PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The requirements of the General Conditions, Supplementary Conditions and the following Specification sections apply to all Work herein:
1. Section 21 00 10 - General Requirements
2. Section 21 00 20 - Fire Suppression Scope of Work
3. Section 21 05 07 - Design Conditions
4. Section 21 05 13 - Motor Requirements for Fire Suppression Equipment
5. Section 21 05 48 - Vibration and Seismic Controls for fire Suppression Piping and Equipment
6. Section 21 05 93 - Testing
7. Section 21 07 00 - Fire Suppression System Insulation
8. Section 21 11 00 - Connections to Utilities
9. Section 21 12 00 - Fire Suppression Standpipe Systems
10. Section 21 30 00 - Fire Pumps and Controllers
11. Section 21 41 00 - Fire Suppression Water Storage Tank
12. Division 28 - Fire Detection, Alarm, and Communication System Specifications

1.2 SUMMARY

A. Furnish and install fire suppression wet and dry sprinkler systems as specified herein and as indicated on the Drawings.

B. The Subcontractor shall provide fire-hydrant flow test as a basis for hydraulically calculated systems. Testing shall be conducted as a location representative of the actual future system(s) supply and be no more than 12 months old at date of submission. The flow test report shall have, as a minimum, the following:
1. Contractor's name and contact information.
2. Project name.
3. Date, time and location of flow test.
4. Static pressure (psi)
5. Residual pressure (psi)
6. Water flow measurement (gpm)
7. Elevation of hydrant(s) tested (feet above sea level).

C. Refer to Architectural drawings and specifications for portable fire extinguisher requirements and locations. The portable fire extinguishers in the building will be provided under the Architectural Section by the Contractor. Fire extinguishers in the garage will be provided by the Fire Suppression Subcontractor.

D. Under this Division, the Subcontractor shall furnish all labor, equipment, appliances and materials to perform all operations in connection with the installation of a wet type sprinkler system, dry pipe sprinkler system and preaction systems as indicated on the Drawings; and as specified herein and/or as required by the local and state Building Code, Fire Marshall requirements and applicable NFPA Standards.

1.3 REFERENCE STANDARDS

A. All fire suppression system equipment and associated components shall be designed, manufactured and tested in accordance with the latest applicable standards or the particular edition specified by the authorities having jurisdiction including the following:
1. NFPA 13 - Installation of Sprinkler Systems
2. NFPA 20 - Installation of Centrifugal Fire Pumps
3. NFPA 24 - Installation of Private Fire Mains
4. NFPA 25 - Inspection, Testing and Maintenance of Water Based Fire Suppression Systems
5. NFPA 70 - National Electrical Code (NEC)
6. NFPA 101 - Life Safety Code
7. ASTM
8. ANSI - B16.3, B16.4, B16.5, B16.9, B31.1.0, and B36.10
9. AWS - American Welding Society

B. All equipment and material to be furnished and installed on this Project shall be UL listed, and/or FM approved, in accordance with the requirements of the authorities having jurisdiction, and suitable for its intended use on this Project.

1.4 SUBMITTALS

A. The following submittal data shall be furnished according to the General Conditions and Section 21 00 10 and shall include, but not be limited to:
1. Schedule of Pipe and Fitting Materials* complete with typical mill reports.
2. Subcontractor's Roll and Cut Groove Machine Certifications*.
3. Welder qualification test reports.
4. Fire-Hydrant flow test report.
5. List of pipe, hanger and support manufacturers.
6. Fire Suppression Sprinkler System, materials, sprinkler heads, fire department connections, automatic pressure reducing valves, water flow switches, pressure switches, piping arrangement, controls, alarm check valves, dry pipe valves, air supply components and piping, dry pipe compressors, preaction system compressors, etc.
7. Sprinkler System Shop Drawings and Hydraulic Calculations. The Automatic Sprinkler Subcontractor shall submit piping Shop Drawings and hydraulic calculations for review prior to fabrication of any of the systems. Shop Drawings shall indicate plan locations and elevations of piping and hangers, including bottom elevation of major piping and be coordinated with ductwork and other mechanical and electrical services. Complete Shop Drawings and hydraulic calculations shall be submitted to all local and state authorities having jurisdiction, Fire Department and the Owner's insurance carrier for approval. Shop Drawings submitted to the Engineer for review shall bear the approval stamp of all authorities having jurisdiction if those authorities normally review the Subcontractor's documentation. See Section 21 00 10 for requirements.
8. Inspector's test fitting complete with physical dimensions, materials, etc.
9. Proposed test procedures, recording forms, test equipment, and list of personnel and qualifications for all tests proposed. Refer to Section 21 05 93 titled "Testing" for additional requirements.
10. Field Test Schedule.
11. Field Test Reports.
    a. Hydrostatic Test Reports.
    b. Periodic Inspection Reports – NFPA "Report of Inspection"

B. All items or equipment listed above with asterisks (*) shall be certified by the manufacturer using Manufacturer Certification "MCA" as set forth in Section 21 00 10. See Section 21 00 10 for certification requirements.

1.5 WARRANTY

A. Comply with the requirements of the General Conditions and Section 21 00 10.

1.6 WORK INCLUDED

A. The Work includes but is not limited to the following:
1. Sprinkler supply mains, risers, valves and drains.
2. Flow switches and supervisory switches.
3. Sprinkler, fire pump if a separate pump is required, controllers, and accessories. See Specification Section 21 30 00 titled "Fire Pumps and Controllers".
4. Jockey pump if a separate jockey pump is required, controllers and accessories. See Specification Section 21 30 00 titled "Fire Pumps and Controllers".
5. Wet and/or dry hydraulically designed sprinkler system(s), sprinkler heads, inspector's test connections, preaction systems, etc.
6. Provide dry pipe systems in areas subject to freezing such as garage, truck dock and exposed area sprinkler systems.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. All pipe material shall be as specified herein. The Subcontractor shall submit to the Engineer for review a list of the proposed manufacturers of pipe and fittings. See Section 21 00 10 for requirements.

B. If it complies with these Specifications and is UL listed, and/or FM approved, for 175 psig working pressure systems, one of the following pipe fitting manufacturers will be acceptable:
   1. Screwed piping fittings, Class 150, ANSI B16.3 screwed malleable iron Class 125, ANSI B16.4 cast iron, or Class 150 ductile iron:
      a. Central
      b. Grinnell
      c. Star Products, Inc.
      d. Ward
   2. Welding fittings ANSI B16.9 with wall thickness identical to pipe in which installed:
      a. Babcock & Wilcox
      b. Grinnell
      c. Ladish
      d. Taylor Forge
      e. Tube-Line
      f. Tube-Turn
      g. Weld Bend
   3. Flanges, Class 150, ANSI B16.5, raised face, forged steel, screwed or welding neck type where specified and/or required:
      a. Grinnell
      b. Ladish
      c. National Flange
      d. Taylor Forge
      e. Weld Bend

C. If it complies with these Specifications and is UL listed, and/or FM approved, for 300 psig working pressure systems, one of the following pipe fitting manufacturers will be acceptable:
   1. Screwed piping fittings, Class 300, ANSI B16.3 screwed malleable iron, Class 250, ANSI B16.4 cast iron, or Class 300 ductile iron:
      a. Central
      b. Grinnell
      c. Ward
   2. Welding fittings, ANSI B16.9 with wall thickness identical to pipe in which installed:
      a. Babcock & Wilcox
      b. Grinnell
      c. Ladish
      d. Taylor Forge
      e. Tube-Line
      f. Tube-Turn
      g. Weld Bend
   3. Flanges, Class 300, ANSI B16.5, raised face, forged steel, screwed or welding neck type where specified and/or required:
      a. Grinnell
      b. Ladish
      c. National Flange
      d. Taylor Forge
      e. Weld Bend

D. Weld fittings shall be UL listed, and/or FM approved, factory made and shall be full line size. If it complies with these Specifications, one of the following weld fitting manufacturers will be acceptable:
   1. Branch pipes more than one size smaller than the diameter of the main pipe:
      a. Bonney Forge “Weldolet” or “Threadolet” ANSI B16.9
      b. Grinnell Forged Steel Weldolet or Threadolet ANSI B 16.9

c. "Weldolet", "Threadolet" and Merit fittings and shaped nipples shall have a wall thickness as required by the ANSI B31.1.0 and ANSI 36.10 Code and shall be suitable for the working pressure and temperature of the pipe to which they connect.

2. For branch sizes 3" and smaller shaped nipple welding fittings with factory beveled ends :
   a. Allied Type T-1 and T-2
   b. Grinnell
   c. Tube Forgings
   d. Tube-Turn
   e. Wheeling
   f. No branch shall be made by burning a hole in the main and welding in the branch line.

E. If it complies with these Specifications and is UL listed, and/or FM approved, one of the following pipe hanger and support manufacturers will be acceptable:
1. B-Line
2. Grinnell
3. Hilti
4. Michigan Hanger
5. PHD
6. Tolco

F. At the Subcontractor's option and subject to the approval by the local authorities having jurisdiction, grooved style couplings and fittings may be used in lieu of welded or screwed joints specified hereinbefore as follows:
1. For Loop and Branch Piping: Victaulic Style 009H "FireLock EZ" or Gruvlok Figure 7400 "Rigidlite" UL listed, painted ductile iron couplings may be used subject to the special requirements in Paragraph 2.01F.4. hereinafter.
2. For Main Piping: Victaulic Style 107H "QuickVic", Victaulic Style 009H "FireLock EZ", Gruvlok Figure 7000 or Gruvlok Figure 7400 "Rigidlite" UL listed rigid couplings may be used for up to and including 300 psig working pressure. Victaulic Style HP70 or Gruvlok Figure 7001 couplings may be used for over 400 psig working pressure subject to the special requirements in Paragraph 2.01F.4. hereinafter.
3. For Fittings: UL listed, painted ductile iron Victaulic Standard, Victaulic "FireLock" or Gruvlok fittings and Victaulic Style 920 or Gruvlok Figure 7045 mechanical tees. All fittings shall be suitable for the design working pressures specified in Section 21 05 07 titled "Design Conditions" and may be used subject to the special requirements in Paragraph 2.01F.4. hereinafter.
4. Special Requirements: Victaulic or Gruvlok fittings and couplings shall be made of ASTM A 47 Grade 32510, malleable iron or ASTM A 536 Grade 65-45-12 ductile iron, with grooved ends. Grooved fitting manufacturer shall be ISO 9001 approved.
   a. Pipe grooves shall be made by a tool manufactured by the grooved coupling/fitting company. The manufacturer shall provide a certified letter with the Shop Drawing stating that the roll or cut grooving machine and fittings will provide a system complying with the pressure class and piping materials previously specified. A Victaulic or Gruvlok cut groove depth control tool shall be used for field and shop grooving of piping. A Victaulic or Gruvlok hole cutting tool shall be used in lieu of burning a hole in the piping. When using joining materials the piping shall be installed in accordance with the joint manufacturer's instructions. Gaskets shall be UL listed for the service and working pressure of the systems. Victaulic or Gruvlok flanges, reducing couplings and outlet couplings shall not be allowed. If they comply with these Specifications, UL listed couplings, full flow fittings and gaskets manufactured by Victaulic Company of America or Grinnell Corporation (Gruvlok) will be acceptable. Couplings and fittings installed throughout the project shall be the product of one manufacturer.
   b. Roll grooving shall not be acceptable for galvanized piping systems.

G. If it complies with these Specifications and is UL listed, and/or FM approved, one of the following pipe joint compound manufacturers will be acceptable:
1. LACO
2. Rector-Seal

H. If it complies with these Specifications and is UL listed, and/or FM approved, one of the following gasket manufacturers will be acceptable:
1. Crane
2. Dallas Gasket
3. Garlock

I. If it complies with these Specifications and is UL listed, and/or FM approved, check valves manufactured by one of the following manufacturers will be acceptable:
   1. Crane
   2. Croker
   3. Grinnell
   4. Kennedy
   5. Mueller
   6. Nibco
   7. Reliable
   8. Viking

J. If it complies with these Specifications and is UL listed, and/or FM approved, gate valves manufactured by one of the following manufacturers will be acceptable:
   1. Badger-Powhatan
   2. Crane
   3. Croker
   4. Fairbanks
   5. Grinnell
   6. Jenkins
   7. Kennedy
   8. Milwaukee
   9. Mueller
   10. Nibco
   11. Walworth

K. If it complies with these Specifications and is UL listed, and/or FM approved, butterfly valves manufactured by one of the following manufacturers will be acceptable:
   1. Grinnell
   2. Jenkins
   3. Kennedy
   4. Milwaukee
   5. Nibco
   6. Victaulic

L. If they comply with these Specifications and are UL listed, and/or FM approved, Venturi flow tubes manufactured by one of the following manufacturers will be acceptable:
   1. Aeroquip (Barco)
   2. Aurora
   3. Croker
   4. Gerand
   5. Preso
   6. Victaulic

M. If it complies with these Specifications and is UL listed, and/or FM approved, water flow switches manufactured by one of the following manufacturers will be acceptable:
   1. Autocall
   2. Croker
   3. Potter Electric Signal Company
   4. System Sensor

N. If it complies with these Specifications and is UL listed, and/or FM approved, Sprinkler heads, valves, alarms, etc., manufactured by one of the following manufacturers will be acceptable:
   1. Reliable
   2. Tyco
   3. Viking
   4. Victualic

O. If it complies with these Specifications and is UL listed, and/or FM approved, floor control valves manufactured by one of the following manufacturers will be acceptable:
   1. Croker

2. Elkhart “Pressure-Matic”
3. Guardian
4. Potter-Roemer
5. Standard “Pressuretrol”
6. Zurn

P. If it complies with these Specifications and is UL listed, and/or FM approved, and is suitable for installation on the valves provided, supervisory switches manufactured by one of the following manufacturers will be acceptable:
1. Notifier
2. Potter Electric Signal Company
3. System Sensor

Q. If it complies with these specifications, double interlocked preaction sprinkler systems in accordance with local code requirements (or single interlocked preaction sprinkler system where required by the local authorities) manufactured by one of the following manufacturers will be acceptable:
1. Grinnell
2. Reliable Sprinkler Company
3. Viking Corp

2.2 GENERAL

A. This building will utilize various pressure classes for the sprinkler systems. Pipe, valves and fittings shall conform to requirements of the working pressures specified in Section 21 05 07 titled “Design Conditions” and as indicated by the Drawings.

B. Piping 4” and smaller shall be ASTM A 53, ASTM A 135 or ASTM A 795 black steel for all wet pipe systems as specified herein. Dry pipe systems shall be galvanized, Schedule 40, if required by local code, by the authorities having jurisdiction or the Owner’s insuring agency. Pipe shall be manufactured in the United States and be UL listed and FM approved for all piping except ASTM A53 pipe.

C. Piping 5” and larger shall be UL listed, and/or FM approved, ASTM A 53, ASTM A 135 or ASTM A 795, black steel Type “S” (seamless), Type “F” (furnace-butt welded) or Type “E” (electric resistance welded). Electric resistance welded pipe shall be fully normalized at the seams after welding. Pipe shall be manufactured in the United States and be UL listed and FM approved for all piping except ASTM A 53 pipe.

D. Pipe thickness shall be in accordance with ANSI B36.10, current edition and shall be as follows:
1. For 175 psig and 300 psig on all wet pipe systems:
   a. 4” : Schedule 10 or 40
   b. 6” : Schedule 10 or 40
   c. 8” and larger: Schedule 10 or 40
2. For 175 psig wet loop and branch pipe systems on the low pressure side of all automatic pressure regulating control valves:
   a. 1” through 2”: Schedule 40
   b. 2½” through 4”: Schedule 10 or 40
3. For 175 psig on all dry pipe systems including pre-action systems:
   a. 1” through 4”: Schedule 40
   b. 6” through 8:: Schedule 10 or 40
   c. Piping shall be galvanized per ASTM A123, if required by code and/or local Authorities Having Jurisdiction.
      All galvanized pipe shall be Schedule 40.

E. Fire suppression systems utilizing Schedule 40 pipe may be of threaded, butt welded or cut or roll groove construction.

F. Flanges shall be required for servicing and/or removal of equipment for repair, etc., for butt welded systems. Schedule 10 pipe shall be joined by roll grooved fittings only.

G. At each joint the flanges shall have matching flat faces or raised faces, and the flanges shall be identified in configuration and pressure rating. Steel flanges shall have a medium tool finish and shall have either flat or

raised faces. When 150 lb. steel flanges are connected to 125 lb. cast iron or 300 lb. ductile iron flanges valves or fittings, the steel flanges shall be flat face medium finish. Grooved flanges shall be Victaulic 741/743 or Gruvlok Fig. 7012/7013 using flange washers to join to the rubber faced serrated flanged components or raised faced flanges. Serrated flanges or raised face flanges shall use a full face red rubber gasket between the grooved flange washer and the flange to provide an acceptable sealing surface.

H. Screw joints shall be made up with approved pipe joint compound. Screw threads shall be in accordance with American Pipe Thread Standards.

I. Gasket material shall be as specified herein and shall be suitable for the service and pressure class intended.
   1. Gaskets shall be 1/16” thick for all pipe sizes 10” and smaller; and 1/8” thick for all pipe sizes 12” and larger. Gaskets shall be ring type between raised face flanges and full face type between flat face flanges with punched bolt holes and pipe opening.
   2. Gaskets shall be compressed non-asbestos with a nonstick clean surface and factory applied parting agent applied to both sides of the gasket.
   3. Gaskets shall contain no asbestos.

J. Flange bolting materials for flanges in service at 399°F or below shall be carbon steel ASTM A 307 Grade B hexagon head bolts and nuts. Cap screws utilized with flanged butterfly valves shall be ASTM A 307 Grade B cap screws with hexagon heads. Flange bolt thread lubricant shall be an antiseize compound. Thread lubricant designed for temperatures up to 1000°F, shall be Crane Antiseize Thread Compound or approved equal. Where the configuration or arrangement of flanges prevent the installation of machine bolts, stud bolts shall be used.

2.3 GATE VALVES

A. Furnish and install all gate valves, indicating type, that are indicated on the Drawings and/or specified herein. Valve packing and gaskets shall contain no asbestos.

B. Gate, Ball and Butterfly Valves:
   1. 175 psig Working Pressure:
      a. Gate valves up to and including 2” Kennedy Figure 66, 175 psig cold water, UL listed, bronze body, bronze trim, single disc, outside screw and yoke, screwed bonnet valves with seats of bronze, screwed ends.
      b. Gate valves 2-1/2” through 12” Kennedy model KS-FW, 175 psig cold water, UL listed, AWWA Standard C509 approved, cast iron body, outside screw and yoke, bolted bonnet valves with double or single disc, Class 125 ANSI B16.1 flanged ends, bronze trim, and cast iron wedge fully encapsulated with resilient material.
      c. Butterfly valves 2-1/2” through 8” Victaulic Series 705, Gruvlok AN7722-3A, Kennedy G300/01G or Nibco GD-4765-8N, UL listed, ductile iron body and disc with EPDM disc coating, grooved ends, flanged or full lug body.
      d. Ball valves up to and including 2” shall be red brass or cast bronze UL listed with brass, bronze or stainless steel ball, full port type, 400 psig non-shock WOG at 200°F.
   2. 300 psig Working Pressure:
      a. Gate valves up to and including 2” Crane No. 634E, Milwaukee 1184 or Nibco T-174-SS, 400 psig cold water, UL listed bronze body, wedge disc, rising bronze stem, union bonnet, bronze disc with bronze or stainless steel body seat rings and screwed ends.
      b. Ball valves up to and including 2” shall be red brass or cast bronze UL listed with brass, bronze or stainless steel ball, full port type, 400 psig non-shock WOG at 200°F.
      c. Gate valves 2-1/2” through 12”, Crane No. 7-1/2E, Milwaukee F2894A or Nibco F-667-0, 500 psig cold water, iron body, brass stem, bolted bonnet, outside screw and yoke valves with wedge disc, bronze seats and Class 250 ANSI B16.1 flanged ends.
      d. Butterfly valves 2-1/2” through 8” Victaulic Series 705, Gruvlok 7722-3 FD or Nibco, UL listed, ductile iron body and disc with EPDM disc coating, grooved ends, flanged or full lug body.
   3. Furnish and install supervised valve tamper switches as shown on the Drawings or as required by NFPA standard and local codes. Coordinate all requirements with Division 28 FDAC System Specifications.

2.4 SPRINKLER SYSTEM

A. A complete wet pipe system shall be installed in all areas of the building unless otherwise specified. This installation shall be installed in accordance with the rules and regulations of the applicable NFPA 13. See Reference Standards specified hereinbefore. The complete installation shall comply with the regulations of the Fire Marshal and the authorities having jurisdiction.

B. The hydraulic calculations shall include an allowance of at least 250 gpm at the standpipe for fire department use and a ten (10%) percent overage. The hydraulic calculations for the floor sprinkler system downstream of the floor control valve shall be based on a maximum outlet pressure of 150 psig or the lower pressure actually available. The hydraulic calculations shall be based on the specified main line flow and static test at the Project Site.
   1. Sprinkler piping shall be hydraulically designed throughout all areas in accordance with the Rules and Regulations of the applicable NFPA 13 using the design densities hereinafter:
      a. OFFICE AREAS - Provide a ceiling density of 0.10 gpm per square foot over any, including the most remote, 1,500 square feet when utilizing 165°F temperature rated heads and a head spacing not exceeding 180 square feet per head. Design area reduction for quick response sprinklers shall not be applied.
      b. RETAIL/COMMERCIAL AREAS - Provide a ceiling density of 0.20 gpm per square foot over any, including the most remote, 2,000 square feet when utilizing 165°F temperature rated heads and a head spacing not exceeding 100 square feet per head.
      c. STANDBY GENERATOR ROOMS - Provide a density of 0.20 gpm per square foot over any, including the most remote, 2,000 square feet when utilizing 165°F temperature rated heads and a head spacing not exceeding 130 square feet per head.
      d. MECHANICAL ROOMS - Provide a density of 0.20 gpm per square foot over any, including the most remote, 1,500 square feet when utilizing 165°F temperature rated heads and a head spacing not exceeding 130 square feet per head.
      e. STORAGE AREAS - Provide a ceiling density of 0.20 gpm per square foot over any, including the most remote, 1,500 square feet when utilizing 165°F temperature rated heads and a head spacing not exceeding 130 square feet per head.
      f. PARKING GARAGE AREAS REQUIRING WET PIPE SYSTEMS* - Provide a density of 0.15 gpm per square foot over any, including the most remote, 1,500 square feet when utilizing a wet pipe system with 165°F temperature rated heads and a head spacing not exceeding 130 square feet per head. Extended coverage sprinklers shall be permitted if sprinklers are listed for the system working pressure, refer to Section 21 05 07 titled “Design Conditions”.
      g. LOADING DOCK AREAS REQUIRING WET PIPE SYSTEMS* - Provide a density of 0.20 gpm per square foot over any, including the most remote, 1,500 square feet when utilizing a wet pipe system with 165°F temperature rated heads and a head spacing not exceeding 130 square feet per head. Extended coverage sprinklers shall be permitted if sprinklers are listed for the system working pressure, refer to Section 21 05 07 titled “Design Conditions”.

   * See Drawings for requirements of wet pipe systems.

C. System piping shall be hydraulically designed throughout all areas in accordance with the rules and regulations of the applicable NFPA 13 using the design densities indicated on the Drawings and hereinabove.

D. Sprinkler Heads:
   1. All sprinkler heads shall be quick response.
   2. Sprinkler heads in unfinished areas shall be plain brass, upright, pendent or sidewall type as required.
   3. Sprinkler heads in all public areas (lobbies, atria, corridors, toilets, etc.) shall be [concealed type with white or chrome-plated cover] [recessed type with white or chrome-plated escutcheon]. Final approval of the finish for this sprinkler head shall be by the Architect and Owner.
   4. Areas not built out during Base Building construction (e.g. unfinished Tenant spaces) shall have sprinkler head coverage as required for unoccupied shell space with temporary heads and “heat shields”, if required, furnished and installed by the Subcontractor in accordance with the requirements of the Fire Marshal and the authorities having jurisdiction. The finished Tenant area sprinkler heads shall be [concealed type with white or chrome-plated cover] [recessed type with chrome-plated head and white or chrome-plated escutcheon]. [Refer to the Contractor’s or Owner’s “Instructions to Bidders” for proposal requirements related to the Tenant area sprinkler fit out.] Final approval for this sprinkler head shall be the Engineer, Architect and Owner.

5. All material and equipment used in the installation of the sprinkler systems and standpipes shall be listed by the Underwriters Laboratories, Inc., [and/or FM approved,] and shall be the latest design of the manufacturer.
6. Temperature ranges for all sprinkler heads shall be selected by the Subcontractor per NFPA 13 requirements based on use and proximity to heat sources.
7. Sprinkler heads shall be:

Head Type	Manufacturer				
	GEM	Reliable	Star	Viking	Victaulic
Upright Pendent	A-QR	F1FR	SG-QR	M-QR	V2703
Concealed Pendent	F690	G4A	QR-Q	Mirage	V3802
Recessed Pendent	A-QR	F1FR	SG-QR	M-QR	V2708
Dry Pendent	F960-QR Recessed	G3FR	SG-QR Recessed	M-QR Recessed	V3608
Dry Sidewall	F960/ Q-46	G3FR	SG-QR	M-QR	V3610
Recessed Sidewall	A/Q-71	F1FR - HSW1	SG-QR	M-QR	V3610
Sidewall (Brass)	A/Q-71	F1FR - HSW1	SG-QR	M-QR	V2710
Window Sprinkler	N/A	N/A	N/A	N/A	V10
Extended Coverage Upright Pendent		GFR-VELCO-ECOH		ECOH-ELO	

E. Flexible Sprinkler Drops:
1. Sprinklers installed into suspended tile ceilings may be joined to sprinkler piping by way of flexible sprinkler drop connections, Viking model VKFD28B or Victaulic series AQB. The flexible drop shall be UL Listed, [and/or FM approved], stainless steel in construction, include a protective braided jacket and be rated for a 200 psi working pressure. Flexible drops shall allow vertical and horizontal adjustment.

F. Floor Control Valves:
1. In locations where pressure is greater than 175 psig at full flow conditions, provide automatic pressure regulating control valves set for 175 psig where approved by the authorities having jurisdiction. Valves shall be UL listed, and/or FM approved, indicating type with rough brass finish, combination shutoff pressure reducing and pressure regulating feature under flow or no flow conditions, suitable for 400 psig working pressure and field set for the outlet pressure required by the hydraulically designed sprinkler system. Provide a pressure gauge on both sides of all automatic pressure regulating control valves.
2. At the Subcontractor's option, in locations where the full flow pressure does not exceed 175 psig and as approved by the authorities having jurisdiction, UL listed, and/or FM approved, Milwaukee Valve Company Model BB-SCS, Central Systems Model 13 indicating type, slow close butterfly control valve with threaded ends or Victaulic Series 708-W with grooved ends and complete with one (1) single pole double throw supervisory control tamper switch may be used in lieu of OS&Y gate valve with separate tamper switch. Switch rating shall be at least seven (7) amperes at 120V AC - 60 hertz.

G. Hangers: All hangers used in this installation shall be the approved type shown in the applicable NFPA 13 or Underwriters Laboratories listed, and/or FM approved, and shall be black steel.

H. Drain Piping: All drain piping shall be extended as shown on the Drawings.

I. Pipe Sleeves: The Subcontractor shall furnish and install all sleeves required for the lines and mains as needed for sprinkler piping. See Section 21 00 10 for requirements.

J. Water Flow Alarm Switches: UL listed, and/or FM approved, water flow alarm switches shall be furnished and installed at each sprinkler system connection to the wet pipe main where indicated on the Drawings and as required by the applicable NFPA Standards. Water flow switches similar to Potter Electric VSR-F shall be suitable for the working pressure of the system and shall be equipped with an adjustable retard feature to prevent false alarms. Coordinate all requirements with Division 28 FDAC System specifications.

K. Supervisory Switches: UL listed, and/or FM approved, valve supervisory switches will be furnished and installed by the Subcontractor for each sprinkler system and standpipe system valve, which can be used to shut off the flow of the fire suppression water to a zone. Locations shall be as indicated on the Drawings and as required by the applicable NFPA Standards. Switches shall be single pole, double throw type with cast aluminum housing and tamper proof cover. Switch rating shall be at least seven (7) amperes at 125/250V. Plug type switches will not be acceptable. Coordinate requirements with the Division 28 Section 28 31 30 titled “Fire Detection, Alarm and Communication System”.

L. At the Subcontractor’s option a Victaulic Test Master II Style 720 or AGF Manufacturing Inc. model 2500/2511A UL listed, and/or FM approved, inspector’s test fitting, which meets the requirements of the applicable NFPA 13, may be used in lieu of the inspector’s test piping indicated on the Drawings.

PART 3 EXECUTION

3.1 INSTALLATION

A. The complete sprinkler system installation shall be in accordance with the manufacturer’s recommendations and as indicated on the Drawings.

B. All fire suppression piping shall be made and installed in accordance with the applicable NFPA Standards, as indicated on the Drawings, and as specified herein.

C. Exposed piping shall be installed as nearly as possible parallel to or at right angles to the column lines of the building. Run all pipe straight and true. Springing or forcing piping into place will not be permitted. Install piping in such a manner as to prevent strain on the equipment.

D. Piping in finished portions of the building, except in mechanical equipment rooms, stairwells or where otherwise indicated on the Drawings shall be concealed.

E. All piping shall be carefully graded so as to eliminate traps and pockets. Where water traps cannot be avoided, provide drains.

F. Inspector’s test piping shall be equivalent size as the associated branch line and shall terminate in a smooth bore, corrosion resistant, orifice that is representative of the sprinklers installed in the system.

G. The inspector’s test piping shall be connected to the end of the most hydraulically remote sprinkler line and shall be equipped with a readily accessible full ported ball valve. Globe valves will not be accepted.

H. Make all joints smooth and unobstructed inside. Ream all cut pipe ends to remove burrs. Remove all obstructions prior to fabrication.

I. Install a union or flanges at equipment connections and elsewhere as indicated.

J. Make welded joints on pipe runs with continuous welds, without backing rings, and with pipe ends beveled before fabrication. Gas cuts shall be true and free from burned metal. Before welding, surfaces shall be thoroughly cleaned. The piping shall be carefully aligned and no metal shall project within the pipe.

K. All welded elbows shall be long radius types.

L. The Subcontractor shall furnish and install all sleeves and fire safing required for the lines and risers required for the sprinkler systems. See Section 21 00 10 for requirements.

M. All piping shall be of the sizes required by applicable codes but not less than the sizes indicated on the Drawings. The maximum water flow velocity shall be limited to five (5) feet per second in the suction line supplying the fire pumps. Main and loop piping shall be routed as indicated on the Drawings.

N. All welders shall be certified by ANSI B31.1.0-1967 - "Standard Qualification Welding Procedures, Welders and Welding Operators". Furnish welder performance qualification test certificates for positions 2G and 5G made in strict compliance with the above codes. Welders shall be certified for the type of pipe materials specified herein. All costs incident to procedures and welder's qualification tests shall be assumed by the Subcontractor. Two (2) copies of the qualification test report and certification with welder's identification number, letter, etc., shall be delivered to the Engineer for his file before any welding commences. Each weld shall bear the welder's identification mark permanently indented in the weld. Welding procedures shall also be in accordance with the requirements of the American Welding Society, current edition where applicable.

O. The Subcontractor shall coordinate the installation of pipes, hangers, valves and all other items of the fire suppression system with the work of all other trades so that all components will be installed to avoid conflicts, maintain the tenant flexibility zone at least 8" above the ceiling, and provide for proper servicing and maintenance of mechanical and electrical equipment in ceiling plenums. Components improperly installed shall be removed and/or relocated as directed by the Architect or Engineer at no additional cost to the Owner. Refer to Section 21 00 10 Paragraph 1.12 titled "Coordination Drawings" for additional requirements. If any departures from the Drawings are necessary to comply with any NFPA requirements or the authorities having jurisdiction, such revisions and/or departures shall be detailed and submitted for approval. Departures shall not be made without prior written approval by the Architect or Engineer. The Drawings are schematic and do not indicate inferred details. This installation shall also meet the approval of the local Fire Marshal.

P. All pipes throughout the building shall be thoroughly and substantially supported with UL listed, and/or FM approved, hangers and support devices. Furnish and install any special hangers or supports that may be required due to any peculiarities of construction. The design, selection spacing and application of horizontal pipe hangers, supports, restraints, anchors and guides shall be in accordance with the applicable NFPA 13 and 14.

Q. All vertical pipes 6" in diameter and smaller shall be supported at least every other floor with Grinnell Figure 261 or approved equal riser clamps.

R. Hanger rods, inserts, etc., shall be sized and installed as recommended by the manufacturer for the service intended. Hanger rods shall be cadmium plated or galvanized.

S. The Subcontractor shall submit pipe hanger, insert and support details for concrete floor construction to the base building Structural Engineer for review and approval prior to submission to the Engineer.

T. The entire sprinkler installation shall be installed in accordance with the rules and regulations of the applicable NFPA 13 and NFPA 101 and the local and state authorities having jurisdiction and have an inspection certificate furnished.

U. The sprinkler heads in public areas, atriums and in typical floor elevator lobbies shall be located as indicated on the Architectural reflected ceiling plans and coordinated with the lighting fixtures. Sprinkler head alignment is required in all areas. Sprinklers shall be provided with a temporary plastic cover when installed in plaster or drywall ceilings.

V. The Subcontractor utilizing a grooved piping system shall provide a letter of certification to the Engineer and Architect stating that a Project Site training session of at least two (2) hours duration was conducted for this Project by the grooved fitting manufacturer for the Subcontractor's supervisory and installing personnel.

W. Qualifications: Only Subcontractors and workmen experienced and regularly engaged in the installation of automatic sprinkler type fire suppression systems for the past five (5) years and licensed as required by the authorities having jurisdiction shall be permitted to install the system.

3.2 FACTORY TESTING

A. All standard factory tests shall be performed in accordance with the latest applicable version of NFPA and UL Standards.

3.3 FIELD TESTING

A. Inspections and Tests: All inspections, examinations and tests required by the authorities and/or agencies specified hereinbefore shall be arranged and paid for by the Subcontractor, as necessary to obtain complete and final acceptance of the system as installed. The certificates of inspection shall be in quadruplicate and shall be furnished as Submittal Data,
NOTE: All hydrostatic tests shall be performed as required by the reference standards cited hereinbefore and the authorities having jurisdiction, except the testing period shall be not less than eight (8) hours.

B. Periodic Inspection Service: After completion of the automatic sprinkler system and at the beginning of the warranty period the Subcontractor shall perform, without charge to the Owner, one (1) inspection of the sprinkler system during the warranty period. Inspection shall be as per the applicable NFPA No. 25, “Inspection, Testing and Maintenance of Water Based Fire Suppression Systems” plus the following maintenance to be performed during the course of the inspection:
1. Operation of all control valves.
2. Lubrication of operating stems of all interior valves.
3. Operation of water gong, electric alarms, supervisory panels, air compressors, alarm trip switches, flow switches, etc.
4. Cleaning of alarm valves.
5. Lubrication of Fire Department hose connection inlet and fire hose valve threads.
6. The Standard Form of the National Fire Sprinkler Association, Inc., “Report of Inspection” (Sheets 1 and 2), shall be filled out in triplicate after each inspection and the copies furnished as Submittal Data

C. The Subcontractor shall notify the Engineer and Owner in writing at least two (2) weeks prior to the day of the field test. The Engineer and Owner may witness the field test if they so desire.

D. Refer to Section 21 08 00 for additional testing requirements for fire suppression systems.

END OF SECTION