

DIVISION 15 - MECHANICAL

SECTION 15500 - FIRE PROTECTION SYSTEMS

PART 1 - GENERAL

1.01 GENERAL CONDITIONS

As specified in Section 00700 - GENERAL CONDITIONS OF THE CONTRACT.

1.02 MECHANICAL GENERAL PROVISIONS

As specified in Section 15011 - GENERAL MECHANICAL PROVISIONS shall apply to work specified in this Section.

1.03 DESCRIPTION OF WORK

- A. Provide a complete wet pipe automatic fire sprinkler system for the entire building, as required by code and authority having jurisdiction. The sprinkler system layout as shown on drawings is intended only to describe the general scope of work required and is not to be construed as being a complete workable design in accordance with the Building and Fire Codes of the County of Kauai, and all the applicable NFPA Codes and Regulations. Final design and providing of the Sprinkler System meeting all applicable codes and regulations shall be the sole responsibility of the Contractor. The electrical work to be included under this section is limited to labor and materials required for providing a complete working local supervisory system, include the circuitry between panels, alarms, detectors, etc.

Design and provide each system giving full consideration to blind spaces, piping, electrical equipment, ductwork, and other construction and equipment in accordance to detailed drawings to be submitted for review. Locate sprinkler heads in a consistent pattern with ceiling grid, lights, and air devices. Center sprinkler heads with respect to ceiling grids, unless otherwise indicated.

- B. The work includes the designing and providing of approved Clean Agent, FK-5-1-12 extinguishing system for protection of the Security/Electronics 74 and Data Room 8. The design, equipment, materials, installation and workmanship shall be in strict accordance with the required and advisory provisions of NFPA 2001, except as modified herein. Each system shall include all materials, accessories and equipment inside and outside the building necessary to provide each system complete and ready for use. Design and install each system to give full consideration to built-in spaces, piping, electrical equipment, ductwork and all other construction and equipment and to be free from operating and maintenance difficulties, all in accordance with detailed drawings to be submitted to the Officer-in-Charge for approval. Devices and equipment for fire protection service shall be of a make and type listed by the Underwriter's Laboratories, Inc., or approved by the Factory Mutual System. In the 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 State Designated Representative.

CB. Fire extinguisher cabinets.

DC. Related Sections:

1. Section 01330 - SUBMITTALS.
2. Section 01352 - LEED REQUIREMENTS.
3. Section 15011 - GENERAL MECHANICAL PROVISIONS: As specified in Section 15011 - GENERAL MECHANICAL PROVISIONS shall apply to work specified in this Section.

1.04 SUBMITTALS

- A. Submit in accordance with Section 01300 - SUBMITTALS and Section 15011 - GENERAL MECHANICAL PROVISIONS.
- B. Product Data.
- C. Layout shop drawings.
- D. Design Calculations.
 1. **Hydraulic calculations.**
 2. **Clean Agent, FK-5-1-12 discharge calculations.**
 3. **Battery Capacity calculations.**
- E. Shop and Permit Drawings: Submit a layout of the proposed system shop **drawings.**
- F. LEED Submittals: Submit LEED submittal requirements according to Section 01352 - LEED REQUIREMENTS, paragraph 1.05, Item F., LEED Documentation Submittals:
 1. Credit EQ 4.1 - Low-Emitting Materials for Adhesives and Sealants: Using the "ENVIRONMENTAL MATERIALS REPORTING FORM" appended to the end of Section 01352 - LEED REQUIREMENTS, for all adhesives and sealants installed in the building interior (defined as inside the weatherproofing system and applied on-site) submit manufacturer information along with cut sheets, MSDS, and/or letters from product manufacturers indicating the product meets testing and product requirements of the California Department of Health Services Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers, including 2004 Addenda.

1.05 RELATED WORK SPECIFIED IN OTHER SECTION

- A. Smoke detectors to be connected to fire alarm system by electrical.
- B. All electric power wiring and conduit for flow switch and other equipment required under this section shall be provided under the Electrical Work.

1.06 REFERENCE SPECIFICATION

HAWAII HEALTH SYSTEMS CORPORATION – KAUAI DIVISION
Samuel Mahelona Memorial Hospital
Behavioral Health New Patient Facility
Project No. 221093-01

Fire Protection Systems
15500-2

Latest edition of the Building and Fire Codes of the County of Kauai shall be followed. Where these specifications vary from said standards, the more rigid requirements shall apply.

1.07 STANDARDS

Comply with the local ordinances; requirements of Local Authority, Standards of the National Fire Protection Association regulations of the County of Kauai Building and Fire Departments, and all other applicable regulatory bodies.

1.08 SUBSTITUTIONS

Substitutions shall be in accordance with DIVISION 1- GENERAL REQUIREMENTS.

1.09 COORDINATION

Coordinate with the various trades. Where items must fit spaces previously constructed, verify measurements at the site. Coordinate with other work to ensure that all required inserts, sleeves, and attachments are properly set and that adequate provision is made for installing this work.

1.10 PERMITS AND INSPECTIONS

Obtain and pay for permits, arrange for periodic inspection by local authorities and deliver certificates of final inspection and compliance to the Architect.

1.11 DRAWINGS

- A. Contract Drawings: Follow architectural plans of Building and diagrammatic fire protection layouts wherever practicable. Locations are approximate, and before installing, study adjacent architectural details and make installation in an appropriate manner.
- B. Shop and Permit Drawings: Submit a layout of the proposed system shop drawings in compliance with the Section "Special Provision", and copies of brochures or catalogs cuts of fixtures and equipment including detailed construction drawings, for approval by the agency having jurisdiction, and by the Architect. Drawings shall be stamped by the contractor's licensed mechanical engineer registered in the State of Hawaii. Show all fire protection work, indicating where piping is exposed or concealed and location of all valves and equipment. No work shall be commenced until these locations are approved by the Architect. Shop drawings shall be submitted in accordance with Section 15011 - GENERAL MECHANICAL PROVISIONS.
- C. Material and Equipment: Material or equipment brochures for the following items shall be submitted in accordance with Section 15011 - GENERAL MECHANICAL PROVISIONS.

Fire Extinguishing Cabinets

Fire Department Connection

FK-5-1-12 Fire Extinguishing System

Hangers and Supports

Piping and Fittings

Seismic Restraints

Sprinklers Heads

~~Seismic Restraints~~

Valves and Accessories

- D. As-built drawings shall be provided in accordance with Section 15011 - GENERAL MECHANICAL PROVISIONS.

1.12 GUARANTEE

Guarantee all work for a period of one (1) year from date of final acceptance and in accordance with Section 15011 - GENERAL MECHANICAL PROVISIONS.

1.13 DESIGN

- A. Design automatic wet pipe fire extinguishing sprinkler systems in accordance with the required and advisory provisions of Building and Fire Codes of the County of Kauai, by hydraulic calculations for uniform distribution of water over the design area. Each system shall include materials, accessories, and equipment inside and outside the building to provide each system complete and ready for use. Design and provide each system to give full consideration to blind spaces, piping, electrical equipment, ducts, and other construction and equipment in accordance with detailed working drawings to be submitted for approval. Locate sprinkler heads in a consistent pattern with ceiling grid, lights, and air supply diffusers. Devices and equipment shall be for fire use in wet pipe sprinkler systems. Design systems for earthquake protection.
- B. Heads in relation to the ceiling and the spacing of sprinkler heads shall not exceed that permitted by the Building and Fire Codes of the County of Kauai. Uniformly space sprinklers on the branch piping. Unless otherwise indicated on drawings, heads shall be located in the center of ceiling panels.
- C. Pipe sizing shall limit water velocities to 20 feet per second maximum.
- D. Submit electronic copy and at least 1 hardcopy set of hydraulic calculations to the Architect for review and approval. Use pressure information indicated on the drawings; hydraulic calculations shall add 10 percent, but not less than 5 psi safety factor to the calculated required water pressure at the required flow. If computer calculations are used, submittal shall include legend of all abbreviations and step-by-step detailed explanation of printouts. Incomplete submittal will be returned without review.
- E. Submit electronic copy and at least 1 hardcopy set of complete shop drawings stamped by the contractor's licensed mechanical engineer to the Architect for review and approval.
- F. Obtain fire and building department permit for construction. Provide amount of shop drawings and calculations sets as required by the Building Department.
- G. Design and installation of Clean Agent, FK-5-1-12 fire extinguishing systems shall conform to NFPA 70, NFPA 72, NFPA 75, and NFPA 2001 to the requirements as hereinafter specified.**
- H. Annotate clean agent, FK-5-1-12 system piping layout with reference points**

for design. In field wiring diagrams, show locations of devices and points of the system. Prepare working drawings on sheets not smaller than the contract drawings, in accordance with the requirements for "Plans" as specified in NFPA 2001. Include data essential to the proper installation of each system.

- I. Submit clean agent, FK-5-1-12 discharge calculations verifying total storage requirements, flooding concentrations, discharge times, flow through the piping network, pipe sizes, and nozzle orifice sizes, in accordance with the manufacturer's listed design manual and NFPA 2001. Submit substantiating battery capacity calculations showing capacity, supervisory and alarm power requirements. The calculations must be shown on the shop drawings
- J. The system shall totally flood the protected area providing a volumetric concentration of Clean Agent, FK-5-1-12 of not less than 4.5 percent nor more than 10 percent at 70 degrees F
- K. The Clean Agent, FK-5-1-12 concentration shall be based upon shutting down the heating, ventilation and air conditioning (HVAC) systems at the time of agent discharge. The required Clean Agent, FK-5-1-12 concentration shall be maintained in the protected area for a minimum of ten minutes
- L. The maximum Clean Agent, FK-5-1-12 liquid discharge time shall be 10 seconds.
- M. Each system shall be provided with its own connected reserve supply of Clean Agent, FK-5-1-12. Each reserve supply shall contain an amount of Clean Agent, FK-5-1-12 equal to the primary supply of the system to which it is connected.
- N. Upon completion, and before final acceptance of the work, submit a complete set of as-built (record) working drawings, including complete as-built circuit diagrams, of each Clean Agent, FK-5-1-12 system for record purposes. The as-built working drawings shall be not smaller than the contract drawings and shall be reproducible drawings on vellum with title block similar to full size contract drawings. The as-built working drawings shall be furnished in addition to the record drawings required by Section 01300 SUBMITTALS.

1.14 WORKMANSHIP

All materials and equipment shall be installed in accordance with the Building and Fire Codes of the County of Kauai to conform with the contract documents. The system shall be installed by an experienced firm regularly engaged in the design and installation of fire-protection sprinkler systems in accordance with the Building and Fire Codes of the County of Kauai. The Architect may reject any proposed installer who cannot show evidence of such qualifications. Architect's approval will not relieve the Contractor from his responsibilities to perform all work in accordance with specifications to contract terms.

1.15 INSTRUCTIONS TO OWNER

The Contractor shall provide the Owner with the necessary (as required by the Building and Fire Codes of the County of Kauai) information concerning the care,

operation and maintenance of the system.

1.16 CONFORMANCE TO AGENCY REQUIREMENTS

Where materials or equipment are specified to be approved by the Underwriters' Laboratories, Inc., the Contractor shall submit proof that the items furnished under this section of the specifications conform to such requirements. The label of or listing in the Underwriters' Laboratories, Inc., Building Materials List, or the Electrical Appliance and Utilization Equipment List will be acceptable as sufficient evidence that items conform to Underwriters' Laboratories, Inc., requirements.

1.17 NAMEPLATES

Each major component of equipment shall be engraved with the manufacturer's name, address, and catalog number and electrical data on a metal plate mechanically attached to the item of equipment.

1.18 VERIFICATION OF DIMENSIONS

The Contractor shall be responsible for the coordination and proper relation of his work to the building structure and to the work of all trades. The Contractor shall visit the premises and thoroughly familiarize himself with all details of the work and working conditions, to verify all dimensions in the field, and to advise the Architect of any discrepancy before performing any work. Fabrication of piping shall be in accordance with field measurements.

1.19 DELIVERY AND STORAGE

All equipment and materials shall be delivered and stored in a manner to preclude any damage from the weather, humidity, temperature variations, dirt and dust, or other contaminants. Additionally, all piping shall be capped or plugged until installed.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. All valves, fittings, and alarm devices shall be UL listed and FM approved for use in wet pipe sprinkler systems.

2.02 MANUFACTURER

- A. UL listed Sprinkler and Alarm equipment shall be products of Central, Reliable, Viking, Automatic Sprinkler Corp., Tyco or approved equal.
- B. Clean Agent Fire Suppression System and Alarm Equipment shall be products of Kidde Fire Systems, Fike Corporation, or approved equal manufacturer.**

2.03 SPRINKLER HEADS

- A. UL and Factory Mutual Laboratory approved automatic closed pendent or upright

type, ordinary degree temperature ratings (165 degrees F). All fire sprinkler heads shall be chrome plated, 1/2-inch orifice, and 1/2-inch NPT unless otherwise noted on drawings. For areas that require ligature resistant devices, as indicated on drawings, fire sprinkler heads shall be institutional type. See drawings for special requirements.

- B. Cover plates for concealed pendent sprinkler heads shall be color coordinated to match surroundings. Coordinate colors with the Architect prior to ordering.
- C. Sprinklers in light hazard and ordinary hazard occupancies shall be of the quick response type.
- D. Water shields shall be provided as needed.
- E. All surface type escutcheons shall be not more than 5/8 inch deep. Recessed type escutcheons shall be supplied by the same manufacturer as the sprinkler head. Escutcheons shall be chrome plated steel.
- F. Furnish extra sprinklers, sprinkler stoppers and wrenches as required by the Building and Fire Codes of the County of Kauai. Provide where directed an approved metal cabinet with hinged door, lock and 2 keys, for storing extra sprinklers, sprinkler stoppers and wrenches.

2.04 FIRE SPRINKLER PIPE AND FITTINGS

- A. Aboveground: NFPA 13, except as modified herein. Piping shall be black steel, Schedule 40. (Light wall steel pipe and copper tubing are not allowed). Fittings into which sprinkler heads, sprinkler head riser nipples, or drop nipples are connected shall be threaded. Other pipe fittings shall be welded, or threaded. Plain-end fittings with mechanical couplings and fittings which use steel gripping devices to bite into the pipe when pressure is applied will not be permitted. When space is available, rubber gasketed grooved-end pipe and fittings with mechanical couplings shall be permitted in pipe sizes 1.5 inches and larger. Mechanical couplings manufacturer shall supply fittings and rubber gaskets. Sprinkler pipe and fittings shall be metal. Piping and fittings shall be shipped pre-coated with end caps from the factory. Rusted items delivered and installed at the job site will be rejected.
- B. Underground: Provide outside-coated, cement mortar-lined, ductile-iron pipe and fittings conforming to NFPA 24 for piping under the building and less than 5 feet outside of the building walls. Anchor the joints in accordance with NFPA 24; provide concrete thrust block at the elbow where the pipe turns up toward the floor, and restrain the pipe riser with steel rods from the elbow to the flange above the floor. Minimum depth of cover shall be 3 feet.

2.05 WATER - FLOW ALARM

Provide water-flow alarm valve complete with electric alarm switch, alarm retarding device; local, water motor alarm gong weather-proof type; valves, pressure gages, fittings; install complete as per manufacturer's printed installation direction.

2.06 SUPPORT

- A. Support sprinkler system piping from building structure by means of hangers,

- inserts and other supports, as per requirements in the Building and Fire Codes of the County of Kauai and as indicated on drawings.
- B. Provide all necessary supplemental structural steel for proper support or attachment of hangers. Steel shall be hot dipped galvanized.
 - C. All ferrous items including but not limited to hangers, fasteners rods and accessories shall be galvanized.

2.07 PIPE SLEEVES, ESCUTCHEONS

Furnish and set cast iron (below grade) or Schedule 40 steel pipe sleeves to accommodate pipes passing through foundations, walls, floors, partitions; provide escutcheons at exposed finished surfaces pierced by pipes. Extend sleeves above finished floor and pack space between pipe and sleeve as recommended by the Building and Fire Codes of the County of Kauai.

2.08 SPRINKLER WATER FLOW SWITCH

Vane-type water flow detector or pressure switch shall be installed as indicated on the drawings. The detector shall have a minimum of 2 contacts. The detector shall incorporate a retard element to prevent false signals and be installed in accordance with the manufacturer's recommendations. Local electric audible alarm activated by the detector circuit shall also be provided by Sprinkler Contractor.

2.09 GAUGES

Shall be 3-1/2 inches dial type.

2.10 VALVES

Flanged gate valves shall be O.S. & Y. type, iron body, brass trim, 175 pounds working pressure. Flanged check valves shall be iron body, brass seat and discs, clearway swinging type, with drip connections, 175 pounds working pressure. Valves used in conjunction with valve supervisory devices shall have items notched or otherwise modified to suit the supervisory device.

When indicated on drawings valves located in pit shall be equipped with an indicator post with valve position locking device. UL listed butterfly valves may be used in lieu of gate valve with the Architect's approval.

2.11 FIRE DEPARTMENT CONNECTION

Potter Roemer Co., No. 5715 free standing cast bronze body, Underwriters Labeled 2 way inlet connections with 4 inches N.P.T. outlet, 2, 2-1/2 inch satin chrome finish inlet snoots with National Standard Hose Thread, clapper type independent check valves with ground seats, satin chrome finish bronze snoots plugs with chain and with satin chrome finish coat bronze nameplate lettered as indicated on drawings; and Potter Roemer Co., 5970 Series Identification Plate that describe the name of the building(s) it serves. Complete installation shall include check valve and other accessories as required by the Building and Fire Codes of the County of Kauai.

2.12 ALARM CHECK VALVE ASSEMBLY

The riser or risers shall be installed where shown on plans. The alarm shall consist of a variable pressure alarm check valve, and water motor gong. Contractor shall also completely install a flow switch; wiring by Electrical Contractor.

2.13 CONTROL PANEL

- A. Provide a releasing panel that is able to be networked with the building security system. Provide complete electrical supervision of all circuits. Install modular type panel in a flush or surface mounted steel cabinet with hinged door and cylinder lock. Switches and other controls shall not be accessible without the use of a key. The control panel shall be a neat, compact, factory-wired assembly containing all parts and equipment required to provide specified operating and supervisory functions of the system. Panel cabinet shall be finished on the inside and outside with factory-applied enamel finish. Provide prominent rigid plastic or metal identification plates for all lamps and switches. A single open or ground fault condition in any detection or actuation circuit shall not result in any loss of system function, but shall cause the actuation of system trouble signals. A ground fault condition or single break in any other circuit shall result in the activation of the system trouble signals. Supervision of wiring external to the control panel for mechanical equipment shutdown is not required, provided a break in such wiring will cause the associated mechanical equipment to shut down. Loss of AC power, a break in the standby battery power circuits, or abnormally low battery voltage shall also result in the operation of the system trouble signals. The abnormal position of any system switch in the control panel shall also result in the operation of the system trouble signals. Trouble signals shall operate continuously until the system has been restored to normal at the control panel. Panel shall be provided with the following switches:
1. Trouble silencing switch which transfers trouble signals to an indicating lamp. Upon correction of the trouble condition, audible signals will again sound until the switch is returned to its normal position, or the trouble circuit shall be automatically restored to normal upon correction of the trouble condition.
 2. Evacuation alarm silence switch which when activated will silence all alarm devices and cause operation of system trouble signals.
- B. System control panel shall be UL Fire Prot Dir listed or FM APP GUIDE approved for extinguishing system control (releasing device service).

2.14 SECONDARY POWER SUPPLY

- A. Supply shall include nickel cadmium, lead calcium or sealed lead acid batteries and charger. Dry cell batteries are not allowed. House batteries in a well constructed steel cabinet with cylinder lock.
- B. Storage Batteries: Provide batteries of adequate ampere-hour rating to operate the system under supervisory conditions for 60 hours at the end of which time batteries shall be capable of operating the entire system in a full

alarm condition for not less than 30 minutes. Provide calculations substantiating the battery capacity. Provide reliable separation between cells to prevent contact between terminals of adjacent cells and between battery terminals and other metal parts.

- C. **Battery Charger:** Provide completely automatic high/low charging rate type charger capable of recovery of the batteries from full discharge to full charge in 48 hours or less. Provide an ammeter for recording rate of charge and a voltmeter to indicate the state of battery charge. Provide a red pilot light to indicate when batteries are manually placed on a high rate of charge as part of the unit assembly if high-rate switch is provided.

2.15 MANUAL ACTUATION STATIONS

- A. Provide actuation stations for systems at the exits from the protected areas. Operation of a manual station shall cause the control panel to go into full alarm condition and discharge Clean Agent, FK-5-1-12 into the protected area following the adjustable time delay. Stations shall be of a type not subject to operation by jarring or vibration. Stations shall have a dual action release configuration to prevent accidental system discharge. Break-glass-front stations are not permitted. Station color shall be yellow or orange. Warning signs shall be placed at each station indicating that operation of the station will cause immediate Clean Agent, FK-5-1-12 discharge. Where building fire alarm pull stations are also mounted at the exits from the protected areas, they shall be separated from Clean Agent, FK-5-1-12 actuation stations by at least 3 feet horizontally, labels shall be provided to clearly distinguish building fire alarm stations from Clean Agent, FK-5-1-12 stations and stations shall be of different colors.

2.16 SMOKE DETECTORS

- A. Designed for detection or abnormal smoke densities by the photoelectric principle. Necessary control and/or power modules required for operation of the device shall be integral with the main control panel. Detectors shall be compatible with main control panel provided and shall suitable for use in a supervised circuit. Malfunction of the electrical circuitry to the detector shall result in the operation of the system trouble alarm. Each detector shall contain a visible indicator lamp that shall show when the unit is activated. Each detector shall be the plug-in type in which the detector base contains screw terminals for making all wiring connections. Remote indicator lamp shall be provided for each detector that is located above suspended ceilings, beneath raised floors or otherwise concealed from view.
- B. **Photoelectric Detectors:** Operate on a multiple cell concept using a light-emitting diode (LED) light source. Failure of the LED shall not cause an alarm condition but shall operate the detector trouble indicating lamp.
- C. **Detector Spacing and Location:** In accordance with the requirements of NFPA 72, the manufacturer's recommendations and the requirements stated herein. Spacing and location of detectors shall take into account the airflow into the room and supply diffusers. Detectors shall not be placed closer than 900 millimeters from any discharge grille. Spacing of

detectors on room ceilings shall not exceed 41.80 square meters per detector. Spacing of detectors under raised floors shall not exceed 23.25 square meters per detector. Detectors installed beneath raised floor framing, with the detector facing downward. Where the space under the raised floor is less than 305 millimeters in height, detectors shall be mounted with their bases either horizontal or vertical, with the detection chambers mounted in the upper half of the underfloor space. Under no circumstances shall detectors be mounted facing upward.

2.17 ABORT SWITCH

- A. Provide one switch where shown. Activation of switch shall delay only equipment shutdown and agent discharge. Switch shall be guarded, spring-loaded type which operates only when pressure is manually applied to the switch. Upon release of manual pressure, switch shall de-activate allowing delayed functions to resume. After start of agent discharge, switch shall have no effect. Activation of switch during normal (non-alarm) conditions shall cause activation of system trouble signals.**

2.18 ALARM SIGNALING DEVICES

- A. Audible Alarms: Alarm Horns - Recessed, vibrating type suitable for use in an electrically supervised circuit and shall have a sound output rating of at least 90 decibels at 3 meters.**
- B. Visual Alarm: Surface mounted lamp assembly suitable for use in an electrically supervised circuit. Lamp shall be the flashing stroboscopic type and powered from the control panel alarm circuit. Lamps shall provide a minimum of 100 candela. Flash rate shall be between 60 and 120 flashes per minute. Lamps shall be protected by a thermo-plastic lens, red for pre-discharge alarms and blue for discharge alarms. All visual alarms shall be synchronized.**

2.19 MAIN ANNUNCIATOR

- A. Annunciator shall be integral with the main control panel. Provide separate alarm and trouble lamps for each zone alarm initiating circuit located on the exterior of the cabinet door or visible through the cabinet door. Supervision will not be required provided a fault in the annunciator circuits results only in loss of annunciation and will not affect the normal functional operation of the remainder of the system. Each lamp shall provide specific identification of the area by means of a permanent label. In no case shall zone identification consist of the words "Zone 1," "Zone 2," etc., but shall consist of the description of the area.**

2.20 AUTOMATIC FIRE DAMPERS

- A. Provide automatic control of fire dampers in air conditioning supply duct work as specified in Section 23 00 00 AIR CONDITIONING AND VENTILATION. Activation of fire dampers shall occur upon activation of Clean Agent, FK-5-1-12 discharge.**

2.21 ELECTRICAL WORK

- A. Electrical work is specified in SECTION 16010 - ELECTRICAL WORK.
- B. Wiring: Control and fire suppression wiring, including connections to fire alarm systems, shall be provided under this section and shall conform to NFPA 70. Wiring for 120 volt circuits shall be No. 12 AWG minimum. Wiring for low voltage DC circuits shall be No. 14 AWG minimum. All wiring shall be color coded. Use rigid metal conduit or intermediate metal conduit, except electrical metallic tubing may be used in dry locations not enclosed in concrete and where not subject to mechanical damage.
- C. Operating Power: Power shall be 120 volts AC service, transformed through a two winding isolation type transformer and rectified to 24 volts DC for operation of all signal initiating, signal sounding, and trouble signal. Provide secondary DC power supply for operation of system in the event of failure from emergency to normal power shall be fully automatic and shall not cause transmission of a false alarm. Obtain AC operating power to control panel and battery charger as indicated on the drawings. The power supply shall be equipped with a locking mechanism and marked in red with the words "FK-5-1-12 System Circuit Control".
- D. Conductor Identification: All circuit conductors shall be identified within each enclosure where a tap, splice or termination is made. Conductor identification shall be by plastic coated self-sticking printed markers or by heat-shrink type sleeves. Attach the markers in a manner that will not permit accidental detachment. Properly identify control circuit terminations.

2.22~~43~~ FIRE EXTINGUISHER CABINETS

- A. Fire Extinguisher Cabinet: Potter Roemer, Croker, J.L., or approved equal, unit consisting of 20-gauge aluminum box with anodized aluminum door, style "E" break glass (25 square inch), decal Figure No. 1970, cylinder lock. Finish shall be baked enamel inside, rust resistant prime coat outside except for aluminum door and trim. 10 lb. dry chemical fire extinguisher, UL rating of 4A:80B:C. See architectural drawings for mounting heights.

		Overall	Recess
F.E.C.-R	Fully Recessed 1704-E	13 inches x 28 inches x 6 inches	10 inches x 25 inches x 5.5 inches
F.E.C.-SR	Semi Recessed 1724-E	13 inches x 28 inches x 6 inches	10 inches x 25 inches x 4 inches

2.23 CLEAN AGENT FIRE EXTINGUISHERS

- A. Fire Extinguisher Cabinet shall be as specified in the preceding paragraph. Fire extinguisher shall be 10 lb. Clean agent, UL rating of 2A and shall be placed in fire extinguisher cabinets, or surface mounted.**

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Do not scale the plans. Check all measurements at the building and adjust the work to fit the space allotted. Close cooperation between all trades will be required. Any work done without regard for the work of other trades shall be moved if necessary, at the option of the Architect, without extra charge, to permit the proper installation of other work.
- B. When work is not in progress, open ends of pipe and fittings shall be securely closed so that no trench water, earth, or other substances can enter the pipe or fittings.
- C. The responsibility for the care and protection of the equipment and work rests with the Contractor until it has been tested and accepted.
- D. Work shall not proceed before obtaining a building permit, and approved shop drawing and approved equipment submittals.

3.02 CUTTING AND PATCHING

- A. Place sleeves for piping penetrating through poured concrete or masonry construction prior to pouring of concrete or construction of masonry.
- B. Do not cut any openings in any structural member until location is approved by the Architect.
- C. Cutting holes in hardened concrete is not permitted except by special permission of the Architect, which will be on an individual basis and require the use of small hand tools, diamond drills, or other controlled means at the Architect's discretion.
- D. Cutting of reinforcing bars is not permitted. Splay bars to clear or move holes as required.
- E. If necessary to cut holes in slabs or concrete walls, first prelocate holes to clear beams, joists, columns, etc. Cut hole neat and clean using diamond core drill or small chipping gun. Leave all reinforcing bar intact; enlarge holes if necessary.
- F. If necessary to cut holes in masonry walls, carefully remove a minimum amount of masonry.
- G. Install sheet metal or black iron pipe sleeves through holes cut in slabs, concrete walls or masonry walls. In concrete slab walls, install sleeves to clear reinforcing bars and tightly pack concrete around sleeve for full thickness of walls. In masonry walls, rest or re-grout all loose masonry units; pack cement grout tight and solid around sleeves for full thickness of wall.

3.03 FITTINGS

Fittings for above ground piping shall be of a type specifically approved for use in sprinkler systems. Bushings shall be used only where standard fittings of the required size are not available. The use of bushings is further restricted to requirements of the Building and Fire Codes of the County of Kauai.

3.04 REDUCERS

Reductions in pipe sizes shall be made with one-piece reducing fittings.

Bushings will not be acceptable, except when standard fittings of the proper size are not available. Where used, face bushings shall be installed with the outer face flush with the face of the fitting opening being reduced. Bushings shall not be used in elbow fittings in more than one outlet of a tee, in more than 2 outlets of a cross, or where reduction in size is less than 1/2 inch.

3.05 PIPE SUPPORTS AND HANGERS

- A. The recommended methods and requirements for supporting or hanging pipe as set forth in the Building and Fire Codes of the County of Kauai shall be mandatory.
- B. Install hangers and supports for all pipe work to provide for expansion and contraction, prevent vibration and maintain required grading by proper adjustment.
- C. Refer to structural drawings for type of construction from which piping and/or equipment is to be suspended. Drilling of pre-stressed concrete is not permitted without written approval from the Structural Engineer.
- D. Drilled in Threaded Inserts: Where supports in beams and joists are required after concrete has been poured, Phillips "Redhead" Drilled-In Threaded Inserts shall be provided, installed in accordance with the manufacturer's recommendations and U.L. listed for seismic applications. Locations shall be approved by the Structural Engineer.

3.06 EARTHQUAKE (SEISMIC) PROTECTION

Install sprinkler systems with seismic protection to prevent pipe breakage during an earthquake. Provide flexible couplings, swing joints, sway bracings and adequate clearances in accordance with NFPA 13. Provide seismic protection in accordance with IBC 2018, Chapter 9 and Section 1613 - Kauai.

3.07 PIPE SLEEVES

Pipes passing through concrete or masonry walls or concrete floors shall be provided with pipe sleeves fitted into place at the time of construction. All rectangular and square openings shall be as detailed. Each sleeve shall extend through its respective wall or floor, and be cut flush with each surface. Unless otherwise indicated, sleeves shall be of such size as to provide a minimum of 1/4-inch all-round clearance between the pipe and sleeve. Sleeves in bearing walls, waterproofing membrane floors, and wet areas shall be steel pipe or cast iron pipe. Sleeves in non-bearing walls, floors, or ceilings may be steel pipe, cast iron pipe, or galvanized sheet metal with lock-type longitudinal seam.

3.08 BRACING AND CLAMPING

The connection between the underground piping and the base of the riser shall be anchored by means of tie rods and pipe clamps. Bends, plugs, and tees shall be braced or clamped in accordance with the requirements of NFPA 24.

3.09 THRUST BLOCKS

Adequate concrete reaction thrust blocks conforming to NFPA 24 shall be installed at underground pipe fittings.

3.10 TESTS

- A. Subject Sprinkler System to tests required by and in presence of representatives of agencies having jurisdiction. Notify the Fire Protection Engineer a minimum of 5 working days in advance of flushing and testing. Conduct, duration, other details of tests not covered by agencies' requirements shall be in accordance with the Building and Fire Codes of the County of Kauai. Provide instruments, equipment; pay expenses incurred in making tests; obtain approvals, and certificates. Where evidence of stoppage appears in piping or equipment, disconnect, clean, repair, reconnect obstructed parts; also bear cost of cutting and patching adjoining work necessitated by such cleaning and repairing. Provide material and test certificate for underground and aboveground piping per NFPA 13 with the necessary information. Aboveground and belowground piping shall be hydrostatically tested at 200 psi for 2 hours without any pressure loss.

Note: The Fire Protection Engineer must witness tests and sign certificate.

3.11 SPECIAL CONDITIONS

- A. Conformance with provision of the IBC 2018, Chapter 9 and Section 1621 - Kauai (as amended and adopted) are hereby made a part of this section of the specifications.
- B. Fire Sprinkler Heads shall be located in the center of ceiling panels. When centering sprinkler heads in the ceiling panel require additional sprinkler heads, additional sprinkler heads shall be added.
- C. Brace excessively long sprigs and drops at individual sprinkler heads. In general, sprigs and drops shall not exceed 20 inches without additional bracing.

3.12 WATER SUPPLY CONNECTION

Connect sprinkler system to new main water service pipe outside of building with detector check meter. Before connecting, flush water service through unrestricted opening at least 4 inches diameter. Refer to civil drawing for detector check meter location.

3.13 DRAIN AND TEST CONNECTIONS

Install horizontal piping graded to low points and in manner to make it possible to test and empty entire system; provide valves and piping of sizes and in locations in accordance with the requirements of the Building and Fire Codes of the County of Kauai. Drain valve and discharge fittings shall be visible; use sight-

drain fittings if necessary. Provide flushing connections at end of cross mains, consisting of capped nipple same diameter as pipe but not larger than 2 inches.

3.14 VALVE SEALS, TAGS, CHARTS

- A. Seals: Provide approved seal for each manually operated shut-off valve required to be sealed in open position.
- B. Signs: Provide identification signs of standard design, fasten securely at designated locations as per the Building and Fire Codes of the County of Kauai.
- C. Tags: Provide brass tags 1-1/2 inches diameter; stamp with designator numbers, secure with 12-gauge copper wire to spindle of all control valves.
- D. Charts: Provide 2 copies of approved sprinkler system diagram and valve chart, giving designating number, function, location of each valve; mount in painted, glazed frames, and hang where directed.

3.15 TESTING AND FLUSHING

Testing and flushing shall be done in accordance with the Building and Fire Codes of the County of Kauai.

3.16 DISINFECTION

Disinfect the new water piping and existing water piping affected by Contractor's operations in accordance with AWWA C601. Fill piping systems with solution containing minimum of 50 parts per million of available chlorine and allow solution to stand for minimum of 24 hours. Flush solution from the systems with clean water until maximum residual chlorine content is not greater than 0.2 parts per million. Exercise caution when mixing chlorine disinfection solutions. Flushing of chlorinated water shall be done in accordance with NFPA 25 - INSPECTION, TESTING AND MAINTENANCE OF SPRINKLER SYSTEMS. The Contractor shall be responsible for the proper disposal of chlorinated water to safeguard public health and environment in accordance with the applicable Department of Health requirements.

3.17 FIELD PAINTING

- A. Clean, pre-treat, prime, and paint all new fire sprinkler systems including valves, piping, conduit, hangers, supports, miscellaneous metalwork, and accessories. Apply coatings to clean, dry surfaces, using clean brushes. Clean the surfaces to remove dust, dirt, rust, and loose mill scale. Immediately after cleaning, provide the metal surfaces with one coat of oil base primer applied to a minimum dry film thickness of 1.0 mil.
- B. Clean, pretreat, prime, and finish paint new Clean Agent, FK-5-1-12 fire extinguishing systems, including piping, conduit, hangers and miscellaneous metalwork. Apply coatings only to clean, dry, surfaces using clean brushes. Clean surfaces to remove all dust, dirt, rust and loose mill scale. Immediately after cleaning, the metal surfaces shall receive one coat of primer conforming to FS TT-P-645 applied to a minimum dry film thickness of one mil. Exercise due care to avoid the painting of operating devices. Materials which are used to protect devices, while painting is in**

process, shall be removed upon the completion of painting. Remove all devices which are painted and provide new clean devices of the proper type in lieu thereof.

- CB. Clean, pre-treat, prime and paint (as described above) existing fire sprinkler system, where indicated on drawing.
- DC. Finish painting shall consist of 2 coats - material and dry film thickness as specified in Section 09900 - PAINTING.

3.18 FIELD TESTING

- A. **Preliminary Tests: Perform tests in the presence of the Fire Protection Engineer to determine conformance with the specified requirements. Each piping system shall be pneumatically tested at 150 psig and shall show no leakage or reduction in gage pressure after 30 minutes. The contractor shall conduct complete preliminary tests, which shall encompass all aspects of system operation. Individually test all detectors, manual actuation stations, alarms, control panels, and all other components and accessories to demonstrate proper functioning.**
- B. **Final Acceptance Tests: The Fire Protection Engineer, Special Inspector, State, Construction Manager and Commissioning Authority will witness formal tests and approve all systems before they are accepted. The system shall be considered ready for such testing only after all necessary preliminary tests have been made and all deficiencies found have been corrected to the satisfaction of the Fire Protection Engineer and written certification to this effect is received by the State. The Fire Protection Specialist shall conduct the Final Acceptance Test and shall provide a complete demonstration of the operation of the system. This shall include automatic and manual operation of the systems and the room integrity test. In addition, the Fire Protection Specialist shall have available copies of as-built drawings and certificates of tests previously conducted. The installation shall not be considered accepted until identified discrepancies have been corrected and test documentation is properly completed and received.**
- C. **System Function Tests Without Clean Agent, FK-5-1-12 Discharge: The entire detection/alarm/actuation system shall be operated. As a minimum, operation and supervision of the following functions and devices shall be demonstrated.**
 - 1. **All operational and supervisory functions of the control and annunciator panels, including the cross-zoning, pre-discharge alarm, discharge alarm, post-discharge alarm and time delay features.**
 - 2. **Each manual actuation station and associated circuit.**
 - 3. **All pre-discharge and post-discharge alarms and associated circuits.**
 - 4. **All actuator circuits and discharge heads (without Clean Agent, FK-5-1-12 discharge).**
 - 5. **Air handling, Fan coil, and computer equipment shutdown.**
 - 6. **Automatic fire dampers.**

7. **Activation of the building fire evacuation alarm system.**
8. **Activation of the Base fire alarm system (receipt of fire alarm at alarm office).**
9. **All of the above tests shall be repeated with the system on battery power only.**

3.1948 STANDARDIZED PIPE IDENTIFICATION SYSTEM

- A. Use an arrow marker with each pipe content marker, the arrow shall always point away from the pipe marker and in the direction of the flow.
- B. If flow can be in both directions, use a double headed arrow marker.
- C. Apply pipe marker and arrow marker at every point of pipe entry or exit where line goes through wall.
- D. Apply pipe marker and arrow marker on each riser and "T" joint.
- E. Apply pipe marker and arrow marker every 20 feet on long continuous lines.
- F. Apply markers on the 2 lower quarters of the pipe and where view is unobstructed.
- G. Arrow markers shall be 4 inches long minimum and pipe content marker lettering sizes shall be 1-1/2 inches minimum in height.

END OF SECTION