
The shafts shall be turned, ground and polished and shall be selected for operation well below the first critical speed and shall have rust preventive coating. Shafts shall be supported by self-aligning bearings with grease seal and lubrication fittings. All components shall be thoroughly cleaned and given a coat of primer paint and baked enamel finished. Fan motors and drives shall be mounted out of the air stream. Motor bases shall be adjustable. All fanse shall be provided with 19mm drain pipe coupling welded to the lowest point of the fan housing.

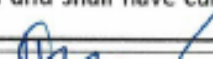
2.03 Refrigerant Piping

- 203.1 Refrigerant piping shall be type L and hard drawn seamless copper, suitable for a working pressure of 2413 kpa. Fittings shall be wrought copper or brass designed for use with high temperature solder and suitable for a working pressure of not less than 2413 kpa. Joints from soldered to threaded joints shall be made with standard adapter fittings using high temperature solder. Pipes or tubing shall be cut accurately to measurements established at the building lines. All piping shall be laid straight and no pipe shall be laid against other metal without insulation. After cutting, the tubing shall be reamed, all burrs removed and the internal surface thoroughly cleaned. While soldering pipes and fittings together, a continuous flow of inert nitrogen gas must be applied to sweep the internal surface of the tubing to avoid the formation of oxide inside.
- 203.2 Condensate drain piping shall be of PVC pipe and sized to liberally dispose of the condensate to the nearest floor drain. A P-trap with a clean out plug shall be provided at the outlet for each drain pan and shall be insulated with flexible Elastomeric Pipe insulation contact adhesive.
- 203.3 Pipe supports, and hangers shall be provided and fabricated in workmanship manner out of steel angles, rods and flat bars. Metal to metal contact between pipes and hangers must be avoided by providing 3 mm thick rubber in between. Supports on horizontal lines shall be spaced at not more than 1.80 meters on center. All piping must be properly anchored so that no stress is placed on equipment connection by expansion.
- 203.4 Pipe sleeves shall be of standard steel pipes with sufficient diameter to provide a minimum clearance of 6 mm around the pipe and in case of insulated pipe approximately 6 mm around the insulation. Pipe sleeves shall be installed whenever a permitted to pass thru bearing wall, beam bar columns unless permitted by the Architect.
- 203.5 Piping insulation shall be properly size applied on all refrigerant suction lines and condensate drain lines. Insulation material shall be flexible elastomeric pipe insulation contact adhesive. For pipes installed outdoors a weather resistant Aluminum metal cladding protective finish is to be applied.

2.04 Controls

- 204.1 Operation of the air conditioning system shall be fully automatic. They shall be capable of maintaining at full or partial loads inside conditions of 24.4 C. D. B. (plus or minus 1.11 C) and 50% relative humidity (plus or minus 5% RH). The controls shall be wired in such a way that whenever a condensing unit is in operation the fan coil unit is also in operation.
- 204.2 The compressor crankcase heater must be of such capacity to provide sufficient heat to the oil in the crankcase during in operative periods so that serious oil foaming and slugging shall be prevented. The heater must be automatically energized whenever compressor operation stops and de-energized when the compressor starts.

2.05 Valves, Dehydration and sight glasses

- 205.1 Refrigerant valves shall be installed in the suction and discharge line adjacent to the compressor or unless built-in valves are furnished and the liquid line on the discharge side of the condenser. The valves shall be wrought copper or brass for use with R-22 and suitable for working pressure of 2413 kpa.
- 205.2 Thermostatic expansion valves of the proper capacity shall be installed in the refrigerant supply line to the evaporator. They shall be of diaphragm type externally equalized and must be one of such optimum size as to maintain a full active evaporator under all load conditions and yet reduce the possibility of flooding the refrigerant to the compressors during light loads.
- 205.3 Solenoid valves shall be installed where required and shall be designed for the operating pressure of the system. Valves capacities shall be based on the pressure drop across them not exceeding 3 psi.
- 205.4 Dehydrators in combination with strainers shall be installed in the refrigerant line of the inlet side of the thermostatic expansion and solenoid valves. They shall have brass or copper bodies designed for a working pressure of 2413 kpa.
- 205.5 Sight glasses shall be a combination of liquid and moisture indicators and shall be installed in the refrigerant lines to indicate whether or not the systems are properly charged whether or not refrigerant in the system is dry.
- 207.2 Fire dampers shall be fabricated from heavy gage black iron sheets and equipped with fusible link set to melt at 73 °C.
- 207.3 In general, access doors at hand dampers shall be large enough and so placed that damper blade position may be observed. Access door at five dampers shall be large enough and replaced that damper blades may be repositioned with fusible link replaced.
- 209.1 Supply and exhaust grilles shall be deflection horizontal and vertical face bars. They shall be fabricated from gauge 20 B. I. Sheets bonerized after fabrication and finished with baked enamel paint. Exhaust and fresh air louver shall be fabricated or the same material as the grilles and shall have curved and hemmed edges to give appearance as well as rigidity and
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strength.

209.2 Supply air diffuser for business office area shall be 4-way ceiling diffusers.

210.1 Air conditioning ducts shall be insulated with 25mm thick fiberglass 2 pounds density with integral aluminum foil reinforced barrier on one side. Refer to mechanical plans for installation details.

2.13 Electric Motor

213.1 Motor shall be of sizes as specified or as schedule herein or on the drawings as required for driving compressor, fan and blower, all motor shall operate at speed and electrical characteristics specified on the drawings. They shall be guaranteed to operate at rated output with plus or minus ten (10) percent voltage variation at their terminals.

213.2 Motors above 560 watts shall be 3-phase squirrel cage induction type, constant speed. Motor 560 watts and below shall be single phase capacitor start induction run, or split type or shaded pole type as approved for the service.

213.3 Motor driving indoor equipment shall be open drip-proof construction. Motor driving outdoor equipment shall be of the totally enclosed fan-cooled construction. Motor driving equipment thru pulleys and belt shall be provided with belt guards. The belt guards shall be made of heavy wire mesh or expanded metal set in a suitable frames, covering the motor pulleys, belt and driving sheaves with access plates for tachometer.

2.14 Motor Controller

214.1 All motor starters shall be magnetic type complete with overload and relays manufactured in accordance with NEMA Standard. Starter installed outdoor shall have rain tight enclosures.

214.2 Starter for motor 5.60 kW and below shall be across the line type. Starters for motor above 5.60 kW shall be reduced voltage type.

214.3 Unless otherwise indicated in the drawings circuit breakers shall operate in the thermal magnetic principle. Aside from serving as disconnecting means they shall afford protection for motors against phasing circuit faults. They shall be provided with enclosure suitable for the application.

2.15 Wiring

All electric power and control wiring necessary to be provided by the contractor shall be accomplished in accordance with the requirement of the electrical plans and specifications and shall conform to National Electric Code.

Wiring system including materials shall also comply with the specifications under the electrical division of the project.

2.16 Testing and Balancing

216.1 Upon completion of installation and when the system is ready for operation capacity and general tests shall be conducted by a competent and experienced accredited balancing engineer to be furnished by the contractor. These test shall demonstrate the specified capacities of the equipment.

216.2 All instruments to be used shall be of the industrial grade recently calibrated and the proper type to suit the type of system being tested and balanced.

216.3 During this test the contractor shall demonstrate to the satisfaction of the owner, or his representative that all parts are installed correctly and operating properly. The contractor shall be responsible for the satisfactory operation of all temperature and humidity controls and safety controls.

216.5 Technical Publications:

- a. Maintenance and operational manual. Three (3) copies shall be furnished to the owner at completion. The manual shall be bound between hard covers and shall contain but not limited to installation and operating instructions. Maintenance procedures, illustration and drawings, detailed description, tests, adjustments and safety precautions.
- b. Part List - giving part numbers and prices for the equipment furnished shall be submitted to owner

2.17 Guarantee and Service

The air conditioning and ventilating systems and equipments and accessories furnished and installed under this part of the specifications shall be guaranteed to a period of one (1) year from date of acceptance thereof, and materials and equipment furnished shall be free from any defect in the materials, workmanship and design. At any time within one year after acceptance and upon proper notice the contractor shall rectify any and all deficiencies including replacement of part or the entire units without additional cost to the owners, if such deficiencies have been caused directly or indirectly by inferior materials, faulty workmanship and/or defective design or parts. Expendable items such as oil, refrigerant, belts, filters, etc., are included in this one year guarantee. During the guarantee period the contractor shall perform free monthly inspection and service and make adjustment if necessary for proper efficient operation of the system.

FIRE PROTECTION SPECIFICATIONS

FIRE PROTECTION SYSTEM

SECTION 1-FIRE PROTECTION

FPS 100 - GENERAL CONDITIONS

- A. The General Conditions form a part of these specifications and contract.
- B. The Sub-contractor for the Fire Protection Works is designated as the Contractor in this Division.

FPS 200 - SCOPE OF WORKS

- A. Furnishing of all materials, labor, tools, equipment and accessories for the complete installation, testing and adjustment, ready for use of the proposed automatic fire sprinkler system.

The work essentially shall include, but shall not necessarily be limited to the following items:

- a. Sprinkler system for the floors as shown on the plans.
 - b. Fire Department Connections, fire hose valves, roof manifolds and dry stand pipes system.
 - c. Materials and accessories:
 - 1. Automatic fire sprinkler system, risers, piping, hangers, supervisory flow switches, sway braces including installation of sprinkler system and accessories.
 - 2. Supply and installation of the wet standpipe system consisting of interior fire hose cabinet.
 - 3. Supply and installation of dry standpipe system consisting of Fire Department inlets, fire hose valves and testing hose valve headers.
 - 4. Miscellaneous metal works, hangers, braces, signs, supports & misc. materials.
 - 5. Supply and installation of alarm check valve assembly with retarding chambers, motor gong, bell complete with trims and accessories including connection to the building central fire alarm system.
 - d. Supply and installation of fire and jockey pumps with
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controllers and accessories to include foundation, vibration and accessories .

- e. Installation and supply of floor control valves and water flow switches including connection of electrical wiring up to the fire alarm box or fire alarm central control /or command station.
- f. All openings through which fire may spread from one floor to the other, such as holes through floors made for the passage of sprinkler pipes, plumbing pipes and electrical conduits shall be sealed with fire resistant materials.
- g. Supply of tools and stock of spare sprinkler heads.
- h. Furnishing and installation of instruction boards, charts, signs and markers.
- i. Priming and finish painting of all exposed piping and all equipment except for the sprinkler heads.
- j. Securing and payment of permits, licenses for construction purposes, including approval from the Fire Department having jurisdictions.
- k. Complete testing of all Fire Protection System in accordance with NPFA - 13.
- l. One year warranty of trouble free operation, tests and maintenance of the complete work.
- m. Water supply for fire protection use shall be separate from the domestic supply and shall have a minimum capacity of not less than 10,000 gallons.
- n. Submission of as-built drawings in reproducible sheets including two (2) white print copies at no cost to the owner(s).

FPS 300 : WORK NOT INCLUDED

- A. The following items of works will be supplied and done by others.
 - 1. All cutting and patching shall be by the General Contractor, except as specifically modified herein.
 - 2. All electric power wirings, except that furnished as an integral part of factory assembled equipment, except as otherwise specified herein.
 - 3. Supply and installation of fire doors.
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4. Fire alarm bells and fire station for the alarm system.
5. Construction of the reinforced concrete water and fire storage reservoir including elevated water tanks.

FPS 400 : APPLICABLE SPECIFICATIONS CODES, ORDINANCES, PERMITS AND FEES

- A. The work covered in this contract is to be installed according to the specifications, codes ordinances and requirements of the following:
 1. The Fire Code of the Philippines
 2. NFPA No. 13 - latest edition
NFPA No. 80 - latest edition -
NFPA No. 75 - latest edition
NFPA No. 18 - latest edition (National Fire Code)
 3. National Plumbing Code of the Philippines
 4. Fire Department ordinances of concerned city and municipality.
- B. All construction permit and fees required for the work shall be obtained by and the expense of the Contractor. The Contractor shall furnish the Architect, The Engineer and the Owner final certificates of inspection and approval from the proper government authorities after the completion of the work.
- C. The Contractor shall obtain all necessary allowances, pay royalties, etc. in connection with the use of any patented device or system and shall save the Owner harmless from any claim or lawsuit arising from such use.

FPS 500 : SHOP DRAWINGS, SAMPLES & OTHER SUBMITTALS

- A. The Contractor shall prepare and submit for approval the following :
 1. Dimensional layout of all pumping system, fire hose cabinet connections, etc.
 2. Manufacturer's catalog, sheets, marked as necessary to indicate materials or equipment being furnished for the following items.
 - a. Pumps
 - b. controls and pump controllers
 - c. Pressure relief and reducing valves
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- d. mechanical grooved coupling and flexible connectors.
 - e. fire department connections (inlet & outlet), hose valves, hose headers and hose cabinets.
 - f. sprinkler heads
 - g. riser supports and sleeves
3. List of miscellaneous materials proposed, including pipe, ftgs, valves, etc. and manhole accessories, identifying manufacturer and type.
 4. Filed test reports
 5. Such other similar information the Engineer may require.

FPS 600 : ACCEPTANCE TESTS

- A. Acceptance of work shall be conditioned on successful tests of the entire system.
- B. Test requirement laid out in the standards for the installation of sprinkler system NFPA-13 shall be performed prior to the approval of the work.
- C. Isolated leak tests or partial tests of areas may be performed prior to installation of ceiling materials in the area to preclude any damage there at during total system final tests.
- D. The Contractor shall furnish the owner a written statement to the effect the work covered by the Contract has been completed and tested, before requesting for final approval of the installation by the Fire Department Authority.

FPA 700 : WORKMANSHIP AND COORDINATION OF WORK WITH OTHERS

- A. The Contractor shall be held fully responsible for the work of any manufacturer or subcontractor supplying materials to or performing work for as it is intended that the entire Fire Protection System shall be ready in every respect for satisfactory and efficient operation when finally delivered to the Owners
- B. The Contractor shall assume full responsibility and shall provide the services of the of a qualified Engineer to supervise the complete installation of equipment and to conduct the final acceptance tests.
- C. The work throughout shall be executed in the most thorough and satisfactory manner in accordance with the best practices of the trade.

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- D. Outlet shall have chain connected caps or plugs.

FPS 1300: PORTABLE FIRE EXTINGUISHERS

Furnish and install as indicted: on the drawings portable fire extinguisher, 10lbs, dry chemical type capable for type ABC fire. Units shall be approved by the Fire Department having jurisdiction and UL listed. Mounting shall be inside fire hose cabinets and as shown on drawings.

FPS 1400: PIPINGS - GENERAL

- A. Where American Standards are specified, other approved national or local standards may be acceptable, provided copies of these standard Specifications are forwarded to the Engineer for his written approval.
- B. Black iron, schedule 40 pipes, ASTM A 53 for risers only (wet and dry)
- C. Black iron, schedule 40 pipes, ASTM A-120 for inside building installations (feed mains, cross mains and branch lines.
- D. All inside piping shall be installed by means of screwed or flanged fittings. Flanged joint shall be used at all sprinkler risers and provided with 1.6 mm thick long fiber asbestos, cross laminated gasket "cranite".
- E. Torch cutting shall not be permitted as means of modifying or repairing sprinkler system.
- F. All welding shall be "shop welding" only and shall be done by electric arc welding process.

FPS 1500: FITTINGS GENERAL

- A. Sprinkler system fitting shall be extra heavy pattern. Whenever a change in pipe size is made, one piece of reducing fitting shall be used. Provide mechanical grooved couplings at each main feed line of every floor just after the riser and along the ceiling line.
- B. All fittings shall be of malleable iron fittings.
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- C. Steel pipe flanges matting with steel equipment flanges shall have the same facing as mating flange.
 - D. Screwed union shall not be used on pipes larger than 50 mm (2"). Couplings and unions of pipes other than screwed type shall be of types approved specifically for sprinkler used.

FPS 1600: VALVES-GENERAL

- A. All valves shall be of the same manufacture for each class of piping and as much as possible, for the entire project. Valves shall permanently bear affixed stamp or tag indicating manufacturer, catalog number, pressure and temperature ratings of gate valve, angel valves, check valves, pressure relief with all cast iron body with bronzē trim.
 - B. Furnish all valves and accessories material necessary for piping not shown on drawings as follows:
 - 1. Vents and drains for equipment to which piping connections are made.
 - 2. Connections to metering instruments and controls including pressure gauges, thermometer, controllers, traps and appurtenances requires for proper functioning on instrument in controls.
 - 3. Temporary valves and accessories required for placing equipment into initial service.
 - 4. Piping 50 mm (2") and smaller required for proper operation of piping system and equipment, including drain valves required to drain all low points in piping.
 - C. Valve seats shall be renewable except for forged steel and high pressure cast steel valves where manufacturer's standard is integral seats.
 - D. All valves shall be approved by Factory Manual and Underwriters Laboratories, Inc. (UL listed).
 - E. Where required and not noted, provided chain-wheel operators, extending chain for chain operated valves to which 1.2 meters of nearest floor or operating platform of valves.
 - F. Provide floor stand with flanged faces for bolting to floor or platforms and other special devices where specified or noted on drawings.
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- G. Provide extension stem, universal joints stem guide bearings and other accessories required to locate floor stands in convenient location with interference with other equipment, piping or building parts.
 - H. Floor control valves within the building shall be approved indicating wedge gate with electrical contact and which will open when valve is partially or totally put in close position.

FPS 1700: SWAY BRACES, HANGER AND SUPPORTS

- A. Sway Bracing: Steel flat bars, structural grade 7 mm minimum thickness, with corrosion protection; shape/type as shown on plans.
- B. Pipe Hangers: Steel flat bars, structural grade 7 mm minimum thickness, with corrosion protection, shape as shown on plans and 13 mm dia. bars with corrosion protection as shown on plans.

C. Sway Bracings Installation

1. Adequate sway bracing shall be provided to oppose longitudinal or transverse pipe movements.
2. Lateral bracing shall withstand a force equal to 50% of the weight of the water contained in piping, valves and fittings.
3. When pipes 100 mm dia. and larger are supported in the vertical position, the supports shall be at a minimum spacing of 3.0 meters (10') on center. Holes in concrete for expansion shield shall be made of the proper size and depth, as specified for the type of shield used, to provide a uniform contact with the shield over its entire length and circumference.
4. Maximum distance between hangers shall be 3.65 meters (12') for size mm (1'). Provide at least one hanger for each length of branch line, one between each two cross main branches, one hanger for each 4.75 meters (15') length of feed mains. the distance between the hanger and the center line of upright sprinkler shall be not less than 76 mm(3").

E. Support on Risers

Risers shall be adequately supported either by attachments directly to the riser or by hangers located on the horizontal connections close to the risers. Supports shall be provided at the ground level and at each third level and at the top most level of the riser.

A. MATERIALS:

1. Through fottings - cast iron
2. Below Grade - cast iron or standard weight iron pipe.
3. Above Grade - steel pipe.

B. INSTALLATION

1. Minimum clearance between the pipe and sleeve shall not be less than 25 mm (1") for pipes. 25 mm (1") to 89 mm (3-1/2") and 50 mm (2") clearance for pipes 100 mm (4") and larger. The clearance between pipes and sleeves shall be filled with non-combustible flexible materials such as asbestos rope and furnished with semi- hardening mastic flush.
2. Floor sleeves shall extend at least 76mm (3") above the top of the wearing surface.
3. Drains, fire department connections, test manifolds and other auxiliary pipings connected to risers shall not be cemented into walls or floors.

FPS 1900: PIPE PAINTING

- A. Sprinkler heads, valve stems and the like shall not be painted.
- B. After installation and test and before the installation of ceiling fixtures or boards, all pipings shall be prime painted and coated with two coats of gloss re quick drying enamel.

FPS 2000: ALARM CHECK VALVES

- A. The alarm assemblies shall be so constructed and installed, that any flow of water from the sprinkler system equal to or greater than from a single automatic sprinkler head, will result in an audible and visual alarm bells whether water or electrically actuated shall be capable of being actuated both automatically and annually.
- B. The water actuated alarm check valve assembly shall be complete with all the necessary attachments required to give an alarm and ease in maintenance.

The gong shall be installed as indicated in the plans. The alarm check valve shall consist of but not limited to the following:

1. Retard chamber
 2. Water motor
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3. Weatherproof gong, 300 mm dia.
 4. Strainer
 5. Pressure gages
 6. Drain and attachments
 7. Electrically supervised control valves
 8. Pressure switches

FPS 2100 : FLOOR CONTROL VALVES & WATER FLOW SWITCHES OR DETECTORS.

- A. Flow alarm valves with sizes indicated on the plans shall be provided with two (2) N.O. electrical contacts that will close instantaneously with steady flow of water in the pipe and shall be complete with tamperproof terminal chamber with minimum of 1/2" Ø conduit knock-out. False alarm shall be prevented by an adjustable pneumatic device to retard the flow switch operation due to water surges. The switch shall be actuated only by an unidirectional flow of water. Conduits connections, conduit box, riser, etc. shall be under Electrical Contractor scope of works.
- B. The alarm apparatus shall be substantially supported, located and installed so that all parts shall be readily accessible for inspection, removal and repair.
- C. An actual water flow, through the use of the test connection, shall be employed to tests the operation of the sprinkler alarm units in each floor or as a whole.

FPS 2200 SPRINKLER FIRE ALARM AND SUPERVISORY SYSTEM

The supervisory and sprinkler fire alarm system shall be integrated with the building Fire Alarm System at the control room (security office) at the ground floor. The Sprinkler Fire Alarm System annunciator shall indicate the supervisory switches of the system.

FPS 2300 MARKERS, INSTRUCTION & IDENTIFICATION SIGNBOARD

These signboards shall be made of gauge No. 14 black iron sheet with baked enamel finish and letter of instruction as shown in the plans. Additional signboards shall be mounted on the unobstructed for easy identification reading. Paints shall be basically gloss fire red and white.

FPS 2400 : PUMPS

A. GENERAL :

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1. Manufacturer's installation drawings shall be submitted together with the proposal. After installation is completed as "as-installed" drawings showing all the field revisions and exact locations/dimensions on reproducible form plus two (2) white print copies shall be submitted to the Owners at the Contractor's Expense.
 2. Pump performances curves shall be submitted together with the proposal. The Pump efficiencies at the various work loads shall be indicated thereon and properly marked.
 3. Test run shall be performed by the supplier after the installation is completed, to demonstrate conformity to the manufacturer's specifications. A successful test shall be a condition to the Owner's acceptance of the installed equipment and to final payment.
 4. A direct statement on the availability of spare parts and maintenance service from pump supplier, for a period of at least three (3) years reckoned from the date of acceptance test shall be submitted.

B. FIRE PUMPS

1. There shall be One (1) unit of Fire Pump for the system. The pumps, electric motor drive, all control and necessary attachments specified herein shall be UL listed. and Fm Approved and shall be furnished under this contract. The pump shall be capable of delivering not less than 150 percent of rated capacity at not less than 65 percent of total head. The shut-off head shall not exceed 120 percent of the rated heads. The fire pump shall be Vertical In Line. Vertically mounted electric motor drive. . Fire Pump to be supplied with accessories to include controllers, circuit breakers, starters and contactors. Fire pump volumetric capacity shall be 750 GPM vs 250 PSIG , approx. 150 HP.

Pump unit major Accessories :

- a. Circulating relief valve
 - b. Hose valve manifold 105Ø, hose valve
 - c. Flow Measuring Device
 - d. Relief valve and discharge cone
 - e. Suction Strainer
 - f. Primary Connection
 - g. Capacity plate
 - h. Automatic Air released valve fittings
 - I. Water level testing device and piping
 - j. Pressure gauge, 80mm Ø
 - k. Pressure switches
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2. Electric Motor Drive :

- HP - 150 HP or as per manufacturer's recommendations
- Voltage - 380 V
- Phase - 3
- Frequency - 60 hz
- Temperature rise - 40 degree C
- Service Factor - 1.15 min.

3. Motor Controller :

a. Type - Combination circuit breaker and starter; UL listed and FM approved:

1. Circuit Breaker - magnetic trip, 3 phase, 230 V (min.) 300 times motor FLA continuous rating. Interrupting rating not less than 40,000 rms. amps. symmetrical at 230 VAC with external operating handle.
2. Starter - magnetic, wye delta reduced voltage type, close transition with 3-0.L relays and necessary auxiliary contacts.
3. Enclosure - watertight type, NEMA 4 floor mounted.

4. Flow Measuring Device

Fire pump shall be acquired also with "Flow Measuring Device" consisting of flow meter and flow indicator.

Flow pump flowmeter shall be orifice type 1/8" thk 304 Stainless steel " Meriam: series 951B30 or approved equal; flange meriam Series 952 or approved equal; Flowmeter Manometer " Meriam" Model 30EB25 for wall mounting, with single indicating tube, rated 250 PSIG. maximum operating pressure, scale for direct GPM reading and complete with mercury fluid, return well, valve and piping manifold; Flowmeter bellows or D/P Dial Option differential pressure indicator, beryllium copper with forged brass housing, 500PSIG. maximum pressure rating, GPM scale reading and complete with pulsation dampener, valve and manifold.

5. Installation Drawings:

Manufacturer's installation drawings shall be submitted as part of Shop drawings, section 500 of the Specifications.

6. Performance Curves:

Performance curves shall be submitted together with the requirements of section 500. The pump efficiencies at various work loads shall be indicated thereon and properly marked.

7. Installation :

The Contractor shall assume unit responsibility and shall provide the services of a qualified Engineer to supervise the complete installation of equipment who shall be available conducting the final acceptance test as stated under Section 600 of the Specifications.

C. Jockey Pump

1. There shall be One (1) unit of Jockey Pump for the system. Pump rating shall be 25 GPM vs 250 PSIG . Vertical in line, complete with pump bowl assembly and riser pipes drive with controllers and accessories to be installed inside Fire Storage Tank and shall be setting for a maximum of 10 ft. depth. Jockey pump to be supplied with accessories to include controllers, circuit breakers, starters and contactors. The drive shall be Vertical mounted electric motor, 1800 rpm complete with controls and accessories, 380 Volts, 3-phase 60Hz, approx. 10 HP.

2. Jockey Pump Control Panels : furnish ready for wiring jockey pump, General Electric CRI 35 type "F" with "H-O-A" switch and timer run relay, with three overload relays, Clark Controller, Cutter Hammer, Inc. " Firetrol of as approved.

D. PUMP SEQUENCE OF OPERATION

Adjust pressure switches to control the fire pump operation in the following sequence :

Pump	Pump on	Pump off
a. 25 gpm Jockey Pump	250 PSIG	160 PSIG
b. 750 gpm Fire Pump	250 PSIG	Manual

E. SYSTEM REQUIREMENTS :

(Minimum Requirement)

F. SPARE PARTS:

Furnish spare parts and maintenance service part lists for a period of at least one (1) year reckoned from the date after termination of warranty as indicated in Section 2700 of this Specifications.

MOTORS :

1. General Requirements:

- a. Motor type required for project: Refer to other parts of specifications.
 - b. Motor shall be furnished with driven equipment to assure proper coordination of motor and control characteristics with requirements of driven equipment. Contractor is responsible for proper correlation of horsepower, starting torque, other characteristics of electrical equipment, with requirements of driven equipment.
 - c. Horsepower nameplate rating shall be at least as great as the brake horsepower required to drive the equipment under the maximum specified conditions without consideration of service factor.
 - d. Conform to NEMA Standard No. MG1 entitled "Motor and Generator", except where specifically noted otherwise.
 - e. Conform to ANSI Standard No. C50, 2-1955 " Alternating - Current Induction Motors, Induction Machine is in General and Universal Motors.
 - f. Torque and speed characteristics, suited to requirements of driven equipment, including gear reducers if specified.
 - g. Maximum speed : 1750 rpm unless specified otherwise.
 - h. Horsepower :
 - 1). Motor HP rating specified shall be nameplate rating without consideration of motor service factor.
 - 2). Nameplate HP not less than HP required by driven equipment operated at maximum conditions specified.
 - i. Duty : continuous
 - j. Service factor: as specified herein, unless specifically stipulated otherwise in detailed equipment specifications.
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- k. Bearings: ball, unless otherwise specified; provide for in-service lubrication of enclosed motors, unless specifically noted otherwise.
 - l. Base :
 - 1). Provide cast iron or steel motor base with provision for motor alignment on direct coupled drives.
 - 2) Provide sliding or hinge motor base with screw type, automatic gravity type, or other manufacturer's standard means of adjustment for belt or chain drives.
 - m. Accessories: lifting lugs as required.
 - n. Motor specified as 460-volts, three phase or 230-volts single-phase, may be designed for single or dual voltage in accordance with manufacturer's standard for horsepower and speed required.
 - o. Frequency: 60 Hz.
2. Enclosure and Insulation :
- a. Suitable for 40 degree C ambient duty, with standard service factor, unless otherwise specified.
 - b. Drip-proof encapsulated : encapsulated moisture sealed insulation system, with weather resistant conduit box; bearing shielded against entrance of moisture and dirt; and anti corrosion treatment of exposed metal parts, 40 degree C ambient, continuous duty, with 1.15 (min.) service factor.
 - c. Totally enclosed non-ventilated or fan-cooled; 40 degree C ambient, continuous duty, with 1.15 (min.) service factor.
 - d. If other types of insulation are proposed, operating temperature must be guaranteed satisfactory for proposed installation.
3. Types:
- Single-phase induction; method of starting suited to driven load requirement; constant or multi-speed, and method of starting as specified.

FPS 2500 : ACCEPTANCE TESTS

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- A. The Contractor shall conduct test in the presence of inspector or authority having jurisdiction (The Philippine Fire Protection Association of Fire Protection Associates).
 - B. To remove foreign materials which may have entered the piping during installation of same, flushing or underground connection is required before sprinkler piping is connected.
 - C. Hydrostatic Tests :
 - 1. Test pressure not less than 200 psi for two hours.
 - 2. No visible leakage for inside sprinkler piping will be allowed. For underground mains and lead-ins, exceeding the permissible leakage or joints necessary repair shall be made.
 - 3. All control valve water pressure to insure proper operating tests. Use clean, non-corrosive water.
 - 4. Fire connection shall be tested.
 - D. Testing of drainage facilities shall be made by opening the main drain valve while the control valve is wide open.
 - E. Test certificate shall be filled out and signed by the Owner's and Contractor's representative.
 - F. System operations and maintenance chart shall be submitted to the Owner's upon completion of the Contract. This shall include, among others, the locations of the control valves and care of the new equipment.

FPS 2600 MINOR MODIFICATIONS AND TIME COMPLETION

- A. The plans as drawn should conditions as accurately as it is possible to indicate them in scale. The Plans are diagrammatical and do not necessarily show all fittings, etc. necessary to fit the building conditions. The location of valves, fittings and the fixture shown on the plans are approximately. The contractor shall be responsible for the proper location in order to make them fit with architectural details and instructions.
 - B. The Contractor shall complete the work herein described in accordance with the specific schedules set by the Owners in accordance with General Contractor's Schedule of Work.
-

FPS 2700: GUARANTEE

The Contractor shall guarantee that the installed sprinkler system complies with the requirements of the authorities and free from all defective workmanship and materials and will remain so, for a period of one (1) year from the date to final inspection and acceptance of the work. Any defect appearing within one year shall be corrected by the Contractor at no additional cost to the Owner.

FPS 2800: CONTRACTOR'S RESPONSIBILITY

- A. The Contractor shall provide temporary fire protection system during the construction period. This shall be of sufficient capacity to put any fire that may break out at any floors due to construction operations. This is in addition to temporary fire extinguisher required.
- b. The Contractor shall identify and save the Owner, the Architect and the Consulting Engineer harmless from and against all liabilities for damage to property occasioned by any or omission of this Contractor on any of this Sub-contractors, including any and all expenses, legal or otherwise which may be insured by the Owner, the Architect or the Consulting Engineer, in the defense of any claims, action or suits.

13.03 PRESSURE TEST FOR WATER LINES:

- a. After the pipe have been installed, the joints completed and with joints exposed for examination, all newly installed pipe or any valve section therefore, shall be subjected to hydrostatic pressure 1 1/2 the designed working pressure of the system or as specified by the Architect.
- b. The duration of each pressure test shall be at least 10 minutes unless otherwise specified by the Architect.
- c. Each section of pipeline shall be slowly filled with water and the specified test pressure, measured at the point of lowest elevation, shall be applied by means of a pump lowest elevation, shall applied by means of a pump connected to the pipe in a manner satisfactory to the Architect. During the filling of the pipe and before applying the test pressure, all air shall be expelled from the pipeline. To accomplish this type shall be made, if necessary, at point of highest elevation, and after completion of the test the taps shall be tightly plugged unless otherwise specified. During the test, all exposed pipes, fittings, valves, joints and couplings will be carefully examined. If found to be cracked or defective, they shall be removed and replaced by the Contractor with sound materials at his expenses. The test shall then be repeated until satisfactory results are obtained.

13.04 DEFECTIVE WORK

- a. If the inspection or test shows any defect, such defective work or material shall be replaced and the test shall be repeated unless until satisfactory to the Architect.
- b. All repairs to piping shall be made with new materials at the expense of the contractor.
- c. No caulking of screwed joints of holes will be accepted

13.05 DISINFECTION OF WATER DISTRIBUTION SYSTEM & WATER TANKS (as per AWWA C-601)

- a. The entire water system shall be thoroughly flushed and disinfected with chlorine before it is place on operation. Water tanks shall be washed and swabbed.
- b. Chlorination materials shall be liquid chlorine or hypochlorite, as specified and shall be introduced into water lines in a manner approved by the Engineer. Tank shall be thoroughly cleaned of all debris, dirt or dust before swabbing.

ELECTRONICS SPECIFICATIONS

GROUNDING AND BONDING

Part 1 – GENERAL

1.1 DESCRIPTION

- A. Provide grounding system in accordance with the Contract Documents

1.2 QUALITY ASSURANCE

- A. Utility company approval of service installation

1.3 STANDARDS

- A. American National Standards Institute (ANSI):

ANSI/IEEE 81 – Guide for Measuring Earth Resistivity, Ground Impedance and Earth Surface Potentials of a Ground System Part 1: Nominal Measurements

- B. National Fire Protection Association (NFPA)

- C. Philippine Electrical Code (PEC): PEC (PART 1 and 2: 2019)

- D. Underwriter 's Laboratories, Inc. (UL):

UL 44 – Thermoset Insulated Wires and Cables

UL 83 – Thermoplastic Insulated Wires and Cables

UL 467 – Grounding and Bonding Equipment

- E. Utility Company Requirements

1.4 SUBMITTALS

- A. Shop Drawings:

1. Showing the location of system grounding electrode connections and the routing of grounding electrode conductor.

A. MATERIALS:

1. Through fottings - cast iron
2. Below Grade - cast iron or standard weight iron pipe.
3. Above Grade - steel pipe.

B. INSTALLATION

1. Minimum clearance between the pipe and sleeve shall not be less than 25 mm (1") for pipes. 25 mm (1") to 89 mm (3-1/2") and 50 mm (2") clearance for pipes 100 mm (4") and larger. The clearance between pipes and sleeves shall be filled with non-combustible flexible materials such as asbestos rope and furnished with semi- hardening mastic flush.
2. Floor sleeves shall extend at least 76mm (3") above the top of the wearing surface.
3. Drains, fire department connections, test manifolds and other auxiliary pipings connected to risers shall not be cemented into walls or floors.

FPS 1900: PIPE PAINTING

- A. Sprinkler heads, valve stems and the like shall not be painted.
- B. After installation and test and before the installation of ceiling fixtures or boards, all pipings shall be prime painted and coated with two coats of gloss re quick drying enamel.

FPS 2000: ALARM CHECK VALVES

- A. The alarm assemblies shall be so constructed and installed, that any flow of water from the sprinkler system equal to or greater than from a single automatic sprinkler head, will result in an audible and visual alarm bells whether water or electrically actuated shall be capable of being actuated both automatically and annually.
- B. The water actuated alarm check valve assembly shall be complete with all the necessary attachments required to give an alarm and ease in maintenance.

The gong shall be installed as indicated in the plans. The alarm check valve shall consist of but not limited to the following:

1. Retard chamber
 2. Water motor
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3. Weatherproof gong, 300 mm dia.
 4. Strainer
 5. Pressure gages
 6. Drain and attachments
 7. Electrically supervised control valves
 8. Pressure switches

FPS 2100 : FLOOR CONTROL VALVES & WATER FLOW SWITCHES OR DETECTORS.

- A. Flow alarm valves with sizes indicated on the plans shall be provided with two (2) N.O. electrical contacts that will close instantaneously with steady flow of water in the pipe and shall be complete with tamperproof terminal chamber with minimum of 1/2" Ø conduit knock-out. False alarm shall be prevented by an adjustable pneumatic device to retard the flow switch operation due to water surges. The switch shall be actuated only by an unidirectional flow of water. Conduits connections, conduit box, riser, etc. shall be under Electrical Contractor scope of works.
- B. The alarm apparatus shall be substantially supported, located and installed so that all parts shall be readily accessible for inspection, removal and repair.
- C. An actual water flow, through the use of the test connection, shall be employed to tests the operation of the sprinkler alarm units in each floor or as a whole.

FPS 2200 SPRINKLER FIRE ALARM AND SUPERVISORY SYSTEM

The supervisory and sprinkler fire alarm system shall be integrated with the building Fire Alarm System at the control room (security office) at the ground floor. The Sprinkler Fire Alarm System annunciator shall indicate the supervisory switches of the system.

FPS 2300 MARKERS, INSTRUCTION & IDENTIFICATION SIGNBOARD

These signboards shall be made of gauge No. 14 black iron sheet with baked enamel finish and letter of instruction as shown in the plans. Additional signboards shall be mounted on the unobstructed for easy identification reading. Paints shall be basically gloss fire red and white.

FPS 2400 : PUMPS

- A. GENERAL :
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1. Manufacturer's installation drawings shall be submitted together with the proposal. After installation is completed as "as-installed" drawings showing all the field revisions and exact locations/dimensions on reproducible form plus two (2) white print copies shall be submitted to the Owners at the Contractor's Expense.
 2. Pump performances curves shall be submitted together with the proposal. The Pump efficiencies at the various work loads shall be indicated thereon and properly marked.
 3. Test run shall be performed by the supplier after the installation is completed, to demonstrate conformity to the manufacturer's specifications. A successful test shall be a condition to the Owner's acceptance of the installed equipment and to final payment.
 4. A direct statement on the availability of spare parts and maintenance service from pump supplier, for a period of at least three (3) years reckoned from the date of acceptance test shall be submitted.

B. FIRE PUMPS

1. There shall be One (1) unit of Fire Pump for the system. The pumps, electric motor drive, all control and necessary attachments specified herein shall be UL listed. and Fm Approved and shall be furnished under this contract. The pump shall be capable of delivering not less than 150 percent of rated capacity at not less than 65 percent of total head. The shut-off head shall not exceed 120 percent of the rated heads. The fire pump shall be Vertical In Line. Vertically mounted electric motor drive. . Fire Pump to be supplied with accessories to include controllers, circuit breakers, starters and contactors. Fire pump volumetric capacity shall be 750 GPM vs 250 PSIG , approx. 150 HP.

Pump unit major Accessories :

- a. Circulating relief valve
 - b. Hose valve manifold 105Ø, hose valve
 - c. Flow Measuring Device
 - d. Relief valve and discharge cone
 - e. Suction Strainer
 - f. Primary Connection
 - g. Capacity plate
 - h. Automatic Air released valve fittings
 - I. Water level testing device and piping
 - j. Pressure gauge, 80mm Ø
 - k. Pressure switches
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2. Electric Motor Drive :

- HP - 150 HP or as per manufacturer's recommendations
- Voltage - 380 V
- Phase - 3
- Frequency - 60 hz
- Temperature rise - 40 degree C
- Service Factor - 1.15 min.

3. Motor Controller :

- a. Type - Combination circuit breaker and starter; UL listed and FM approved:

1. Circuit Breaker - magnetic trip, 3 phase, 230 V (min.) 300 times motor FLA continuous rating. Interrupting rating not less than 40,000 rms. amps. symmetrical at 230 VAC with external operating handle.
2. Starter - magnetic, wye delta reduced voltage type, close transition with 3-0.L relays and necessary auxiliary contacts.
3. Enclosure - watertight type, NEMA 4 floor mounted.

4. Flow Measuring Device

Fire pump shall be acquired also with "Flow Measuring Device" consisting of flow meter and flow indicator.

Flow pump flowmeter shall be orifice type 1/8" thk 304 Stainless steel " Meriam: series 951B30 or approved equal; flange meriam Series 952 or approved equal; Flowmeter Manometer " Meriam" Model 30EB25 for wall mounting, with single indicating tube, rated 250 PSIG. maximum operating pressure, scale for direct GPM reading and complete with mercury fluid, return well, valve and piping manifold; Flowmeter bellows or D/P Dial Option differential pressure indicator, beryllium copper with forged brass housing, 500PSIG. maximum pressure rating, GPM scale reading and complete with pulsation dampener, valve and manifold.

5. Installation Drawings:

Manufacturer's installation drawings shall be submitted as part of Shop drawings, section 500 of the Specifications.

6. Performance Curves:

Performance curves shall be submitted together with the requirements of section 500. The pump efficiencies at various work loads shall be indicated thereon and properly marked.

7. Installation :

The Contractor shall assume unit responsibility and shall provide the services of a qualified Engineer to supervise the complete installation of equipment who shall be available conducting the final acceptance test as stated under Section 600 of the Specifications.

C. Jockey Pump

1. There shall be One (1) unit of Jockey Pump for the system. Pump rating shall be 25 GPM vs 250 PSIG . Vertical in line, complete with pump bowl assembly and riser pipes drive with controllers and accessories to be installed inside Fire Storage Tank and shall be setting for a maximum of 10 ft. depth. Jockey pump to be supplied with accessories to include controllers, circuit breakers, starters and contactors. The drive shall be Vertical mounted electric motor, 1800 rpm complete with controls and accessories, 380 Volts, 3-phase 60Hz, approx. 10 HP.
2. Jockey Pump Control Panels : furnish ready for wiring jockey pump, General Electric CRI 35 type "F" with "H-O-A" switch and timer run relay, with three overload relays, Clark Controller, Cutter Hammer, Inc. " Firetrol of as approved.

D. PUMP SEQUENCE OF OPERATION

Adjust pressure switches to control the fire pump operation in the following sequence :

Pump	Pump on	Pump off
a. 25 gpm Jockey Pump	250 PSIG	160 PSIG
b. 750 gpm Fire Pump	250 PSIG	Manual

E. SYSTEM REQUIREMENTS :

(Minimum Requirement)

F. SPARE PARTS:

Furnish spare parts and maintenance service part lists for a period of at least one (1) year reckoned from the date after termination of warranty as indicated in Section 2700 of this Specifications.

MOTORS :

1. General Requirements:

- a. Motor type required for project: Refer to other parts of specifications.
 - b. Motor shall be furnished with driven equipment to assure proper coordination of motor and control characteristics with requirements of driven equipment. Contractor is responsible for proper correlation of horsepower, starting torque, other characteristics of electrical equipment, with requirements of driven equipment.
 - c. Horsepower nameplate rating shall be at least as great as the brake horsepower required to drive the equipment under the maximum specified conditions without consideration of service factor.
 - d. Conform to NEMA Standard No. MG1 entitled "Motor and Generator", except where specifically noted otherwise.
 - e. Conform to ANSI Standard No. C50, 2-1955 " Alternating - Current Induction Motors, Induction Machine is in General and Universal Motors.
 - f. Torque and speed characteristics, suited to requirements of driven equipment, including gear reducers if specified.
 - g. Maximum speed : 1750 rpm unless specified otherwise.
 - h. Horsepower :
 - 1). Motor HP rating specified shall be nameplate rating without consideration of motor service factor.
 - 2). Nameplate HP not less than HP required by driven equipment operated at maximum conditions specified.
 - i. Duty : continuous
 - j. Service factor: as specified herein, unless specifically stipulated otherwise in detailed equipment specifications.
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- k. Bearings: ball, unless otherwise specified; provide for in-service lubrication of enclosed motors, unless specifically noted otherwise.
 - l. Base :
 - 1). Provide cast iron or steel motor base with provision for motor alignment on direct coupled drives.
 - 2) Provide sliding or hinge motor base with screw type, automatic gravity type, or other manufacturer's standard means of adjustment for belt or chain drives.
 - m. Accessories: lifting lugs as required.
 - n. Motor specified as 460-volts, three phase or 230-volts single-phase, may be designed for single or dual voltage in accordance with manufacturer's standard for horsepower and speed required.
 - o. Frequency: 60 Hz.
2. Enclosure and Insulation :
- a. Suitable for 40 degree C ambient duty, with standard service factor, unless otherwise specified.
 - b. Drip-proof encapsulated : encapsulated moisture sealed insulation system, with weather resistant conduit box; bearing shielded against entrance of moisture and dirt; and anti corrosion treatment of exposed metal parts, 40 degree C ambient, continuous duty, with 1.15 (min.) service factor.
 - c. Totally enclosed non-ventilated or fan-cooled; 40 degree C ambient, continuous duty, with 1.15 (min.) service factor.
 - d. If other types of insulation are proposed, operating temperature must be guaranteed satisfactory for proposed installation.
3. Types:
- Single-phase induction; method of starting suited to driven load requirement; constant or multi-speed, and method of starting as specified.

FPS 2500 : ACCEPTANCE TESTS

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- A. The Contractor shall conduct test in the presence of inspector or authority having jurisdiction (The Philippine Fire Protection Association of Fire Protection Associates).
 - B. To remove foreign materials which may have entered the piping during installation of same, flushing or underground connection is required before sprinkler piping is connected.
 - C. Hydrostatic Tests :
 - 1. Test pressure not less than 200 psi for two hours.
 - 2. No visible leakage for inside sprinkler piping will be allowed. For underground mains and lead-ins, exceeding the permissible leakage or joints necessary repair shall be made.
 - 3. All control valve water pressure to insure proper operating tests. Use clean, non-corrosive water.
 - 4. Fire connection shall be tested.
 - D. Testing of drainage facilities shall be made by opening the main drain valve while the control valve is wide open.
 - E. Test certificate shall be filled out and signed by the Owner's and Contractor's representative.
 - F. System operations and maintenance chart shall be submitted to the Owner's upon completion of the Contract. This shall include, among others, the locations of the control valves and care of the new equipment.

FPS 2600 MINOR MODIFICATIONS AND TIME COMPLETION

- A. The plans as drawn should conditions as accurately as it is possible to indicate them in scale. The Plans are diagrammatical and do not necessarily show all fittings, etc. necessary to fit the building conditions. The location of valves, fittings and the fixture shown on the plans are approximately. The contractor shall be responsible for the proper location in order to make them fit with architectural details and instructions.
 - B. The Contractor shall complete the work herein described in accordance with the specific schedules set by the Owners in accordance with General Contractor's Schedule of Work.
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FPS 2700: GUARANTEE

The Contractor shall guarantee that the installed sprinkler system complies with the requirements of the authorities and free from all defective workmanship and materials and will remain so, for a period of one (1) year from the date to final inspection and acceptance of the work. Any defect appearing within one year shall be corrected by the Contractor at no additional cost to the Owner.

FPS 2800: CONTRACTOR'S RESPONSIBILITY

- A. The Contractor shall provide temporary fire protection system during the construction period. This shall be of sufficient capacity to put any fire that may break out at any floors due to construction operations. This is in addition to temporary fire extinguisher required.
- b. The Contractor shall identify and save the Owner, the Architect and the Consulting Engineer harmless from and against all liabilities for damage to property occasioned by any or omission of this Contractor on any of this Sub-contractors, including any and all expenses, legal or otherwise which may be insured by the Owner, the Architect or the Consulting Engineer, in the defense of any claims, action or suits.

13.03 PRESSURE TEST FOR WATER LINES:

- a. After the pipe have been installed, the joints completed and with joints exposed for examination, all newly installed pipe or any valve section therefore, shall be subjected to hydrostatic pressure 1 1/2 the designed working pressure of the system or as specified by the Architect.
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- a. The entire water system shall be thoroughly flushed and disinfected with chlorine before it is place on operation. Water tanks shall be washed and swabbed.
- b. Chlorination materials shall be liquid chlorine or hypochlorite, as specified and shall be introduced into water lines in a manner approved by the Engineer. Tank shall be thoroughly cleaned of all debris, dirt or dust before swabbing.

ELECTRONICS SPECIFICATIONS

GROUNDING AND BONDING

Part 1 – GENERAL

1.1 DESCRIPTION

- A. Provide grounding system in accordance with the Contract Documents

1.2 QUALITY ASSURANCE

- A. Utility company approval of service installation

1.3 STANDARDS

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ANSI/IEEE 81 – Guide for Measuring Earth Resistivity, Ground Impedance and Earth Surface Potentials of a Ground System Part 1: Nominal Measurements

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- A. Shop Drawings:

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