SECTION 21 13 13

FIRE PROTECTION SYSTEMS

PART 1 – GENERAL

1.1 PURPOSE

A. This guideline is intended to provide useful information to the Professional Service Provider (PSP) to establish a basis of design. PSP is to apply the principles of this section such that the University of Texas at Arlington (UTA) may achieve a level of quality and consistency in the design and construction of their facilities. Deviations from these guidelines must be approved by UTA and may require justification through Life Cycle Cost (LCC) analysis and submitted to UTA for approval.

1.2 **LESSONS LEARNED AND DESIGN CONSIDERATIONS**

A.

1.3 THE FOLLOWING SECTIONS ARE TO BE INCLUDED AS IF WRITTEN HEREIN:

A. Section 21 00 00 – Basic Fire Protection Requirements
B. Section 21 05 29 – Fire Protection Supports and Sleeves
C. Section 21 05 53 – Fire Protection Piping and Equipment Identification

1.4 SECTIONS INCLUDES

A. Pipe, fittings, valves, and connections for sprinkler, standpipe and fire hose, and combination sprinkler and standpipe systems.

1.5 RELATED SECTIONS

A. Section 31 23 16.13 – Trenching
B. Section 09 91 00 - Painting
C. Section 21 05 13 – Fire Protection Motors
D. Section 21 30 00 - Fire Pumps
E. Section 22 20 00 – Plumbing, Piping, Valves and Fittings

1.6 REFERENCES

A. ANSI/ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800.
B. ANSI/ASME B16.3 - Malleable Iron Threaded Fittings, Class 150 and 300.
C. ANSI/ASME B16.4 - Cast Iron Threaded Fittings, Class 125 and 250.
D. ANSI/ASME B16.5 - Pipe Flanges and Flanged Fittings.
E. ANSI/ASME B16.9 - Factory-made Wrought Steel Buttwelding Fittings.
F. ANSI/ASME B16.11 - Forged Steel Fittings, Socket-welding and Threaded.
G. ANSI/ASME B16.18 - Cast Copper Alloy Solder-Joint Pressure Fittings.
H. ANSI/ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
I. ANSI/ASME B16.25 - Buttwelding Ends.
J. ANSI/ASME B36.10 - Welded and Seamless Wrought Steel Pipe.
K. ANSI/ASME Sec 9 - Welding and Brazing Qualifications.
L. ANSI/ASTM A135 - Electric-Resistance-Welded Steel Pipe.
M. ANSI/ASTM A47 - Malleable Iron Castings.
N. ANSI/ASTM B32 - Solder Metal.
O. ANSI/AWS A5.8 - Brazing Filler Metal.
P. ANSI/AWWA C110 - Ductile Iron and Gray Iron Fittings.
Q. ANSI/AWWA C151 - Ductile Iron Pipe, Centrifugally Cast.
R. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc-coated Welded and Seamless.
S. ASTM A120 - Pipe, Steel, Black and Hot-Dipped, Zinc-coated (Galvanized) Welded and Seamless, for Ordinary Uses.
T. ASTM A234 - Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
U. ASTM A795 - Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire

Protection Use.
V. ASTM B75 - Seamless Copper Tube.
W. ASTM B88 - Seamless Copper Water Tube.
X. ASTM B251 - General Requirements for Wrought Seamless Copper and Copper-Alloy Tube.
Y. ASTM F442 - Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR).
Z. AWS D10.9 - Specifications for Qualification of Welding Procedures and Welders for Piping and Tubing.
AA. NFPA 13 - Installation of Sprinkler Systems, 2019
BB. NFPA 14 - Standpipe and Hose Systems, 2019
CC. NFPA 24 - Installation of Private Fire Service Mains and Their Appurtenances, 2019
DD. UL - Fire Protection Equipment Directory.
EE. City of Arlington, Texas, Fire Prevention Standards.
FF. State of Texas, State Fire Marshal Rules.
GG. All hose threads, coupling types, etc., utilized in the fire protection systems shall conform to the standards and requirements of the City of * , Texas Fire Department.

1.7 SUBMITTALS
A. Submit under provisions of Section 21 00 00.
B. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.
C. Product Data: Provide data on sprinkler heads, valves, and specialties, including manufacturer’s catalogue information. Submit performance ratings rough-in details, weights, support requirements, and piping connections.
D. Manufacturer's Certificate: Certify that system has been tested and meets or exceeds requirements specified and suggested by listed codes.
E. Provide certificate of compliance from authority have jurisdiction indicating approval of field acceptance tests.

1.8 OPERATION AND MAINTENANCE DATA
A. Submit under provisions of Section 21 00 00.
B. Maintenance Instructions: Include installation instructions, spare parts lists, procedures, and treatment programs.

1.9 QUALITY ASSURANCE
A. Sprinkler Systems: Perform work to NFPA 13.
B. Standpipe and Hose Systems: Perform to NFPA 14.
C. Welding Materials and Procedures: Perform to ASME Code.
D. Equipment and Components: Bear FM label or marking. Provide manufacturer's name and pressure rating marked on valve body.
E. Maintain one copy of each document on site.
F. Design system under direct supervision of a Professional Engineer experienced in design of this work and licensed in the State of Texas. All design submittal documents, and shop drawings shall bear the responsible engineers signed and dated seal.
G. All parts of fire protection piping systems shall conform to all provisions of Underwriters' Laboratories requirements. All equipment shall bear the Underwriters' Laboratories label of approval.
H. Determine volume and pressure of incoming water supply from residual pressure water flow test.

1.10 DELIVERY, STORAGE, AND HANDLING
A. Deliver, store, protect, and handle products to site under provisions of Section 21 00 00.
B. Deliver and store valves in shipping containers, with labeling in place.
C. Provide temporary protective coating on cast iron and steel valves.
D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

PART 2 – PRODUCTS

2.1 UNIONS:
A. Provide and install unions at proper points to permit removal of pipe and various equipment and machinery items without injury to other parts of the system. No unions will be required in welded lines. Unions 2 inch

and smaller shall be Class 300 AAR threaded malleable iron unions with iron to brass seats, and 2 ½ inch and larger shall be ground flange unions. Companion flanges on lines at various items for equipment machines and pieces of apparatus shall serve as unions to permit removal of the particular items.

2.2 FLANGES:

A. All 150 lb. and 300 lb. ANSI flanges shall be weld neck and shall be domestically manufactured, forged carbon steel, conforming to ANSI B16.5 and ASTM A-181 Grade I or II or A-105-71 as made by Tube Turn, Hackney or Ladish Company. Slip on flanges shall not be used. Each fitting shall be stamped as specified by ANSI B16.9 and, in addition, shall have the laboratory control number stenciled on each fitting for ready reference as to physical properties and chemical composition of the material. Complete test reports may be required for any fitting selected at random. Flanges which have been machined, remarked, painted or otherwise produced domestically from imported forges will not be acceptable. Flanges shall have the manufacturer's trademark permanently identified in accordance with MSS SP-25. Contractor shall submit data for firm certifying compliance with these Specifications. Bolts used shall be carbon steel bolts with semi-finished hexagon nuts of American Standard Heavy dimensions. Allthread rods will not be an acceptable for flange bolts. Steam system flange bolts shall have a tensile strength of 105,000 psi and an elastic limit of 81,000 psi and rated at least ANSI Grade V. Other bolts shall have a tensile strength of 80,000 psi and an elastic limit of 36,000 psi and rated at least ANSI Grade I.

B. Flat faced flanges shall be furnished to match 125 lb cast iron flanges on pumps, check valves, strainers, etc. with full flange gaskets. Bolting of raised face flanges to flat faced flanges is not allowed.

2.3 FLANGE GASKETS

A. Gaskets shall be placed between the flanges of all flanged joints.

B. Gaskets shall be ring form gaskets fitting within the bolt circle of their respective flanges. Gaskets shall be 1/16” thick asbestos free material recommended for service by Anchor, Garlock, or John Crane. The inside diameter of such gaskets shall conform to the nominal pipe size and the outside diameter shall be such that the gasket extends outward to the studs or bolts employed in the flanged joint.

C. Spares - Contractor shall provide ten spares for every flange size and rating.

2.4 WALL, FLOOR AND CEILING PLATES:

A. See Section 21 00 00.

2.5 SLEEVES, INSERTS, AND FASTENINGS:

A. General: All openings through all floors, walls, and roofs, etc., regardless of material for the passage of piping, etc., shall be sleeved. Refer to Specification Section 21 05 29.

2.6 MATERIALS:

A. PIPING:

1. All pipe used for fire protection standpipe systems and fire sprinkler systems shall be Schedule 40 black steel pipe conforming to ASTM A-795 or ASTM A-53. All piping 2 1/2" and larger shall be welded, unless otherwise indicated herein.
2. Use of piping, when approved by UT System, shall be “roll” grooved type; cut grooved pipe is not permitted.
3. No pipe smaller than 4" nominal pipe size shall be used for standpipe systems except for individual runouts to one hose cabinet. The 1-1/2" or 2-1/2" runout to cabinet shall have a maximum center line height of 60".
4. Scheduled 10 pipe is not permitted.

B. FITTINGS:

1. All welding type steel fittings employed in fabricating fire protection standpipe system and fire sprinkler systems shall conform to A.S.T.M. Specification A-234 and ANSI Standard B16.9-1964. All threaded fittings shall be Class 150 malleable iron fittings conforming to ASME B16.3. Grooved type fittings will not be accepted for use in standpipe systems unless specifically indicated. Pipe size changes shall be performed through the use of reducing tees or reducers designed for that purpose. The use of bushings is explicitly prohibited.
2. Unless otherwise shown or required, all fittings shall be welding type steel fittings. Refer to specification Section 22 20 00.
3. Threaded fittings shall be used when shown and shall be used from the point of connection of the pipe to the riser to each fire hose cabinet. Threaded fittings shall be Crane or Grinnell Company's Class 150

malleable iron fittings.

4. Grooved end couplings 2 ½" and larger shall be Victaulic Style 07 "Zero-Flex" Rigid Coupling, with EPDM gasket (minimum 700 psi working pressure) for use with roll grooved piping. Products by Gustin-Bacon, Gruvlok are acceptable, or Engineer-approved equal. Reducing type couplings, outlet couplings, "T" outlet fittings, cut-in style fittings, snap joint couplings, and flange adapter type fittings are not acceptable. Provide grooved fittings similar to standard weld fittings.
5. Extra heavy "Thread-o-lets" shall be used at each point of departure from the riser to the fire hose or valve cabinet. A "Thread-o-let" shall be installed below the level of the valve in the cabinet and a minimum of two (2) threaded ells shall be used to provide a swing joint connection from the riser to the valve in the cabinet.

2.7 VALVES:

A. General – All shutoff valves shall be UL listed and FM approved for fire protection service.
B. Shutoff valves for sizes 2 inch and smaller:
   1. Two-piece bronze ball valve, bubble-tight shutoff, full port, blow-out proof stem, chrome plated brass ball and silicon bronze stem, threaded end connections, conforming to MSS SP-110.
   2. One piece, butterfly valve, full port, threaded ends, bronze housing and body, stainless steel disc. EPDM disc seal and slow closing.
   3. All valves shall be furnished with two factory mounted internal supervisory switches.
C. Shut off valves for sizes over 2 inch:
   1. Butterfly valves lug type with EPDM molded in seat liner, ductile iron disc, stainless steel stem, manual gear operator, conforms to MSS SP-67 and MSS SP-25, with integral supervisory switch. Where a grooved piping system is allowed grooved end type butterfly valves may be used, consisting of ductile iron body and disc EPDM seats, stainless steel stem. Valves shall be equipped with internal supervisory switch.
   2. Gate valves – OS&Y (Outside Yoke and Stem) resilient wedge, epoxy coated interior and exterior, ASTM A 536 ductile iron valve body, bonnet and resilient wedge, ASTM B150 stem and flanged ends.
D. Check valves for sizes 2 inch and smaller:
   1. Horizontal swing, bronze body, conforming to MSS Sp-80, threaded ends and rubber disc.
E. Check valves for sizes over 2 inch:
   1. Iron body swing-check, bronze disc, seat ring and hinge pin, UL listed and FM approved, flanged ends, renewable seats and disc, tapped ¾ inch for ball drip assembly.
F. Standard of Quality for Fire Protection Valves:

Size	Type	Class	Manufacturer
2" and Smaller	Ball	300	Nibco No. KT-505-W-8, Stockham No. T-255-FB-P-UL
2" and Smaller	Butterfly	175	Milwaukee No. BB-SC02
2 ½" and Larger	Butterfly (lug)	250	Nibco No. LD3510-8
2 ½" and Larger	Butterfly (grooved)	300	Nibco No. GD-4765-8N
2" and Smaller	Check	200	Nibco No. KT-403-W
2 ½" and Larger	Check	175	Nibco No. F-908-W
2 ½" and Larger	Check (grooved)	250	Nibco No. G-917 W

2.8 BACKFLOW PREVENTERS:

A. Provide double check valve assembly on fire water service entry inside building, unless local municipality requires a reduced pressure type backflow preventer. Double check valve assembly shall be UL listed, FM approved and ASSE 1015 listed, with flanged OS & Y resilient seated gate valves with type 304 schedule 40 stainless steel housing and sleeve with replaceable check disc rubber, manufactured by Watts No. 757OSY or approved equal by Wilkins or Apollo.

2.9 SPRINKLER SYSTEM

A. SYSTEM DESCRIPTION
   1. System to provide coverage for entire building.
   2. Provide system to NFPA 13 [light hazard] [ordinary hazard, Group 1] [ordinary hazard, Group 2] [ordinary hazard, Group 3] [extra hazard] occupancy requirements unless otherwise noted. Refer to "FP" drawings for locations of design densities of specific rooms and areas.

3. Interface system with building fire and smoke alarm system.

B. SUBMITTALS
1. Submit under provisions of Section 21 00 00.
2. Preliminary Shop Drawings: Prior to detailed submission, submit preliminary layout of finished ceiling areas indicating only head locations coordinated with ceiling installation.
3. Shop Drawings: Indicate hydraulic calculations, detailed pipe layout, hangers and supports, components and accessories. Indicate system controls.
4. Submit shop drawings, product data, and hydraulic calculations to Factory Mutual for review. Submit copies of all information, and review comments to Architect/Engineer and Owner.
5. Samples: Submit two of each style of sprinkler head specified.

C. PROJECT RECORD DOCUMENTS
1. Submit under provisions of Section 21 00 00.
2. Record actual locations of sprinkler heads and deviations of piping from drawings. Indicate drain and test locations.

D. OPERATION AND MAINTENANCE DATA
1. Submit under provisions of Section 21 00 00.
2. Maintenance Data: Include components of system, servicing requirements, Record Drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.

E. QUALITY ASSURANCE
1. Perform Work in accordance with NFPA 13.
2. Equipment and Components: Bear FM label or marking.
3. Maintain one copy of all documents on site.

F. EXTRA MATERIALS
1. Furnish under provisions of Section 21 00 00.
2. Provide extra sprinkler heads as suggested under provisions of NFPA 13.
3. Provide suitable wrenches for each head type.
4. Provide metal storage cabinet in location designated.

G. PRODUCTS
1. General: The Contractor shall provide all components required for the complete installation of automatic sprinkler systems as hereinafter specified and indicated on the Drawings.
2. Qualifications of the Installer: The system shall be installed by a firm regularly engaged in the design and installation of automatic sprinkler systems in accordance with requirements of the National Fire Protection Association and Fire Protection and Engineering Bureau of Texas, or by an authorized agent of such firm. Evidence to support the above requirements may be required and any proposed installer who cannot show suitable experience will be rejected.
3. System Layout: The fire sprinkler areas, piping, head locations, etc. as indicated is only for Contractor's reference as to areas to be protected and possible piping routes. If header or manifold sizes are given in the drawings, then the sizes given shall be the minimum sizes installed. Actual number, spacing and location of heads, size and routes of piping shall be provided in accordance with the applicable Specifications and acceptable Shop Drawings. All layouts, head spacing, coverage, etc., as may be required by the referenced authorities and/or Architectural and Structural conditions shall be made without increase in cost to the Owner or the Architect/Engineer. Modifications to head spacing, pipe routes, etc. shall be closely coordinated with the work of all other trades. The Fire Sprinkler Subcontractor shall be responsible for the design and installation of the fire sprinkler system as described herein and on the project drawings. The piping of the system shall be sized used the "hydraulic" method, as included in NFPA Standard No. 13. Piping sized using the "schedule" method is unacceptable, except where expanding an existing "scheduled" system.
4. Shop Drawings: Shop Drawings shall be submitted prior to fabrication. The Shop Drawings shall include detail plans of sprinkler systems including piping sizes, sections and plot plan indicating the locations of underground supply connections, control valves, fire department connections, and other equipment to be used. The Shop Drawings shall become an integral part of these Specifications.
5. Materials and Equipment:
    a. General: All materials and equipment used in the installation of the sprinkler system shall be listed as approved by the Underwriters' Laboratories, Inc., List of Inspected Fire Protection Equipment and Materials, or the Factory Mutual Testing Laboratories List of Approved Equipment, Fire Protection Devices and Devices Involving Fire Hazard, and shall be the latest design of the manufacturer. All piping, control valves, drain valves, fittings, etc. shall be as specified under this

Section, Fire Protection System, & in Section 22 20 00 utilizing welded, flanged, and threaded fittings only. Where valves are not specified by Figure No. they shall be of specified manufacture, U.L. listed for service, and of same quality level as Figure Nos. specified. All pipe 2 1/2" and larger shall be welded, except as may be allowed herein. All pipe 2" and smaller shall be threaded using Class 150 pound malleable iron, A135 Schedule 40 black steel pipe and fittings. Note that if galvanized pipe or fittings are installed in other than dry systems, the contractor shall be responsible to remove the galvanized pipe or fittings and replace them with specified materials as soon as possible prior to further installation of the system. (EXCEPTION: Dry pipe systems shall be hot dipped galvanized pipe and fittings of same schedule as dry systems, per Factory Mutual recommendations.)

6. Sprinkler Heads:
   a. Unless otherwise specified or indicated on the Drawings, sprinkler heads shall be quick response type spray heads of the upright or pendant ordinary degree temperature rating type except that sprinkler heads to be installed in the vicinity of heating equipment and lights shall be of the temperature rating required for such locations by National Fire Protection Association Standard No. 13. [Chrome plated bronze heads shall be installed in all locations.] [Ceiling sprinklers shall be Tyco No. Ty-FRB semi-recessed with white finish and polished chrome plated brass sprinkler head. Uprights shall be Tyco No. Ty-FRB.
   b. Heads shall be located in a symmetrical pattern related to ceiling features such as grid, beams, light fixtures, diffusers, etc., and where applicable, heads shall be located symmetrically with the ceiling grid, centered in two directions.
   c. The Contractor shall provide spare heads equal to one percent (1%) of the total number of heads installed under the Contract, but not less than ten (10). The heads shall be packed in a suitable wall mounted sprinkler cabinet and shall be representative of, and in proportion to, the number of each type and temperature rating heads installed. In addition to the spare heads, the Contractor shall provide not less than one special sprinkler head wrench for each type of head. The cabinet shall be located where directed by the Construction Inspector.
7. Piping: Installation of piping, fittings and valves shall be as specified in Chapter 3, System Components, NFPA Standard No. 13, except where noted otherwise. Piping shall be concealed in all areas with finished ceilings. Piping shall be sterilized as specified in Section 21 20 00. The O.S.& Y. valves shall be provided as specified herein.
8. Note that the use of piping bushings for any purpose is explicitly prohibited.
9. Water Alarm: A water motor alarm shall be connected to each alarm valve and shall discharge to a brass alarm gong located on the exterior of the building as directed by the Architect. Alarm gong finish to be selected by the Architect. The alarm valves shall be Underwriters' Laboratories approved, wet type, connected to water supply and indicated on the Shop Drawings. Each alarm valve shall be provided with a circuit closer. Valves shall conform to the equipment of NFPA Standard No. 13, complete with retarding chamber and pressure switch.
10. Water Flow Alarm Switch: Provide, where indicated on the Drawings, McDonnell UL approved line size flow switches. Flow switch shall be provided with delay, adjustable up to 90 seconds (60 to 90 seconds in Austin). See Division 26 for electrical signal connection by others to these flow switches.

NOTE TO ENGINEER: CONFIRM CAMPUS STANDARD DELAY SETTING, IF ANY, AND SPECIFY INSTALLATION SETPOINT.

H. Add locations and hazards as required by project conditions.

Location	System Type/Hazard
Offices, Lobbies	Light Hazard
Warehouses	Ordinary Hazard, Group 2
Laboratories	Ordinary Hazard, Group 2
Mechanical Rooms	Ordinary Hazard, Group 2
Computer Rooms	Light Hazard, Pre-action

2.10 STANDPIPE SYSTEMS:

A. General: The Contractor shall provide all components required for the complete installation of standpipe systems as hereinafter specified and indicated on the Drawings.
B. Qualifications of the Installer: The system shall be installed by a firm regularly engaged in the design and

installation of automatic sprinkler systems in accordance with requirements of the National Fire Protection Association and Fire Protection and Engineering Bureau of Texas, or by an authorized agent of such firm. Evidence to support the above requirements may be required and any proposed installer who cannot show suitable experience will be rejected.

C. System Layout: The fire zones, piping, etc. as indicated is only for Contractor's reference as to areas to be protected and for possible piping routes. If header or manifold sizes are given in the drawings, then the sizes given shall be the minimum sizes installed. Actual number, spacing and locations, size and routes of piping shall be provided in accordance with the applicable Specifications and acceptable Shop Drawings. All layouts, coverage, etc., as may be required by the referenced authorities and/or Architectural and Structural conditions shall be made without increase in cost to the Owner or the Architect/Engineer. Modifications to head spacing, pipe routes, etc. shall be closely coordinated with the work of all other trades. The Fire Sprinkler Subcontractor shall be responsible for the design and installation of the fire system as described herein and on the project drawings.

D. Shop Drawings: Shop Drawings shall be submitted prior to fabrication. The Shop Drawings shall include detail plans of systems including piping sizes, sections and plot plan indicating the locations of underground supply connections, control valves, fire department connections, and other equipment to be used. The Shop Drawings shall become an integral part of these Specifications. Submit to Factory Mutual for review and comment.

E. Materials and Equipment:
   1. General: All materials and equipment used in the installation of the sprinkler system shall be listed as approved by the Underwriters' Laboratories, Inc., List of Inspected Fire
   2. Protection Equipment and Materials, or the Factory Mutual Testing Laboratories List of Approved Equipment, Fire Protection Devices and Devices Involving Fire Hazard, and shall be the latest design of the manufacturer. All piping, control valves, drain valves, fittings, etc. shall be as specified under this Section, utilizing welded, flanged, and threaded fittings only. Where valves are not specified by Figure No. they shall be of specified manufacture,
   3. U.L. listed for service, and of same quality level as Figure Nos. specified. All pipe 2 1/2" and larger shall be welded, except as may be allowed herein. All pipe 2" and smaller shall be threaded using Class 150 malleable iron, A120 Schedule 40 black steel pipe and fittings. Note that if galvanized pipe or fittings are installed, the contractor shall be responsible to remove the galvanized pipe or fittings and replace them with specified materials as soon as possible prior to further installation of the system.

2.11 FIRE DEPARTMENT SIAMESE CONNECTIONS:

A. At the points designated on the accompanying Drawings, install Siamese fittings required for fire protection purposes. From a point on the incoming water supply line, the Contractor shall extend water line for fire protection purposes to Siamese connections.

B. Provide 2 way wall type Siamese connection equal to Potter Roemer No. _ double clapper flush type Siamese connections with 2 ½ outlets having threads complying with the requirements of the Fire Department of the City of * . They shall have proper caps with pin type lugs attached to the body of the Siamese connections with substantial chains. The plate fitting against the building shall have raised letters reading "AUTOMATIC SPRINKLER" or "STANDPIPE". All external surfaces shall be chromium plated polished surfaces or as directed by Architect.

C. Provide [2 way] [3way] [4 way] [6 way] free standing type Siamese shall be equal to Potter-Romer No. cast brass body with 2 ½” outlets and escutcheon. They shall have proper caps with pin type lugs attached to the body of connection with substantial chains. "STANDPIPE" or "AUTOMATIC SPRINKLER" is to be cast on head of connection. All external surfaces shall be chromium plated polished surfaces or as directed by Architect.

2.12 ROOF MANIFOLDS:

A. Roof manifolds shall be equal to Potter Roemer cast brass Underwriters' Laboratory listed horizontal roof manifold. Complete with listed brass manufactured by Potter Roemer No. _ valve and 2-1/2" brass caps and chains, [2 way] [3 way] outlets shall be 7-1/2 threads per inch iron pipe size.

B. Systems shall be flushed through a temporary hose until the system is clean. Any leaks found shall be remedied in each instance in a manner approved in advance by the Owner's duly authorized representative. The systems shall be alternately tested and repaired where necessary until they have demonstrated their capability to withstand the test pressure for a period of 24 hours without any appreciable drop in the test pressure initially applied.

PART 3 – EXECUTION

3.1 PREPARATION - ALL SYSTEMS:

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
B. Remove scale and foreign material, from inside and outside, before assembly.
C. Prepare piping connections to equipment with flanges or unions.
D. Flush entire system of foreign matter prior to installation of sprinkler heades.

3.2 SYSTEM TESTS

A. Hydrostatically test entire standpipe system in accordance with NFPA 14 and sprinkler system in accordance with NFPA 13, with a pressure of 200 psi maintaining that pressure with loss for 24 hours. Where portions of the system exceeds 150 psi working per the system shall be tested at a pressure of 50 psi in excess of the system working pressure for a 24 hour period.
B. Test shall be witnessed by campus Fire Marshal.

3.3 INSTALLATION

A. SPRINKLERS
   1. Install piping in accordance with NFPA 13 for sprinkler systems, NFPA 14 for standpipe and hose systems, and NFPA 24 for service mains. Note that the piping sizes indicated in the plans are the minimum acceptable. The Qualified Contractor shall provide proper sizes, materials and installation as required in the appropriate NFPA Standard.
   2. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient. See Section 21 00 00 and 21 05 29.
   3. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.
   4. Provide drain valves at main shut-off valves, low points of piping and apparatus piped to exterior of building and not to interfere with pedestrian pathways of landscaping when draining. Provide Fire Department test station.
   5. Locate outside alarm gong on building wall as indicated.
   6. Place pipe runs to minimize obstructions with other work.
   7. Place piping in concealed spaces above finished ceilings.
   8. Center heads in two directions in ceiling tile and provide piping offsets as required.
   9. Apply paper cover to ensure concealed sprinkler head and cover plates do not receive field paint finish.
   10. Install and connect fire pumps in accordance with Section 21 30 00 and NFPA 13.
   11. Locate fire department connection with sufficient clearance from walls, obstructions, or adjacent Siamese connectors to allow full swing of fire department wrench handle.

B. STANDPIPES
   1. Fire standpipe risers shall be located at the stairs as shown on the drawings. System shall be [empty (dry without air pressurization) and] shall be complete with fire valves for Fire Department hose connections.
   2. Install in accordance with manufacturer's instructions.
   3. Install in accordance with NFPA 14 for standpipe and hose systems.
   4. Locate and secure hose cabinet plumb and level. Establish top of cabinet surface 66 inches above finished floor.
   5. All polyester hoses must be new and unused at the time of acceptance of the project.
   6. Locate angle valve in cabinet at 60 inches above floor.
   7. Locate dry chemical fire extinguisher in cabinet.
   8. Connect standpipe system to water source ahead of domestic water connection.
   9. Where static pressure exceeds 100 psi at any hose station, provide pressure reducing valve to prevent pressure on hose exceeding 90 psi.
   10. Provide [two-way] [three-way] fire department outlet connection on roof.

END OF SECTION