

**SECTION 21 00 00
FIRE SUPPRESSION**

PART 1 GENERAL

1.1 SCOPE

- A. The work under this section of the specifications consists of furnishing all materials, equipment, labor, testing, appurtenances, engineering and performing all operations in conjunction with all fire protection work indicated on drawings and specified herein.
- B. This is a performance based specification with the Sprinkler Contractor providing professional design services of an Engineer.
 - 1. The intent of the information in this Section is solely to set forth the minimum engineering, material and installation requirements used as basic prerequisites applied to the work in this Section.

1.2 RELATED DOCUMENTS

- A. The other Contract Documents complement the requirements of this Section. The General Requirements apply to the work of this Section.

1.3 REFERENCES, CODES AND REGULATIONS

- A. Sprinkler system design, equipment, materials, devices, and installation shall conform to NFPA Codes and Requirements of Governmental Bodies and Bureaus as listed below.
 - 1. ANSI B16.3 – Malleable Iron Threaded Fittings: Classes 150 and 300
 - 2. ANSI B16.4 – Gray Iron Threaded Fittings Classes 125 and 250
 - 3. ANSI B16.9 – Factory-Made Wrought Butt Welding Fittings
 - 4. ASTM A53/A53M _ Standard Specification for Pipe, Steel, Black and Hot Dipped, Zinc Coated Welded and Seamless
 - 5. ASTM A135/A135M – Standard Specification for Electrical Resistance Welded Steel Pipe
 - 6. ASTM A395/A395M – Standard Specification for Ferritic Ductile Iron Pressure Retaining Casting for Use at Elevated Temperatures
 - 7. ASTM A449 – Standard Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use
 - 8. ASTM A536 – Standard Specification for Ductile Iron Castings
 - 9. ASTM A795/A795M _ Standard Specification for Black and Hot Dipped Zinc Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use
 - 10. NFPA 13 – Standard for Installation of Sprinkler Systems
 - 11. NFPA 14 – Standard for the Installation of Standpipes and Hose Systems
 - 12. NFPA 20 – Standard for the Installation of Stationary Pumps for Fire Protection
 - 13. NFPA 24 – Standard for the Installation of Private Fire Service Mains and Their Appurtenances
 - 14. NFPA 72 – National Fire Alarm and Signaling Code
 - 15. UL - Underwriters Laboratory
 - 16. FM - Factory Mutual
 - 17. Department of Professional Regulation, State of Florida, Law and Rules, Chapter 471, Florida Statutes and Rules Chapter 61G15, Florida Administrative Code
 - 18. FBC - Florida Building Code
 - 19. FFPC - Florida Fire Protection Code

1.4 SUBMITTALS

- A. Prior to commencing the work, the Sprinkler Contractor shall submit a complete set of detailed signed and sealed working drawings prepared by an Engineer in accordance with NFPA 13, showing equipment, underground fire service lines, risers, piping and heads.
 - 1. These drawings shall be coordinated with structural steel, mechanical ductwork, and piping shop drawings prior to submission.
 - 2. Drawings shall indicate cut length of piping, elevation of lines, location of piping from columns, and/or other fixed building elements.
 - 3. If using grooved couplings show the joint coupling and fittings on drawings and provide product submittals, specially identified with the applicable manufacturer' style number.
- B. The Engineer shall prepare and submit a complete set of signed and sealed hydraulic calculations for each riser.
 - 1. Where risers serve areas with different hazard classifications, provide a separate calculation for each hazard.
 - 2. Provide graph sheets with plotted water supply curve, sprinkler system demand curve and hose demand.
- C. Sprinkler drawings shall be coordinated with the mechanical, electrical, and the reflective ceiling plans.
 - 1. The Sprinkler Contractor shall locate the sprinkler heads to avoid interference with such items as lighting, ductwork, and air outlets.
 - 2. Locations for mechanical and electrical items shall have priority over sprinkler piping and head locations.
 - 3. When installing the sprinkler heads in modular ceiling panels, locate in a symmetrical pattern acceptable to the Architect.
 - 4. The Contractor shall include in his base bid the cost of providing such material and labor as required coordinating his work with that of the other trades and providing same at no additional cost to the Owner.
- D. Identify sprinklers on drawings, submittals, and other documentation, by the sprinkler identification and Model number as specifically published in the appropriate agency listing approval.
 - 1. Do not use trade names or other abbreviated designations.
- E. Submit material and equipment data sheets, test certificates, instructions, and similar information to demonstrate compliance with the specification.

1.5 TESTS AND CERTIFICATION

- A. Sprinkler Contractor shall test system in accordance with NFPA 13, NFPA 14, and NFPA 24.
 - 1. Conduct tests in the presence of the authority having jurisdiction and the Owners' representative.
 - 2. The Contractor shall have available at the site, a copy of the prescribed test.
 - 3. Contractor shall give ample notice as to time for conducting tests.
- B. Should any component of the system fail the prescribed test, Contractor shall replace such component of increased strength as required to withstand test.
- C. Upon completion of installation and test, Contractor shall prepare "Contractor's Material and Test Certificate for Aboveground Piping", as prescribed in NFPA 13, and "Contractor's Material and Test Certificate for Private Fire Service Mains" as prescribed in NFPA 24.
 - 1. Contractor and Owners' representative shall sign the certificate.

2. Contractor shall furnish copies of the signed Certificate to the Owner, and Project Consultant.
- D. Where a fire pump is required, perform fire pump/controller test in accordance with Chapter 11 of NFPA 20.
 1. Conduct test in the automatic mode of operation on normal and emergency power sources.
 2. Provide a Pump Acceptance Test Data form, similar to the example in the Appendix of NFPA 20.

1.6 WIRING

- A. The Contractor shall coordinate power wiring and connection to the fire alarm system for signal and alarm devices furnished under this section of the specifications.
- B. Furnish motors, controllers, contactors, and disconnects with their respective pieces of equipment.
 1. Controllers and contactors shall have a maximum of 120V control circuits, and auxiliary contacts for use with the controls furnished.
 2. When motors and equipment furnished are larger than sizes indicated, the cost of providing additional electrical service and related work shall be included under this section.

1.7 INSTRUCTION

- A. Furnish typed instructions relative to sprinkler controls, alarm device operations, and emergency procedures.
- B. Encase the instructions in a metal frame with glass or Lucite cover and shall be permanently secured by chain to the sprinkler riser at each controlling alarm valve of the hydraulically designed automatic sprinkler system.
- C. The following information shall be included on each placard where applicable:
 1. Area of water application [redacted] sq. ft.
 2. Minimum rate of water application (density) [redacted] gpm/sq. ft.
 3. Area per sprinkler [redacted] sq. ft.
 4. Allowance for inside hose and outside hydrants [redacted] gpm

1.8 SCOPE

- A. The entire facility shall be fully sprinklered with head spacing and locations in accordance with NFPA 13 including equipment rooms, closets, and similar locations.

1.9 DESIGN CRITERIA

- A. Hydraulically design the sprinkler system.
- B. If constructing the project in phases, size the sprinkler system to serve the completed and future phases.
- C. The general sprinkler system design parameters are as follows:
 1. Administrative and Classrooms: Consider as light hazard occupancy minimum application density of 0.10 gpm/sq. ft. over 1500 square feet.
 2. Kitchen/Food Service Area: Ordinary Hazard, Group I minimum application density of 0.15 gpm/sq. ft. over 1500 square feet.
 3. Stage Area: Consider as Ordinary Hazard, Group II minimum application density of 0.20 gpm/sq. ft. over 1500 square feet. In addition to the sprinkler system, a Class III standpipe system shall be provided at the stage where required by NFPA 101.
 4. Generator Room (if located within the sprinkled building): Extra Hazard Group I minimum application density of 0.30 gpm/sq.ft. over the square footage of the generator room.

Calculate using the room method, to facilitate the use of the room method the generator room shall be enclosed by a 2 hour fire rating.

- D. Hose: 100 gpm for light hazard, 250 gpm for ordinary hazard, 500 gpm for extra hazard.
- E. Coverage: maximum 400 square feet per head for extended coverage heads and maximum 225 square feet per head for standard coverage heads for light hazard areas, maximum 130 square feet per head for ordinary hazard areas.
- F. The flow information is as follows:
 - 1. Static Pressure: [redacted] psi
 - 2. Residual Pressure [redacted] psi
 - 3. Flow at Residual Pressure [redacted] gpm
 - 4. Date of Test: [redacted]
 - 5. Taken by: Palm Beach County Fire & Rescue

PART 2 PRODUCTS

2.1 PIPE MATERIAL

- A. All pipe materials and fittings shall be of a domestic manufacture.
- B. Provide underground piping as shown and specified on civil drawings.
- C. Interior Piping:
 - 1. Branch piping up to 2" in size shall be Schedule 40 black steel ASTM A135/A135M, ASTM A53/A53M, or ASTM A795/A795M with screwed, welded, or cut grooved ends.
 - 2. Main piping 2½" and larger shall be Schedule 10, ASTM A135/A135M, ASTM A53/A53M, or ASTM A795/A795M, with welded or roll grooved ends.
- D. Screwed fittings shall be cast iron Class 125 ANSI B16.4, or malleable iron conforming to ANSI B16.3, 150 pound.
- E. Flanged fittings shall be Cast iron, 175-psi cold-water pressure, ANSI B16.1, butt weld fittings ANSI B16.9.
- F. Grooved fittings shall be cast of ductile iron (ASTM A395/A395M and A536) forged steel (ASTM A-234), or fabricated from carbon steel pipe (ASTM A53/A53M) approved for use by the coupling manufacturer with flow characteristics equal to or better than standard fittings equal to Grinnell, Starr or Victaulic.
- G. Mechanical couplings shall be UL listed and FM Global approved for fire protection service, ductile or iron housing, rust inhibiting no-lead painted coating, zinc electroplated heat treated bolts and heavy hex carbon steel nuts meeting ASTM A 449 equal to Grinnell, Starr or Victaulic.
 - 1. Rigid type shall provide system rigidity; use coupling housings cast with offsetting, angle-pattern bolt pads, support, and hang in accordance with NFPA 13, Victaulic 005 or 07.
 - 2. Flexible type, use in locations where vibration attenuation and stress relief are required.
 - a. May use flexible couplings in lieu of flexible connectors at equipment connections.
 - b. Place three couplings in close proximity to the vibration source, Victaulic Style 75 or 77.
 - 3. Flange adapters shall be flat face, for direct connection to ANSI Class 125 or 150-flanged components, Victaulic Style 744.
- H. Locking Lug Fittings: UL listed and FM Global approved for fire protection service, ductile iron housings with self-contained synthetic rubber gaskets, internal pipe stop, plated ¼-turn positive locking lugs with externally visible locked position indicator.
- I. Hangers shall be UL listed and FM approved plated or galvanized finish equal to Grinnell, B-Line, or Michigan Hanger.

The School District of Palm Beach County

Project Name:

SDPBC Project No.:

- J. Do not use Non-grooved products such as "Pressfit", "Snap-Let" outlets or "Fit" plain end products.
- K. Bolted branch outlets (Victaulic style 920/920N and similar) when approved by the Engineer and the District.
- L. Do not use adjustable nipples using an o-ring design.
 - 1. Head outlets shall be preformed tee pipefittings, welded, thread-o-lets or grooved couplings, similar or equal to Victaulic Style 073.
- M. Do not use reducing bushings/couplings.
- N. Exterior piping:
 - 1. Branch piping up to 2" shall be schedule 40 Hot-Dipped Zinc Coated (Galvanized) ASTM A135/A135M, ASTM A53/A53M, or ASTM A795/A795M with screwed, welded, or rolled grooved ends.
 - 2. Main piping 2 ½" and larger shall be schedule 10 Hot-Dipped Zinc Coated (Galvanized) ASTM A135/A135M, ASTM A53/A53M or ASTM A795/A795M with welded or rolled grooved ends.
 - 3. Main piping at DDCV, PIV and FDC shall be per civil water distribution specification.

2.2 EQUIPMENT

- A. All equipment listed herein shall be Grinnell, Central, Star, Reliable, or Viking, System Sensor, or Victaulic, all components shall be UL listed and FM Global approved.
- B. Provide vane type flow switch waterflow detector with two SPDT switches and adjustable time delay similar or equal to Grinnell Model VSR-F (wet pipe system) or System Sensor Model WFD.
- C. Siamese Fire Department connection with two 2½" polished brass inlet hose connections, 4" outlet pipe, with red enamel finish, cast iron wall plate labeled "Automatic Sprinkler Fire Department Connection", cast iron ease-off caps and automatic brass ball drip connection, equal to Star.
 - 1. Provide wall or freestanding yard mounting as appropriate to the installation.
 - 2. Where applicable, install a 90° elbow with drain connection at each Siamese Fire Department connection equal to Victaulic 10-DR.
- D. 3½" Diameter Pressure Gauges with ¼" gauge cocks on both sides of the riser check valve, at pumps and where otherwise required or indicated.
- E. 2" angle valve drain connection, bronze body, 175 lb. working pressure, screw bonnet, integral seat, renewable disc, Nibco Model T-301-W or equal.
- F. Riser shut-off valves, OS&Y pattern gate valve or butterfly, with tamper.
 - 1. OS&Y valves shall be iron body, rising stem, solid wedge, 175 lb. working pressure, similar to Nibco Model F-607-OTS.
 - 2. Butterfly valves shall be ductile iron body, gear operator with indicator, resilient liner, similar to Nibco Model #LD3510-2 or GD 1765-4, or Victaulic Series 705W.
- G. Riser and Siamese swing-check valves shall be swing type, ductile iron body, brass seat, rubber-faced clapper, and class 150 with a maximum working pressure of 250 psi.
 - 1. Provide Viking Model D-1, G-1, F520, or "easy-riser swing check valve" or Engineer approved equal.
 - 2. Spring-assisted check valves shall consist of ductile iron body, aluminum bronze or elastomer encapsulated ductile iron disc, stainless steel spring and shaft, grooved ends.
 - 3. Provide automatic drip valve where required for drainage.

- H. Fire Pump (where required)
 - 1. Pump shall be UL listed/FM approved, single-stage, centrifugal type with split cast iron casing, electric motor drive.
 - a. Maximum pump and motor speed shall not exceed 3600 RPM.
 - 2. The impeller shall be double suction type, made of cast bronze, balanced hydraulically and dynamically, keyed to the shaft and securely retained in an axial position by positive mechanical means.
 - a. Mount the pump on a steel or cast iron base.
 - b. Pump shall include a motor coupling with guard.
 - 3. Suction and discharge connections shall be located to allow removal of the rotating element without disturbing the system piping connections.
 - 4. Provide the following accessories:
 - a. Suction eccentric reducer, with the flat side on top, at the pump inlet; reducer shall be cast iron or wrought steel with flanged connections.
 - b. Automatic air release valve with threaded inlet and discharge connections, to vent air from the pump casing.
 - c. Casing relief valve, non-adjustable bronze-type, set above the design pressure anticipated but below the combined suction pressure and shut-off head pressure, to discharge water from the system to avoid pump overheating, conforming to NFPA 20.
 - d. Pump discharge test header, number of valves in accordance with NFPA 20.
 - 5. The fire pump manufacturer, of the electrical characteristics indicated, shall provide electric motor drive.
 - a. Motor shall be open drip proof (ODP), 1.15-service factor and be sized such that the pump motor is not operating in the service factor by more than 5 % at the design conditions, and/or as required for UL listing/FM approval.
 - b. Number of motor leads shall be coordinated with the fire pump controller.
- I. Pressure Maintenance Jockey Pump (where required)
 - 1. Provide centrifugal type jockey pump, rated to 230 psi, having a drain and gauge tapings.
 - a. Pump impeller shall be hydraulically balanced, non-vapor-binding type, mechanically keyed to the shaft.
 - b. Pump shall have replaceable bronze impeller (casing) wear rings, threaded connections, mechanical seal, and sealed cast iron cartridge roller ball bearings, close-coupled to an open-drip proof motor.
 - c. Arrange pump to draw water from the suction supply side of the gate valve of the fire pump(s) and discharge into the system on the downstream side of the pump discharge gate-valve.
 - 2. Jockey Pump Controller shall be completely factory assembled, wired, and tested.
 - a. The unit shall be complete with across-the-line magnetic starter equipped with overload protection, 3-pole fusible disconnect switch, H-O-A selector switch, 10-300 psi bourdon tube pressure regulator with independent high and low set points, pump running light, and NEMA 1 enclosure with lockable handle, automatic stop function, minimum run time timer, and contacts for remote restart.
 - b. Provide an adjustable relay (0-60 minute) with a Form "C" NO/NC alarm contact such that if the jockey pump cycles off and then restarts before the expiration of the relay

- timer, the alarm contact energizes and sends an excessive cycling alarm to the fire alarm panel.
 - c. Start/stop pressure settings shall exceed those of the main fire pump(s).
 - d. Also, include a run timer to ensure the jockey pump runs for the minimum time as recommended by the manufacturer of the jockey pump motor.
- J. Electric Fire Pump Controller/Automatic Transfer Switch
1. The fire pump controller shall meet NFPA 20 and NFPA 70 requirements for fire pump service and are UL listed.
 2. The fire pump controller/automatic transfer switch shall be of the combined automatic and manual reduced voltage, soft-start, solid-state, full wave controlled open loop type.
 3. The fire pump controller shall have a single handle for operating both the isolating switch and then the solid-state microprocessor-type circuit breaker in sequence.
 - a. Provide a reduced voltage, soft-start, solid-state NEMA rated starter sized for the motor load.
 - b. Controls to be furnished shall include.
 - i) A built-in 10-300 psi bourdon tube-type pressure switch with independent high and low set points piped to the cabinet exterior.
 - ii) An automatic and manual start and manual soft stop and emergency stop pushbuttons.
 - iii) An adjustable minimum run timer, power available light, and power monitoring sensing all phases for loss of any phase, under voltage, or phase reversal.
 - c. Fire pump controller shall provide three signals to the facility fire alarm control panel per NFPA 20 and NFPA 72.
 - d. Provide dry contacts for signaling loss of input power; phase reversal; pump running; and provide contacts for remote start.
 - e. Provide voltage surge arresters between each line terminal of the controller isolating switch and ground, to suppress voltage surges above rated motor voltage tolerance.
 - f. The reduced voltage acceleration ramp shall be adjustable between 0.5 and 10 seconds, with a bypass contactor to energize at full speed or upon overheating of the solid-state starter.
 - g. Stop sequence shall also be initiated through the solid-state starter and include an adjustable deceleration ramp.
 - h. House all indicated controls and a dry-type control transformer in steel NEMA 2 enclosure with lockable handle, that is factory assembled and tested prior to shipment.
 4. The automatic transfer switch shall withstand current rating of at least 22,000 RMS symmetrical Amps and be capable of manual mechanical operation by means of a readily accessible handle.
 - a. It shall provide for transfer of the soft/start controller to an emergency power source upon failure of the normal power source and return to the normal power when restored.
 - b. Provide electrically operated transfer switch, which is mechanically held, and listed by U.L. for fire pump service.
 5. Provide a controller assembly rated to withstand the maximum available fault current of the normal and emergency isolating switches.
 - a. Voltage and horsepower rating shall be as scheduled.

6. Provide an audible alarm.
7. Provide a safety mechanical link between the emergency isolating switch and the normal isolating switch mechanically open the emergency isolating switch when the normal isolating switch is open.
 - a. It shall also have a safety interlock to prevent the isolating switch from being either opened, or closed when the circuit breaker is closed.
 - b. Provide a visual indication of the switch position.
8. Controller shall be service entrance labeled by U.L.
9. Provide remote alarm panel for 120-volt input with power on light, pump run light, pump power failure light, remote fire-pump start switch, press-to-test switches, and audible alarm with alarm silence.

2.3 SPRINKLER HEADS

- A. Sprinkler heads shall be UL listed, FM Global approved, and from a single manufacturer, equal to Grinnell, Star, Viking, Reliable Central or Victaulic of the following types:
 1. Provide sprinkler heads of the ordinary temperature range, 155°F, except where subject to high temperatures caused by unit heaters, hot pipes, radiant ceiling, kilns, or other heat source, and then provide heads of high temperature type, 250°F.
 2. For areas with finished ceilings, provide heads of semi-recessed pedant type, chrome finish with escutcheon, glass bulb tube.
 - a. Body shall be die cast brass, with hex-shaped wrench boss cast into the body to facilitate installation and reduce the risk of damage during installation.
 3. For areas without ceilings: heads shall be of upright style, brass finish, glass bulb tube.
 4. In gymnasiums, dry storage rooms, walk-in freezers, and other spaces where heads are subject to damage provide wire guards.
 5. For areas subject to freezing (walk-in freezers and coolers): dry type semi-recessed pendant style, chrome finish, with escutcheon, glass bulb type.
 6. Heads shall be nominal ½" orifice type unless otherwise required by hydraulic calculations.
 7. Provide escutcheons and guards listed, supplied, and approved for use with the sprinkler by the sprinkler manufacturer.

2.4 SPRINKLER HEAD CABINET

- A. For each building provide a wall-mounted sprinkler head cabinet with a minimum of 6 heads of each type used or as required by NFPA 13, together with required wrenches for replacing heads.

2.5 ALARM SYSTEM

- A. Install in riser a water flow indicator of the vane type with two sets of contacts, automatic reset and instant recycling retard and circuit closer, for connection to the fire alarm system under Division 28.
- B. Install on riser OS&Y (or butterfly) shut-off valve, a tamper switch to indicate whether the valve is open or closed for connection to the fire alarm under Division 28.

2.6 WALL PENETRATION

- A. Protect penetrations of fire rated partitions using a UL listed fire rated wall penetration assembly.
 1. Rating shall be equal to or greater than the wall rating.
- B. Protect penetrations of floor slabs using a Schedule-40 pipe sleeve, with the space between the pipe and sleeve sealed with mastic.

PART 3 EXECUTION

3.1 DESIGN

- A. Provide services of a Professional Engineer Licensed in the State of Florida to design a complete wet pipe sprinkler system in accordance with NFPA 13, NFPA 24 and other applicable code requirements.
- B. Engineer shall provide signed and sealed engineering documents suitable for fabrication including cut lengths of pipe.
- C. Engineer shall provide signed and sealed hydraulic calculations for each riser and for each hazard classification.

3.2 INSTALLATION

- A. Install new fire service line and sprinkler system generally as indicated and coordinate with work of other trades.
 - 1. Exact requirements and installation shall be in accordance with working shop drawings.
- B. Hydrostatically pressure test above ground piping for two hours at pressure as required by NFPA-13 and 14, with no observable leakage allowed.
 - 1. Pressure test below ground piping in accordance with NFPA 24, with leakage not to exceed that allowed by NFPA 24.
- C. Label drain piping, inspectors test stations, main drain, electric gong and similar system components.
 - 1. Locate inspectors test station in a non-student occupied space.
 - 2. Inspectors test station and main drain piping shall discharge outdoors onto a splash block.
- D. Test system in presence of Owner in accordance with NFPA 13 and NFPA 24 requirements.
 - 1. Provide a fire-pump acceptance test in accordance with NFPA 20 requirements to include both automatic and manual modes of operation on regular and emergency power sources.
- E. Paint exposed piping red.
 - 1. Provide red head guards for heads subject to damage.
- F. Provide rigid couplings at connection to valves in riser, use flexible couplings at building expansion joints and similar locations subject to movement.
- G. Provide auxiliary drains for trapped sections of piping.
- H. Install hangers at branch and main line locations as required by NFPA 13.
 - 1. Securely fasten hangers to the structure-utilizing offset or center loading beam clamps, or "C" clamps with retainer clip.
 - 2. Provide miscellaneous support steel where required to span across structural members.
 - 3. Attach hangers to concrete structures using drilled-in concrete inserts or self-tapping studs.
 - 4. Use power driven studs only with the permission of the project structural engineer.
 - a. If approved, test a minimum of four studs at four times the applied piping load.
 - b. Do not use power driven studs if any of the studs fail the load test.
- I. Provide heads above ceilings where combustible construction is present.
- J. Label exposed piping with snap-on type plastic labels at no less than 20 feet on-center, but at least one label on each exposed section of piping.
- K. Post operating instructions for the fire pump to include system operation, resetting trouble conditions and cautionary warnings.

- L. Provide training for the Owners staff as to proper operation and maintenance of the fire pump system.
- M. Grooved Joints:
 - 1. All grooved couplings, fittings, valves, and specialties shall be the products of a single manufacturer, and the grooving tools shall be of the same manufacturer.
 - 2. Use gaskets molded and produced by the groove-coupling manufacturer.
 - 3. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove.
 - 4. Grooved coupling manufacturer's factory trained representative shall provide on-site training for contractor's field personnel in the proper use of grooving tools, application of groove, and installation of grooved piping products.
 - 5. Factory trained representative shall periodically inspect the product installation.
 - 6. Contractor shall remove and replace any improperly installed products.
 - 7. Contractor shall certify the Pipe for use with the manufacturer's system.
- N. Locking Lug Joints:
 - 1. Pipe ends shall be square cut and thoroughly clean on the outside edge for 1" from the pipe end to remove pipe coatings, mill scale, rust and raised weld beads.
 - 2. Remove all burrs and sharp edges on the pipe inside and outside edge.
 - 3. Pipe shall be marked 1 1/2" from the end and pipe end configuration shall be in conformance with manufacturer's specifications.

3.3 DEMONSTRATION AND TRAINING

- A. Training of the Owner's operation and maintenance personnel is required in cooperation with the Owner's Representative.
 - 1. Provide competent, factory authorized personnel to provide instruction to operation and maintenance personnel concerning the location, operation, and troubleshooting of the installed systems.
 - 2. Schedule the instruction in coordination with the Owner's Representative after submission and approval of formal training plans.
 - 3. Refer to Section 01 91 00, Commissioning, for further contractor training requirements.
- B. Demonstration and training shall be provided for the following equipment and systems:
 - 1. Fire Protection System: General overview, including zoning.
 - 2. Fire Pump
 - 3. Fire Pump Controller and Automatic Transfer Switch
 - 4. Jockey Pump
 - 5. Jockey Pump Controller

END OF SECTION