two addressable smoke detector bases, two audible/visual devices, two visual devices, and two protective cages of each type utilized. Spare parts are not to be consumed during the warranty period.

[2.5 ELEVATORS AND HOISTWAYS

Elevator hoistway and machine room shall be protected in accordance with NFPA 13 and Chapter 7 of NAVFAC Elevator Design Guide. Sprinklers shall have an intermediate temperature rating. Provide a dedicated branch-line with supervised control valve, check valve and flow switch serving the elevator machine room. Provide a listed excess pressure pump with relief valve across the check valve set to maintain a pressure of 30 psi greater than the maximum anticipated system pressure. Provide a sign for the control valve stating "ELEVATOR SPRINKLER ISOLATION VALVE". If sprinklers are provided in the elevator hoistway, sprinklers at the same level as the associated machine room may be fed from the dedicated branch-line serving that machine room. Sprinklers serving the hoistway, which are at a difference level than the elevator machine room shall have a dedicated branch-line with supervised control valve, check valve and flow switch

independent from that machine room branch-line. Provide a test connection with drain to facilitate testing of flow switch. Test connection shall be piped to building exterior. Provide a sign at the test connection stating "ELEVATOR POWER SHUTDOWN TEST CONNECTION". Flow switch shall be set no retard action. Modifications to these criteria to meet local and state code requirements are acceptable upon consultation with the Southwest Division FPE.]

[2.6 STANDPIPE AND HOSE SYSTEM:

Provide a Class I automatic-wet standpipe riser in each required stair tower four or more stories in height. Each standpipe riser shall be equipped with a 65 mm (2½-inch) valved hose connections and fire department connections. The residual discharge pressure for automatic standpipe systems shall be 4.48 bars (65 psi) at the highest outlet(s).]

2.7 PORTABLE FIRE EXTINGUISHERS

2.7.1 DESCRIPTION

Provide portable fire extinguishers in accordance with NFPA 10 and NFPA 101 mounted in a secure manner.

2.7.2 REQUIREMENTS

Provide tri-class fire extinguishers after coordination with the base fire inspector's office as follows:

- a. One 4.5 kg (10 pound) unit in each mechanical, electrical, and storage rooms.
- b. One 4.5 kg (10 pound) unit in all finished areas. Provide all 4.5 kg (10 pound) extinguishers in closed front recess mount fire extinguisher cabinet. Cabinet shall have glass or lexan fronts. Cabinets shall be non-locking.

[2.8 KITCHEN HOOD FIRE EXTINGUISHING SYSTEM

2.8.1 DESCRIPTION

Provide a new pre-engineered wet chemical fire extinguishing system for protection of cooking equipment including exhaust hoods, ducts, and related work. Equipment, materials, installation, workmanship, inspection, and testing shall be in strict accordance with the required and advisory provision of the manufacturer's installation manual and NFPA Nos. 17A and 96 except as modified herein. Each system shall include materials, accessories, and equipment necessary to make each system complete and ready for use.

2.8.2 SUBMITTALS

Submittal shall include, but not limited to the following:

- (1) General layout and arrangement of the systems in plan and elevation.
- (2) Location and number of cylinders used and net weight of wet chemical contained.

- (3) Complete point-point electrical wiring diagrams including the connection of the wet chemical systems to the fire alarm systems.
- (4) Details of signs and instruction plates including colors, materials and size of letters.
- (5) An isometric of the interconnecting piping and control lines, nozzles locations, actuating devices and accessories. Include the distance of the nozzles from cooking surfaces.
- (6) Catalog cuts of each piece of material and equipment to be used, including the energy cut off controls.
- (7) Verification of the system pre-engineering and recommended nozzle locations
- (8) Proof of U.L listing or F.M approval.

2.8.3 SYSTEM REQUIREMENTS

Exhaust hoods with grease extractors listed by U.L or F.M are not required to have protection downstream of the grease extractor. Automatic fuel or heat shut off shall be provided for all cooking appliances. Mechanical shut-off valve for fuel shall be an approved, self-contained pneumatic/mechanical valve operated by a piston and wire rope assembly or a normally energized valve that will shut off fuel if either on system actuation or power failure. Fuel systems shall be reset manually. Electric power source shall be by means of shunt trip breakers. Upon actuation of the system, by either automatic or manual means, the fire alarm system shall be activated and the fuel source, electric or gas, to the equipment shall be shut-off.

Manual release stations shall be located in a readily accessible location, A minimum of 10 feet from the hood in direction of egress.

The cylinders shall located not more than five (5) feet above the floor to permit access for inspection and maintenance.

2.9 PASSIVE FIRE PROTECTION SYSTEMS

The Contractor FPE is also responsible for developing a Code/Criteria Search List (see Attachment C of SWDIV A-E Guide) demonstrating compliance with all NFPA codes and the model building code utilized. The FPE is expected to verify provision and construction compliance of all passive fire protection systems in the facility (proper wall, floor, and ceiling rating, proper use of fireproofing and fire-stopping systems, protection of openings (coordination of door ratings, hardware, etc)).

PART 3 EXECUTION

Not Used.

END OF SECTION