ADDENDUM NO. 001  (Rev 01/2017)
ISSUE DATE: 06/17/2020

RE:  
EDUCATIONAL SCIENCES WCER RENOVATIONS
UNIVERSITY OF WISCONSIN-MADISON
1025 W. JOHNSON STREET
MADISON, WISCONSIN

Division Project No. 0154-1701

BID OPENING:  
MEP Bidders:  2:00 P.M., June 2, 2020
GPC Bidders:  2:00 P.M., July 16, 2020

FROM:  DESTREE DESIGN ARCHITECTS, INC.
222 W. Washington Ave. #310
Madison, WI 53703
Phone: (608) 268.1499

TO:  Prospective Bidders

This addendum forms a part of the Contract Documents and modifies the original Contract Documents dated May 27, 2020 as noted below.  Acknowledge receipt of this Addendum by inserting the number and issue date of this addendum in the blank space provided on the Bid Form.  Failure to do so may subject the Bidder to disqualification.

This Addendum consists of 2 pages and the attached documents: Specifications sections 21 05 00, 21 05 29, 21 08 00, 21 10 00 and drawing sheets A200 & E201.

CHANGES TO BIDDING REQUIREMENTS:

1.  N/A

CHANGES TO CONDITIONS OF THE CONTRACT:

2.  N/A

CHANGES TO SPECIFICATIONS (DIVISIONS 2 THRU 33):

2.  REMOVE: Line 50, “26 24 16 Panelboards” from TC-3 of the TABLE OF CONTENTS VOLUME 2.
3.  ADD: Section 21 05 00, COMMON WORK RESULTS FOR FIRE SUPPRESSION to the Technical specifications.
4.  ADD: Section 21 05 29, HANGERS AND SUPPORTS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT to the technical specifications.
5.  ADD: Section 21 08 00, COMMISSIONING OF FIRE SUPPRESSION to the technical specifications.
6.  ADD: Section 21 10 00, WATER BASED FIRE SUPPRESSION SYSTEMS to the Technical specifications.

CHANGES TO DRAWINGS:

1.  A200 FOURTH FLOOR REFLECTED CEILING PLAN
   a.  REMOVE: (1) W1 fixture and Keynote 4 in room 452.
   b.  REMOVE: (1) W2 fixture and Keynote 5 in room 452S.
2. **E201 FOURTH FLOOR NEW WORK PLAN – ELECTRICAL LIGHTING:**
   a. **REMOVE:** (1) W1 fixture and (1) dimming switch (j) in room 452.
   b. **REMOVE:** (1) W2 fixture and (1) dimming switch (c) in room 452S.

3. **E501 ELECTRICAL SCHEDULES**
   a. **REMOVE:** W2 fixture from Lighting Fixture Schedule. NO DRAWING ISSUED.

**GENERAL QUESTIONS/CLARIFICATIONS:**

1. N/A

END OF ADDENDUM
SECTION 21 05 00
COMMON WORK RESULTS FOR FIRE SUPPRESSION
BASED ON DFD MASTER SPECIFICATION DATED 11/01/2019

PART 1 - GENERAL

SCOPE
This section includes information common to two or more technical fire protection specification sections or items that are of a general nature, not conveniently fitting into other technical sections.

The specifications and drawings are scope documents based on the Owner’s requirements for the fire protection systems. It is the intent of the documents to detail and specify the minimum requirements and components. It is the responsibility of the Contractor to design and install a complete fire protection system in compliance with NFPA, State, and the Local Authority Having Jurisdiction codes and requirements. Pipe and equipment sizing shown in the documents is the minimum allowed. If larger size is required, it is to be included in the bid.

Fire protection impairment is the shutdown, in whole or part of a fire protection system. The Fire Protection Impairment Program was put together by the University to follow requirements made by the NFPA, IFC, and OSHA in order to supervise the safe shutdown of a fire protection system, to control potential fire hazards during impairment, and to restore the fire protection system to service as soon as possible. This program applies to all University of Wisconsin – Madison employees, outside contractors and their representatives, any company representative hired by the University of Wisconsin – Madison to provide service, or any other outside trade worker who will be working at or within a University of Wisconsin – Madison facility.

During the impairment of a fire protection system several actions must be taken as outlined in the Fire Protection Impairment Program. These primarily include completing the pre- and post-impairment forms as well as the fire watch form if necessary. In addition to completing the appropriate forms, the Impairment Coordinator at UW-Madison, John Rindfleisch, will need to be contacted to authorize the shutdown of the fire protection system, and to ensure that the impairment procedures are followed and completed.

Included are the following topics:

PART 1 - GENERAL
Scope
Related Work
Reference
Reference Standards
Quality Assurance
Continuity of Existing Services
Protection of Finished Surfaces
Sleeves and Openings
Sealing and Fire Stopping
Off Site Storage
Codes
Design Criteria
Temporary Standpipes
Certificates and Inspections
Submittals
Operating and Maintenance Instructions
Training of Owner Personnel
Record Drawings

PART 2 - PRODUCTS
Access Panels and Doors
Identification
PART 3 - EXECUTION

1. Sealing and Fire Stopping

2. RELATED WORK
   This section applies to all Division 21 sections of fire suppression.

   3. Section 07 84 00 – Fire Stopping
   4. Section 01 91 01 – Commissioning Process

3. REFERENCE
   Applicable provisions of Division 1 govern work under this section.

4. REFERENCE STANDARDS
   Abbreviations of standards organizations referenced in this and other sections are as follows:

5. AGA American Gas Association
6. ANSI American National Standards Institute
7. ASME American Society of Mechanical Engineers
8. ASPE American society of Plumbing Engineers
9. ASTM American Society for Testing and Materials
10. AWWA American Water Works Association
11. AWS American Welding Society
12. CGA Compressed Gas Association
13. CS Commercial Standards, Products Standards Sections, Office of Engineering Standards Service, NBS
14. EPA Environmental Protection Agency
15. FM FM Global
17. IAPMO International Association of Plumbing & Mechanical Officials
18. IEEE Institute of Electrical and Electronics Engineers
19. ISA Instrument Society of America
20. DSPS State of Wisconsin Dept. of Safety and Professional Services
21. MSS Manufacturer's Standardization Society of the Valve & Fitting Industry, Inc.
22. NBS National Bureau of Standards
23. NEC National Electric Code
24. NEMA National Electrical Manufacturers Association
25. NFPA National Fire Protection Association
26. STI Steel Tank Institute
27. UL Underwriters Laboratories Inc.

5. QUALITY ASSURANCE
   Substitution of Materials: Refer to Section GC - General Conditions of the Contract, Equals and Substitutions.
All products and materials used are to be new, undamaged, clean and in good condition. Existing products and materials are not to be reused unless specifically indicated.

Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contract documents, the contractor is responsible for all costs involved in integrating the equipment or accessories into the system and for obtaining the intended performance from the system into which these items are placed.

CONTINUITY OF EXISTING SERVICES
Do not interrupt or change existing services without prior written approval from the Owner's Project Representative. When interruption is required, coordinate scheduling of down-time with the Owner to minimize disruption to his activities. Unless specifically stated, all work involved in interrupting or changing existing services is to be done during normal working hours.

PROTECTION OF FINISHED SURFACES
Refer to Division 1, General Requirements, Protection of Finished Surfaces.

SLEEVES AND OPENINGS
Refer to Division 1, General Requirements, Sleeves and Openings.

SEALING AND FIRESTOPPING
Sealing and firestopping of sleeves/openings between piping, etc. and the sleeve or structural opening shall be the responsibility of the contractor whose work penetrates the opening. The contractor responsible shall hire individuals skilled in such work to do the sealing and fireproofing. Provide all fire stopping of fire rated penetrations and sealing of smoke rated penetrations in compliance with section 07 84 00 Fire Stopping.

OFF SITE STORAGE
Prior approval by DFD and the A/E will be needed. The contractor shall submit Storage Agreement Form AD-BDC-74 to DFD for consideration of off site materials storage. Generally, sleeves, pipe/pipe fittings and similar rough-in material will not be accepted for off site storage. No material will be accepted for off site storage unless shop drawings for the material have been approved.

CODES
Comply with requirements of Wisconsin Administrative Code, Dept. of Safety and Professional Services, NFPA Standards and local Fire Chief or Fire Marshal (AHJ, Authority Having Jurisdiction) regarding design, materials and installation.

DESIGN CRITERIA
Design fire protection systems in accordance with codes, standards and regulations noted above.

Hydraulically design system for the most remote area based on the following:

<table>
<thead>
<tr>
<th>Location</th>
<th>Occupancy Classification</th>
<th>Area (SqFt)</th>
<th>Density (GPM/SqFt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lobbies, Offices, Lounges,</td>
<td>Light Hazard</td>
<td>1500</td>
<td>0.10</td>
</tr>
<tr>
<td>Toilet Rooms and Similar</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Custodial, Storage, Mechanical</td>
<td>Ordinary Hazard (Group 1)</td>
<td>1500</td>
<td>0.15</td>
</tr>
<tr>
<td>Rooms and Similar</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General Storage, Record Storage</td>
<td>Ordinary Hazard (Group 2)</td>
<td>1500</td>
<td>0.20</td>
</tr>
<tr>
<td>High Density Storage and Similar</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Remote area increase for drypipe/preakion systems and other circumstances i.e. sloped or higher ceilings are to be added to the minimum remote areas noted above as required by code. Remote area reduction for use of quick response sprinkler heads is not allowed without prior approval of the A/E and DFD.

New floor control valve and zone is to be made by connection into existing standpipe system.

Provide hydraulic calculations based on the local fire department’s pumper apparatus serving as the source of supply at the fire department connection per the requirements of the NFPA 14 Standard, current prevailing edition.

Available water supply data for system design is as follows: Reuse existing fire pump in lower level.

Verify and obtain any additional test data required for design.

City of Madison Fire Department direction is to be followed on system documentation, including complete system calculations and labeling. Coordination is required.

CERTIFICATES AND INSPECTIONS

Refer also to Division 1, General Conditions, Permits, Regulations, Utilities and Taxes.

Obtain and pay for all required State or local installation inspections except those provided by the Architect/Engineer. Deliver originals of NFPA test certificates and DFD test reports to the Division’s construction representative. Include copies of the certificates and reports in the Operating and Maintenance Instructions.

SUBMITTALS

Refer to Section GC - General Conditions of the Contract, Submittals.

Shop drawing submittals are to be bound, labeled, contain the project manual cover page and a material index list page showing item designation, manufacturer and additional items supplied with the installation. Submit for all equipment and systems as indicated in the respective specification sections, marking each submittal with that specification section number. Mark general catalog sheets and drawings to indicate specific items being submitted and proper identification of equipment by name and/or number, as indicated in the contract documents. Include wiring diagrams of electrically powered equipment.

The specific items that will be required for submittals shall be coordinated with the DFD Project Representative, the A/E, and the General Prime Contractor for inclusion in the project submittal log.

Plan submittal for review and approval to the Department of Safety and Professional services is required for all state buildings with the exception of the replacement in kind of equipment and projects that include 20 or fewer sprinkler heads. Licensed health care facilities require submittal and approval from the Department of Health Services. Submittals shall be sent to the local Fire Chief or Fire Marshal for review prior to the Architect/Engineer. Include a copy of all review/approval letters in submission to Architect/Engineer.

Submit plans indicating water supply location and size, piping layout and size, sprinkler locations and type, hanger locations and type, equipment locations and type, valve locations and type, occupancy classes, hydraulic reference points, design areas and discharge densities.

Submit hydraulic calculations for water supply and sprinkler and standpipe systems. Include summary sheet and detailed work sheets. Describe characteristics of water supply and location of effective point used in calculations. Include graph illustration of water supply, hose demand, sprinkler demand and in-rack sprinkler demand. Where a fire pump is used, graph primary rating point, secondary rating point and churn pressure of pump and combined water supply.
Submit sufficient quantities of data sheets and shop drawings to allow the following distribution:

- Operating and Maintenance Manuals 2 copies
- Division of Facilities Development 1 copy
- Architect/Engineer 1 copy
- Local Fire Chief or Marshal 1 copy

**OPERATING AND MAINTENANCE INSTRUCTIONS**

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

In addition to the general content specified under GENERAL REQUIREMENTS supply the following additional documentation:

- Copies of all approved submittals along with approval letters.
- Manufacturer's wiring diagrams for electrically powered equipment.
- Additional information as indicated in the technical specification sections

**TRAINING OF OWNER PERSONNEL**

Instruct Owner's personnel in the proper operation, maintenance and testing of systems and equipment provided as part of this project. Include not less than 2 hours of instruction, using the Operating and Maintenance manuals and record drawings during this instruction. Demonstrate testing, startup and shutdown procedures for all equipment. All training to be during normal working hours.

**RECORD DOCUMENTS**

Refer to Division 1, General Requirements, Record Documents.

In addition to the data indicated in the General Requirements, maintain fire protection layout record drawings and hydraulic calculations on originals prepared by the installing contractor/subcontractor. Include copies of these record drawings and calculations with the Operating and Maintenance manuals.

**PART 2 - PRODUCTS**

**ACCESS PANELS AND DOORS**

**LAY-IN CEILINGS:**
Removable lay-in ceiling tiles in 2 X 2 foot or 2 X 4 foot configuration provided under Division 09 are sufficient; no additional access provisions are required unless specifically indicated.

**CONCEALED SPLINE CEILINGS:**
Removable sections of ceiling tile held in position with metal slats or tabs compatible with the ceiling system used will be provided under Division 09.

**METAL PAN CEILINGS:**
Removable sections of ceiling tile held in position by a pressure fit will be provided under Division 09.

**MASONRY WALLS, GYPSUM BOARD AND PLASTER WALLS AND CEILINGS:**
16 gauge frame with not less than a 20 gauge hinged door panel, prime coated steel for general applications, stainless steel for use in toilets, showers, and similar wet areas, concealed hinges, screwdriver operated cam latch for general applications, key lock for use in public areas, UL listed for use in fire rated partitions if required by the application. Use the largest size access opening possible, consistent with the space and the equipment needing service; minimum size is 12" by 12".

**IDENTIFICATION**

**STENCILS:**
Not less than 1/2" high letters for pipe sizes 1" through 2-1/2" and 1" high letters/numbers for pipe sizes 3" and above for marking pipe and equipment. Apply flow arrows to piping.
ADHESIVE LABELS:
Pressure-sensitive, adhesive backed, vinyl pipe markers with applicable labeling, ¾” min. size for lettering and surrounding tape on both ends. With flow arrows on piping. Conforming to ANSI, ANSI and NFPA standards. Seton Opti-Code, MSI, Brady or approved equal. Clean piping before application.

SNAP-AROUND MARKERS:
One-piece, pre-formed, vinyl construction, snap-around or strap-around pipe markers with applicable labeling, ¾” min. size for lettering. Provide nylon ties on each end of pipe marker. Seton Setmark or approved equal.

SIGNS:
Metal construction, baked porcelain enamel finish signs, sizes conforming to NFPA no. 13 and 7-1.2, with holes and s-hooks/chains for hanging or securing. With applicable labeling. MSI, Seton, W.H. Brady or equal.

ENGRAVED NAME PLATES:
White letters on a black background, 1/16” thick plastic laminate, beveled edges, screw mounting, Setonply Style 2060 by Seton Name Plate Company or Emedolite Style EIP by EMED Co., or equal by W. H. Brady.

VALVE TAGS:
Round brass tags with 1/2” numbers, 1/4” system identification abbreviation, 1-1/4” minimum diameter, with brass jack chains with brass "S" hooks or one piece nylon ties around the valve stem, available from EMED Co., Seton Name Plate Company, MSI or W. H. Brady.

SEALING AND FIRE STOPPING
FIRE AND/OR SMOKE RATED PENETRATIONS:
Provide all fire stopping of fire rated penetrations and sealing of smoke rated penetrations in compliance with section 07 84 00 “Fire Stopping”.

NON-RATED PENETRATIONS:
Pipe Penetrations:
At pipe penetrations of non-rated interior partitions, floors and exterior walls above grade, use urethane caulk in annular space between pipe insulation and sleeve. For non-rated drywall, plaster or wood partitions where sleeve is not required, use urethane caulk in annular space between pipe insulation and wall material.

PART 3 - EXECUTION

DEMOLITION
Perform all demolition as indicated on the drawings to accomplish new work. Where demolition work is to be performed adjacent to existing work that remains in an occupied area, construct temporary dust partition to minimize the amount of contamination of the occupied space. Where pipe is removed and not reconnected with new work, cap ends of existing services as if they were new work. Coordinate work with the User Agency to minimize disruption to the existing building occupants.

All pipe, sprinklers, equipment, wiring, associated conduit and similar items demolished, abandoned, or deactivated are to be removed from the site by the Contractor except as specifically noted otherwise. All designated equipment is to be turned over to the User Agency/Owner for his use at a place and time he so designates. Maintain the condition of material and/or equipment that is indicated to be reused equal to that existing before work began.
CONCRETE WORK
Cast-in-place concrete within the building will be performed by the Division 3 Contractor. Provide all layout drawings, anchor bolts, metal shapes, and/or templates required to be cast into concrete or used to form concrete for support or installation of plumbing piping, fixtures, specialties and equipment. Coordinate locations of equipment, pipe penetrations in wet areas, etc. with the Division 3 Contractor.

CUTTING AND PATCHING
Refer to Division 1, General Requirements, Cutting and Patching.

BUILDING ACCESS
Arrange for the necessary openings in the building to allow for admittance of all apparatus. When the building access was not previously arranged and must be provided by this contractor, restore any opening to its original condition after the apparatus has been brought into the building.

EQUIPMENT ACCESS
Install all piping, conduit and accessories to permit access to equipment for maintenance and service. Coordinate the exact location of wall and ceiling access panels and doors with the General Prime Contractor, making sure that access is available for all equipment and specialties. Access doors in general construction are to be furnished by the Fire Protection Contractor and installed by the General Prime Contractor. Provide color coded thumb tacks or screws, depending on the surface, for use in accessible ceilings which do not require access panels.

COORDINATION
Coordinate all work with other contractors prior to installation. Any work that is not coordinated and that interferes with other contractor's work shall be removed or relocated at the installing contractor's expense. Verify that all devices are compatible for the type of construction and surfaces on which they will be used.

IDENTIFICATION
Identify equipment in mechanical equipment rooms by stenciling equipment number and service with one coat of black enamel against a light background or white enamel against a dark background. Use a primer where necessary for proper paint adhesion. Where stenciling is not appropriate for equipment identification, engraved name plates may be used. Identify interior piping mains not less than once every 25 feet, not less than once in each room, adjacent to each access door or panel, and on both sides of the partition where exposed piping passes through walls or floors. Place flow directional arrows at each pipe identification location. Use one coat of black enamel against a light background or white enamel against a dark background, or approved pipe marking label systems, or provide snap-around type pipe markers as specified in Part 2 – Products. Identify valves with signs per NFPA rulings. Provide hydraulic design information sign of permanently marked weatherproof metal or engraved nameplate material. Secure to alarm valve with brass chain. Information to include location of the design areas, discharge densities, required flow and residual pressure at the base of riser, hose stream demand and sprinkler demand.

SLEEVES AND OPENINGS
Pipe penetrations in existing concrete floors: Core drill openings. Where penetrating pipe or conduit weight is supported by floor, provide manufactured product or structural bearing collar designed to carry load.
SEALING AND FIRE STOPPING

FIRE AND/OR SMOKE RATED PENETRATIONS:
Provide all fire stopping of fire rated penetrations and sealing of smoke rated penetrations in compliance with section 07 84 00 Fire Stopping.

NON-RATED PARTITIONS:
At all interior partitions and exterior walls, pipe penetrations are required to be sealed. Apply sealant to both sides of the penetration in such a manner that the annular space between the pipe sleeve or cored opening and the pipe or insulation is completely blocked.

PENETRATIONS SUBJECT TO WATER INTRUSION:
For penetrations (both rated and non-rated) in floors subject to water intrusion or in rooms housing electrical equipment (but not within walls) provide one of the following:
• Pipe penetration where steel pipe sleeve is used extend steel sleeve 2” above the floor.
• Pipe penetration where cast in place fire stopping device/sleeve is used, extend device/sleeve 2” above the floor (provided it meets the device’s UL listing).
• Pipe penetration where there is no steel sleeve or cast in place fire stopping device/sleeve, provide 2” x 2” x 1/8” galvanized steel angles fastened to floor surrounding the penetration or group of penetrations to prevent water from getting to penetration. Provide urethane caulk between angles and floor and fasten angles to floor minimum 8” on center. Seal corners water tight with urethane caulk.

AGENCY TRAINING
All training provided for agency shall comply with the format, general content requirements and submission guidelines specified under Section 01 91 01.

END OF SECTION
SECTION 21 05 29
HANGERS AND SUPPORTS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT
BASED ON DFD MASTER SPECIFICATION DATED 3/3/2020

PART 1 - GENERAL

SCOPE
This section includes specifications for support of all fire suppression equipment and materials as well as piping system anchors. Included are the following topics:

PART 1 - GENERAL
Scope
Related Work
Reference
Reference Standards
Quality Assurance
Description
Shop Drawings
Design Criteria

PART 2 - PRODUCTS
Manufacturers
Structural Supports
Pipe Hangers and Supports
Beam Clamps
Concrete Inserts
Anchors
Corrosive Atmosphere Coatings

PART 3 - EXECUTION
Installation
Hanger and Support Spacing
Riser Clamps
Anchors

RELATED WORK
Division 3 - Concrete
Section 21 10 00 – Water-Based Fire Suppression Systems
Section 01 91 01 – Commissioning Process

REFERENCE
Applicable provisions of Division 1 shall govern work under this section.

REFERENCE STANDARDS
MSS SP-58
NFPA 20 Installation of centrifugal fire pumps (Latest prevailing edition).
UL Underwriters’ Laboratories Listed.
FM Factory Mutual Approved

QUALITY ASSURANCE
Substitution of Materials Refer to Section GC - General Conditions of the Contract, Equals and Substitutions.
DESCRIPTION
Provide all supporting devices as required for the installation of fire suppression equipment and materials. All supports and installation procedures are to conform to the latest requirements of the ANSI Code for building piping.

Do not hang any fire suppression system item directly from a metal deck or run piping so it rests on the bottom chord of any truss or joist.

Fasteners depending on soft lead for holding power or requiring explosive powder actuation will not be accepted.

Support apparatus and material under all conditions of operation, variations in installed and operating weight of equipment and piping, to prevent excess stress, and allow for proper expansion and contraction.

SHOP DRAWINGS
Schedule all hanger and support devices indicating attachment method and type of device for each pipe size and type of service. Provide details on the working drawings submitted for approval with all pertinent information listed.

DESIGN CRITERIA
Materials and application of pipe hangers and supports shall be in accordance with MSS SP-58 Pipe Hangers and Supports – Materials, Design, Manufacture, Selection, Application and Installation unless noted otherwise.

Materials and application of pipe hangers and supports shall be in accordance with NFPA rulings and be UL/FM listed and approved.

PART 2 - PRODUCTS

MANUFACTURERS
B-Line, Anvil, Erico, G-Strut, Tolco, Afcon, Roof Products & Systems or approved equal.

STRUCTURAL SUPPORTS
Provide all supporting steel required for the installation of mechanical equipment and materials, including angles, channels, beams, etc. to suspended or floor supported tanks and equipment. All of this steel may not be specifically indicated on the drawings.

PIPE HANGERS AND SUPPORTS
HANGERS FOR PIPE SIZES 1/2" THROUGH 4":
Carbon steel, adjustable swivel ring with 3/8" min. UL/FM approved hanger rods. B-Line B3170NF, Anvil 69 or 70.

HANGERS FOR PIPE SIZES 4" THROUGH 8":
Carbon steel adjustable swivel ring with ½" min. UL/FM approved hanger rods. B-Line B3170NF, Anvil 69 or 70.

HANGERS FOR PIPE SIZES 10" and UP
MULTIPLE OR TRAPEZE HANGERS:
Manufactured steel channel system with manufacturers slotted interlocking pipe clamps with screw/nut securing and threaded hanger rods or steel channels with welded spacers and threaded hanger rods.

WALL SUPPORT:

VERTICAL SUPPORT:

FLOOR SUPPORT:
Carbon steel pipe saddle, stand and bolted floor flange. B-Line B3088T/B3093.

COPPER PIPE SUPPORTS:
All supports, fasteners, clamps, etc. directly connected to copper piping shall be copper plated or polyvinylchloride coated. Where steel channels are used, provide flexible elastomeric/thermoplastic isolation cushion material to completely encircle the piping and avoid contact with the channel or clamp, equal to B-Line B1999 Vibra Cushion or provide manufacturers clamp and cushion assemblies, B-Line BVT series, Grinnell PS 1400 series.

PIPE HANGER RODS
STEEL HANGER RODS:
Threaded both ends, threaded one end, or continuous threaded, complete with adjusting and lock nuts.

Size rods for individual hangers and trapeze support as indicated in the following schedule.

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Diam. Of Rod</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to and Including 4&quot;</td>
<td>3/8&quot; or 9.5mm min.</td>
</tr>
<tr>
<td>5&quot;, 6&quot; and 8&quot;</td>
<td>½&quot; or 12.7mm min.</td>
</tr>
</tbody>
</table>

BEAM CLAMPS
MSS SP-58 Types 19 & 23 malleable black iron clamp for attachment to beam flange to 0.62 inches thick with a retaining ring and threaded rod of 3/8, 1/2, and 5/8 inch diameter. Furnish with a hardened steel cup point set screw. B-Line B3036L/B3034, Anvil 86/92.

MSS SP-58 Type 28 or Type 29 forged steel jaw type clamp with a tie rod to lock clamp in place, suitable for rod sizes to 1-1/2 inch diameter. B-Line B3054, Anvil 228.

CONCRETE INSERTS
POURED IN PLACE:
MSS SP-58 Type 18 wedge type to be constructed of a black carbon steel body with a removable malleable iron nut that accepts threaded rod to 7/8 inch diameter. Wedge design to allow the insert to be held by concrete in compression to maximize the load carrying capacity. B-Line B2505, Anvil 281.

MSS SP-58 Type 18 universal type to be constructed of black malleable iron body with a removable malleable iron nut that accepts threaded rod to 7/8 inch diameter. B-Line B3014N, Anvil 282.

DRILLED FASTENERS:
CONCRETE CONSTRUCTION
Carbon steel expansion anchors, vibration resistant, with ASTM B633 zinc plating. Use drill bit of same manufacturer as anchor. Hilti, Rawl, Redhead.
CONTINUOUS CONCRETE INSERT CHANNELS
Steel inserts with an industry standard pre-galvanized finish, nominally 1-5/8 inch by 1-3/8 inch deep by length to suit the application, designed to be nailed to concrete forms and provide a linear slot for attaching other support devices. Installed channels to provide a load rating of 2000 pounds per foot in concrete. Manufacturer's standard brackets, inserts, and accessories designed to be used with channel inserts may be used. Select insert length to accommodate all pipe sizes in the area.

ANCHORS
Use welding steel shapes, plates, and bars to secure piping to the structure.

CORROSIVE ATMOSPHERE COATINGS
Factory coat supports and anchors used in corrosive atmospheres with hot dip galvanizing after fabrication, ASTM A123, 1.5 ounces/square foot of surface each side. Mechanical galvanize threaded products, ASTM B695 Class 50, 2.0 mil coating. Field cuts and damaged finishes to be field covered with zinc rich paint of comparable thickness to factory coating.

Corrosive atmospheres include the following locations:
- Chemical storage and hazardous waste storage rooms

PART 3-EXECUTION

INSTALLATION
Size, apply and install supports and anchors in compliance with manufacturers recommendations.

Install supports to provide for free expansion of the piping system. Support all piping from the structure using concrete inserts, beam clamps, ceiling plates, wall brackets, or floor stands. Fasten ceiling plates and wall brackets securely to the structure and test to demonstrate the adequacy of the fastening.

Coordinate hanger and support installation to properly group piping of all trades.

Trim steel hanger rods to within one inch of the final lock nut position. Hanger and support cutoff burrs shall be removed and sharp edges ground smooth.

Where piping can be conveniently grouped to allow the use of trapeze type supports, use standard structural shapes or continuous insert channels for the supporting steel. Where continuous insert channels are used, pipe supporting devices made specifically for use with the channels may be substituted for the specified supporting devices provided that similar types are used and all data is submitted for prior approval.

Perform welding in accordance with standards of the American Welding Society.

HANGER AND SUPPORT SPACING
Use hangers with minimum vertical adjustment.

Where several pipes can be installed in parallel and at the same elevation, provide multiple or trapeze hangers.

Support riser piping independently of connected horizontal piping.

Adjust hangers to obtain the slope specified in the piping section of these specifications.

Space hangers for pipe as follows:

<table>
<thead>
<tr>
<th>Pipe Material</th>
<th>Pipe Size</th>
<th>Max. Horiz. Spacing</th>
<th>Max. Vert. Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper</td>
<td>3/4” through 1”</td>
<td>8'-0”</td>
<td>10'-0”</td>
</tr>
</tbody>
</table>
Copper 1-1/4" through 1-1/2" 10'-0" 10'-0"
2 Copper 2" through 3" 12'-0" 10'-0"
3 Copper 3-1/2" through 8" 15'-0" 10'-0"
4 Steel 1" through 1-1/4" 12'-0" 15'-0"
5 Steel 1-1/2" through 8" 15'-0" 15'-0"
6 Steel 8" through 12" 15'-0" 20'-0"

Restraint hangers shall be installed at all sprinkler head location within 1'-0" for a single restraint and within 5'-0" for two points of restraint. The requirements for hanger restraint for systems in excess of 100 PSI pressure shall be followed.

Unsupported length from the last hanger and an end sprinkler for steel piping systems shall be as follows:
1 1" piping Not greater than 36"
2 1-1/4" piping Not greater than 48"
3 1-1/2" piping Not greater than 60"
4 or larger.

RISER CLAMPS
Support vertical piping with clamps secured to the piping and resting on the building structure or secured to the building structure below at each floor. Use method of securing the vertical risers to the building structure below in stairwell locations.

ANCHORS
Install where indicated on the drawings and details. Where not specifically indicated, install anchors at ends of principal pipe runs and at intermediate points in pipe runs. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.
SECTION 21 08 00
COMMISSIONING OF FIRE SUPPRESSION
BASED ON DFD MASTER SPECIFICATION DATED 02/27/15

PART 1 - GENERAL

SCOPE
This section includes commissioning forms for construction verification and functional performance testing. Included are the following topics:

PART 1 - GENERAL
Scope
Related Work
Reference
Submittals

PART 2 - PRODUCTS
(Not Used)

PART 3 - EXECUTION
Commissioning Forms
CV-21 10 00 Water Based Fire Suppression System

RELATED WORK
Section 01 91 01 – Commissioning Process

REFERENCE
Applicable provisions of Division 1 shall govern work under this section.

SUBMITTALS
Reference the General Conditions of the Contract for submittal requirements.

Reference Section 01 91 01 Commissioning Process for Construction Verification Checklist and Functional Performance Test submittal requirements.

(Not Used)

PART 2 – PRODUCTS

PART 3 – EXECUTION

COMMISSIONING FORMS
Commissioning forms are to be filled in as work progresses by the individuals responsible for installation and shall be completed for each installation phase.

Provide a description of the work completed since the last entry, the percentage of the total work completed for the system for that area and the step of installation or finalization.

Circle Yes or No for each commissioning form item. If the information requested for an item does not apply to the given stage of installation for the system, list it as “N/A”. Explain all discrepancies, negative responses or N/A responses in the negative responses section.

Once the work is 100% complete and the responses to each item are complete and resolved for a given commissioning forms group, mark as complete, initial and date in the spaces provided.

Provide copies of the commissioning forms to the commissioning agent 2 days prior to construction progress meetings.
## CV-21 10 00 – Water Based Fire Suppression System

### A) PRE-INSTALLATION CHECKS

<table>
<thead>
<tr>
<th>Date</th>
<th>Description of Work Performed</th>
<th>% Complete</th>
<th>Initials</th>
<th>Questions (See details below)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>YES</td>
<td>NO</td>
<td>1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>YES</td>
<td>NO</td>
<td>2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>YES</td>
<td>NO</td>
<td>3)</td>
</tr>
</tbody>
</table>

**Question Details**

1) All piping, sprinkler heads, valves, fire department connections, etc. are clean and free of damage prior to installation.
2) Temporary protective coating is provided on cast iron and steel valves during storage.
3) Temporary end caps are provided on piping and fittings until installation.

### Negative Responses

<table>
<thead>
<tr>
<th>Group/Item</th>
<th>Date Found</th>
<th>Found By</th>
<th>Location</th>
<th>Reason for Negative Response</th>
<th>Resolved</th>
<th>Date Resolved</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES / NO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES / NO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES / NO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES / NO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES / NO</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

UW-MADISON Project No. **0154-1701** / UWSA Project No. **A-17-009**

21 08 00-2
## B) PIPING INSTALLATION CHECKS

<table>
<thead>
<tr>
<th>Date</th>
<th>Description of Work Performed</th>
<th>% Complete</th>
<th>Initials</th>
<th>1)</th>
<th>2)</th>
<th>3)</th>
<th>4)</th>
<th>5)</th>
<th>6)</th>
<th>7)</th>
<th>8)</th>
<th>9)</th>
<th>10)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
</tbody>
</table>

**CHECKLIST GROUP COMPLETE**

INITIALS: __________________ DATE: __________

### Question Details

1. Piping is free to expand and contract without noise or damage to hangers, joints, or the building.
2. Joint compound or tape is only applied on male threads.
3. Piping is installed with sufficient pitch and arranged in a manner to ensure drainage of entire system.
4. Changes in pipe sizes are made with the proper size reducing fittings, reducing elbow or reducing tees, and no bushings are utilized.
5. Connections between dissimilar pipe materials are made with dielectric fittings.
6. Pipe hanger spacing complies with specification requirements.
7. Total unsupported length from last hanger to end of sprinkler conforms with specification requirements.
8. All equipment requiring maintenance is accessible (valves, strainers, etc.).
9. Piping allows access to equipment that is part of this system or another system (e.g., air terminal units are accessible).
10. Piping is installed a minimum of 7” above suspended ceiling to allow for lighting fixture installation or relocation.

### Negative Responses

<table>
<thead>
<tr>
<th>Group/ Item</th>
<th>Date Found</th>
<th>Found By</th>
<th>Location</th>
<th>Reason for Negative Response</th>
<th>Resolved</th>
<th>Date Resolved</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES / NO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES / NO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES / NO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES / NO</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

UW-MADISON Project No. 0154-1701 / UWSA Project No. A-17-009
21 08 00-3
## C) VALVE & FITTING INSTALLATION CHECKS

<table>
<thead>
<tr>
<th>Date</th>
<th>Description of Work Performed</th>
<th>Complete</th>
<th>Initials</th>
<th>Questions (See details below)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>1)</td>
<td>2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>NO</td>
<td>NO</td>
</tr>
</tbody>
</table>

**CHECKLIST GROUP COMPLETE**

INITIALS: [ ] DATE: [ ]

### Question Details

1. Inspector's test connection is installed.
2. All fire hose valves and cabinets are installed with adequate clearance for hose connection.
3. Thread patterns of hose valves and fire department connections match the local Fire Department requirements.
4. All valves can be fully operated without removal or alteration of handle.
5. Riser shutoff valve and a capped hose thread drain valve at the bottom of each riser provided.
6. Auxiliary drain connections provided for all low points in system.
7. All monitoring and tampering devices installed and operation verified.

### Negative Responses

<table>
<thead>
<tr>
<th>Group/Item</th>
<th>Date Found</th>
<th>Found By</th>
<th>Location</th>
<th>Reason for Negative Response</th>
<th>Resolved</th>
<th>Date Resolved</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES / NO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES / NO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES / NO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES / NO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES / NO</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

UW-MADISON Project No. **0154-1701** / UWSA Project No. **A-17-009**

21 08 00-4
D) SPRINKLER HEAD INSTALLATION CHECKS

<table>
<thead>
<tr>
<th>Date</th>
<th>Description of Work Performed</th>
<th>% Complete</th>
<th>Initials</th>
<th>Questions (See details below)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>NO</td>
<td>NO</td>
</tr>
</tbody>
</table>

CHECKLIST GROUP COMPLETE

INITIALS: ______________________ DATE: ______________

Question Details
1) Extra sprinkler heads according to NFPA-13 (proportional to types and temperature ratings used) and a sprinkler wrench are provided in a cabinet located where the temperature does not exceed 100 degrees F.
2) Head guards are installed on sprinklers less than 7’ 6” above floor in areas having exposed ceiling.
3) No sprinkler heads are located closer to any obstruction than 3 times the maximum dimension of any obstruction up to a maximum distance of 24”.
4) Sprinkler heads are located under exposed fixed obstructions where the obstruction is greater than 48”.
5) Sprinkler heads are located in the center of the ceiling tiles and head escutcheon plates are tight to the ceiling.

Negative Responses

<table>
<thead>
<tr>
<th>Group/ Item</th>
<th>Date Found</th>
<th>Found By</th>
<th>Location</th>
<th>Reason for Negative Response</th>
<th>Resolved</th>
<th>Date Resolved</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES / NO</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES / NO</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES / NO</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES / NO</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES / NO</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

UW-MADISON Project No. 0154-1701 / UWSA Project No. A-17-009
21 08 00-5
### E) TESTING CHECKS

<table>
<thead>
<tr>
<th>Date</th>
<th>Description of Work Performed</th>
<th>Complete</th>
<th>Initials</th>
<th>1)</th>
<th>2)</th>
<th>3)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
</tbody>
</table>

CHECKLIST GROUP COMPLETE

INITIALS: ____________________  DATE: ____________________

**Question Details**

1) Piping tested utilizing water at 200 psi or 50 psig greater than system pressure for a duration of 2 hours.
2) All leaks identified during testing have been repaired and test re-done until satisfactory conditions are accomplished.
3) Test conducted with DFD present and all piping of tested system or section visible during testing.

**Negative Responses**

<table>
<thead>
<tr>
<th>Group/Item</th>
<th>Date Found</th>
<th>Found By</th>
<th>Location</th>
<th>Reason for Negative Response</th>
<th>Resolved</th>
<th>Date Resolved</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES / NO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES / NO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES / NO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES / NO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES / NO</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Construction Verification Checklist

## 21 10 00 – Water Based Fire Suppression System

### F) FINALIZATION CHECKS

<table>
<thead>
<tr>
<th>Date</th>
<th>Description of Work Performed</th>
<th>% Complete</th>
<th>Initials</th>
<th>1)</th>
<th>2)</th>
<th>3)</th>
<th>4)</th>
<th>5)</th>
<th>6)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
</tbody>
</table>

**CHECKLIST GROUP COMPLETE**

<table>
<thead>
<tr>
<th>INITIALS:</th>
<th>DATE:</th>
</tr>
</thead>
</table>

**Question Details**

1) All exposed piping which passes through a wall, ceiling or floor is provided with escutcheon plates.
2) Pipe labeling and direction of flow is provided per specification requirements.
3) All penetrations through fire rated wall assemblies have been sealed per specification requirements.
4) All penetrations through non-rated wall assemblies have been sealed per specification requirements for given space type.
5) Record drawings have been updated to reflect any changes made.

**Negative Responses**

<table>
<thead>
<tr>
<th>Group/Item</th>
<th>Date Found</th>
<th>Found By</th>
<th>Location</th>
<th>Reason for Negative Response</th>
<th>Resolved</th>
<th>Date Resolved</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>YES / NO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>YES / NO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>YES / NO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>YES / NO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>YES / NO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Page Intentionally Left Blank
SECTION 21 10 00
WATER BASED FIRE SUPPRESSION SYSTEMS
BASED ON DFD MASTER SPECIFICATION DATED 6/5/18

PART 1 - GENERAL

SCOPE
This section contains specifications for fire suppression pipe and pipe fittings for this project. Included are
the following topics:

PART 1 - GENERAL
Scope
Related Work
Reference
Reference Standards
Shop Drawings
Quality Assurance
Delivery, Storage, and Handling
Design Criteria
Welder Qualifications

PART 2 - PRODUCTS
Fire suppression Piping
Unions and Flanges
Mechanical Grooved Pipe Connections
Sprinkler Heads
Flexible Sprinkler Drop Fittings
Flow Switches
Pressure Switches
Pressure Gauges
Valves
Hose Outlet Valves

PART 3 – EXECUTION
General
Preparation
Erection
Welded Pipe Joints
Threaded Pipe Joints
Mechanical Grooved Pipe Connections
Unions and Flanges
Piping System Leak Tests
Installation
Construction Verification Items

RELATED WORK
Section 01 91 01 – Commissioning Process
Section 21 08 00 – Commissioning of Fire Suppression
Section 21 05 00 – Common Work Results for Fire Suppression
Section 21 05 29 – Hangers and Supports for Fire Suppression Piping and Equipment

REFERENCE
Applicable provisions of Division 1 govern work under this section.

REFERENCE STANDARDS
ANSI A21.4
1. ANSI A21.11
2. ANSI A21.51
3. ANSI B16.1 Cast Iron Pipe Flanges and Flanged Fittings
4. ANSI B16.3 Malleable and Ductile Iron Threaded Fittings
5. ANSI B16.4 Cast Iron Threaded Fittings
6. ANSI B16.5 Pipe Flanges and Flanged Fittings
7. ANSI B16.9 Factory Made Wrought Steel Buttweld Fittings
8. ANSI B16.11 Forged Steel Fittings, Socket Welded and Threaded
9. ASTM A53 Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless
10. ASTM A105 Forgings, Carbon Steel, for Piping Components
11. ASTM A126 Gray Cast Iron Castings for Valves, Flanges, and Pipe Fittings
12. ASTM A135 Electric Resistance Welded Steel Pipe
13. ASTM A181 Forgings, Carbon Steel for General Purpose Piping
14. ASTM A234 Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures
15. ASTM A536 Ductile Iron Castings
16. ASTM A795 Black and Hot Dipped Zinc Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use
17. AWS D10.9 Qualification of Welding Procedures and Welders for Piping and Tubing, Level AR3
20. UL Underwriters’ Laboratories Listing
21. FM Factory Mutual Approval

SHOP DRAWINGS
Schedule from the contractor indicating the ANSI/ASTM specification number of the pipe being proposed along with its type and grade, if known at the time of submittal, and sufficient information to indicate the type and rating of fittings for each service.

QUALITY ASSURANCE
Substitution of Materials: Refer to Section GC – General Conditions of the Contract, Equals and Substitutions.
Order steel pipe with each length marked with the name or trademark of the manufacturer and type of pipe; with each shipping unit marked with the purchase order number, metal or alloy designation, temper, size, and name of supplier.
Any installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the Owner.

DELIVERY, STORAGE, AND HANDLING
Promptly inspect shipments to ensure that the material is undamaged and complies with specifications.
Cover pipe to prevent corrosion or deterioration while allowing sufficient ventilation to avoid condensation.
Do not store materials directly on grade. Protect pipe, tube, and fitting ends so they are not damaged. Where end caps are provided or specified, take precautions so the caps remain in place. Protect fittings, flanges, and unions by storage inside or by durable, waterproof, above ground packaging.
Offsite storage agreements will not relieve the contractor from using proper storage techniques.
Storage and protection methods must allow inspection to verify products.
**DESIGN CRITERIA**

Use only new material, free of defects, rust and scale, and meeting the latest revision of ASTM specifications as listed in this specification.

Construct all piping systems for the highest pressures and temperatures in the respective system but not less than 175 psig.

Where weld fittings are used, use only long radius elbows having a centerline radius of 1.5 pipe diameters.

Where mechanical grooved fittings are used, use only ASTM standard radius fittings, short radius grooved fittings are not allowed.

Where ASTM A53 or A795 type F pipe is specified, grade A type E or S, or grade B type E or S may be substituted at Contractor's option. Where ASTM A135 grade A pipe is specified, grade B pipe may be substituted at Contractor's option. Where the grade or type is not specified, Contractor may choose from those commercially available.

**WELDER QUALIFICATIONS**

Welding procedures, welders, and welding operators for all building service piping to be in accordance with certified welding procedures of the National Certified Pipe Welding Bureau and Section 927.5 of ASME B31.9 Building Services Piping or AWS 10.9 Qualification of Welding Procedures and Welders for Piping and Tubing. Before any metallic welding is performed, Contractor to submit his Standard Welding Procedure Specification together with the Procedure Qualification Record as required by Section 927.6 of ASME B31.9 Building Services Piping.

The Architect or Engineer reserves the right to test the work of any welder employed on the project, at the Owner's expense. If the work of the welder is found to be unsatisfactory, the welder shall be prevented from doing further welding on the project and all defective welds replaced.

**PART 2 - PRODUCTS**

**FIRE SUPPRESSION PIPING**

**STEEL PIPE:**

Black steel pipe welded and seamless, Type F, Grade A, ASTM A53; black welded and seamless steel pipe for fire protection use, Type F, ASTM A795; electric resistance welded steel pipe, Grade A, ASTM A135.

Pipe wall Thickness:

Threaded pipe shall have a minimum wall thickness of schedule 40.

All other pipe shall have a minimum wall thickness of schedule 10.

Piping 2” and under shall be minimum schedule 40 unless stated otherwise herein.

Fittings: Cast iron threaded fittings, Class 125 or 250, ASTM A126/ANSI B16.4. Malleable and ductile iron threaded fittings, Class 150 or 300, ASTM A197/ANSI B16.3. Standard weight seamless carbon steel weld fittings, ASTM A234 grade, ANSI B16.9. Mechanical grooved fittings with EPDM gaskets, ASTM A536 ductile iron, ASTM A47 malleable iron or ASTM A53 fabricated steel. For wet pipe systems mechanical tee fittings with full iron back equal to Grinnell Figure 730 will be allowed only as needed for connection to existing systems. Outlets for drypipe and preaction systems shall be mechanical tees. Mechanical tees with U-bolt back or other fastening means are not allowed.

Finish: Hot dipped zinc coated (galvanized) finish on piping and fittings shall be used in drypipe and pre-action systems, piping exposed to weather and piping exposed to corrosive environments where indicated. Thread or grooved hot dipped zinc coated pipe ends for fitting connections.

Plastic pipe and fittings will not be allowed for this project.

UNIONS AND FLANGES
2" AND SMALLER STEEL:
ASTM A197/ANSI B16.3 malleable iron unions with brass seats. Use black malleable iron on black steel piping and galvanized malleable iron on galvanized steel piping. Grooved couplings may be used in lieu of unions.

2-1/2" AND LARGER:
ASTM A181 or A105, Class 150, grade 1 hot forged steel flanges of threaded, welding neck, or slip-on pattern on black steel and threaded only on galvanized steel. ANSI B16.1 or ANSI B16.5, Class 150 cast iron threaded flanges. Use raised face flanges ANSI B16.5 for mating with other raised face flanges or equipment with flat ring or full face gaskets. Use ANSI B16.1 flat face flanges with full face gaskets for mating with other flat face flanges on equipment.

MECHANICAL GROOVED PIPE CONNECTIONS
Mechanical grooved pipe couplings and fittings, ASTM F1476, as manufactured by Victaulic, Anvil, or Grinnell may be used with steel pipe. Mechanical grooved components and assemblies to be rated for minimum 175 psi working pressure unless noted otherwise.

All mechanical grooved pipe material including gaskets, couplings, fittings and flange adapters shall be from the same manufacturer.

Couplings and fittings to be malleable iron, ASTM A47, or ductile iron A536 with painted finish. Fittings used on galvanized steel pipe to have galvanized finish, ASTM A153.


Flange adapters to be ductile iron, ASTM A536; except at lug type butterfly valves where standard threaded flanges shall be used.

Credit for the inherent flexibility of mechanical grooved pipe connections when used for expansion joints or flexible connectors may be allowed upon specific application by the Contractor. Three flexible couplings at first three connection points both upstream and downstream of pumps may be used in lieu of flexible connectors. Request for expansion joints shall be made in writing and shall include service, location, line size, proposed application and supporting calculations for the intended service.

SPRINKLER HEADS
Manufacturer: Sprinkler head model numbers establish type and style of head. Products of the following manufacturers determined to be equal by the Architect/Engineer will be accepted: Tyco, Reliable, Victaulic, Viking and Globe.

Standard coverage sprinkler heads are to be the basis for design unless noted otherwise on the plans or within these specifications.

Fusible link or glass bulb type, cast brass or bronze construction. Provide heads with nominal 1/2" or 17/32" discharge orifice except where greater than normal density requires large orifice.
Select fusible link or glass bulb temperature rating to not exceed maximum ambient temperature rating allowed under normal conditions at installed location. Provide ordinary temperature (155 to 165 degree) fusible link or glass bulb type except at skylights, sealed display windows, unventilated attics and roof spaces, over cooking equipment, adjacent to diffusers, unit heaters, uninsulated heating pipes or ducts, mechanical rooms, storage rooms, or where otherwise indicated.

Provide quantity of spare heads as noted below and 1 wrench for each type of head and each temperature range installed. Provide 6 spare heads per 300 or less installed heads, 12 per 1000 or less and 24 for more than 1000. Provide steel cabinet for storage of heads and wrenches. Provide an equal number of concealed cover plates and/or sprinkler escutcheons for each spare sprinkler head.

Quick Response Upright: Viking Microfast M (QR), brass finish.

Quick Response Concealed Horizontal Sidewall: Viking VK481, finish chosen by Architect.

Quick Response Pendant: Viking Microfast M, chrome plated finish and escutcheon.

Quick Response Sidewall: Viking Microfast M, chrome plated finish and escutcheon.

Concealed sprinkler: Viking Mirage (Quick Response), with adjustable concealed cover plate. Cover plate finish to be selected by the Architect/Engineer from the manufacturer's standard finish selections.

FLEXIBLE SPRINKLER DROP FITTINGS

Manufacturers: FlexHead Industries, Victaulic or Viking.

Corrugated Type 304 stainless steel hose with braided Type 304 stainless steel exterior cover, welded stainless steel or zinc plated steel inlet and outlet threaded fittings with EPDM seals. 175 PSI pressure rating. 225°F temperature rating, 1” minimum internal hose diameter. 40” maximum hose length, straight or angle outlet configuration. Galvanized steel ceiling support bar and brackets selected to match project ceiling support system requirements. UL Listed and FM approved.

Flexible drops are only allowed for use above fully accessible ACT ceilings.

FLOW SWITCHES

Vane type waterflow switch with metal enclosure, adjustable pneumatic retard and electrical characteristics compatible with alarm system.

PRESSURE SWITCHES

Pressure actuated switch with field adjustable settings, metal enclosure and electrical characteristics compatible with alarm system.

PRESSURE GAUGES


Cast aluminum, stainless steel, brass, polycarbonate or ABS case of not less than 3.5 inches in diameter, double strength glass window, black lettering on a white background, phosphor bronze bourdon tube with bronze bushings, recalibration from the front of the dial, 99% accuracy over the middle half of the scale, 98.5% accuracy over the remainder of the scale. Include bronze 3-way globe valve with plugged outlet for Fire Inspector's test gauge.

VALVES

Manufacturers: Kennedy, Milwaukee, Nibco, Stockham, Victaulic, or Watts.
BALL VALVES:
2” and smaller: Brass, 2-piece, threaded or sweat ends, full port, blowout proof stem, 304 stainless steel ball and stem, glass reinforced seats, UL approved @ 250 psi. Watts No. FBV-3C-SS, FBVS-3C-SS.

GATE VALVES:
2” and smaller: Outside screw and yoke gate valves, 175 psig, bronze body, bronze mounted, screwed bonnet, rising stem, solid wedge, with normally open tamper switch with double wire leads.
2-1/2” and larger: Outside screw and yoke gate valves, 175 psig, cast iron body, bronze mounted, bolted bonnet, rising stem, solid wedge, with normally open tamper switch with double wire leads.

BUTTERFLY VALVES:
2” and smaller: Bronze body butterfly valve, 175 psig, geared operator, visible position indicator, normally open tamper switch with double wire leads, Buna or Viton seat, stainless steel disc and stem.
2” and larger: Cast or ductile iron body butterfly valve, lug style or grooved, 175 psig, geared operator, visible position indicator, normally open tamper switch with double wire leads, EPDM resilient seat, EPDM seals, nickel plated ductile iron disc. Valve assembly to be bubble tight to 175 psig with no downstream flange/pipe attached. Use cap screws for removal of downstream piping while using the valve for system shutoff.

SUPERVISORY/TAMPER SWITCHES:
For O S & Y valve or butterfly valve installations, UL/FM listed/approved, to monitor position of valve, tamper resistant cover screws, single or double SPDT switch contacts, corrosion resistant, for indoor or outdoor use, NEMA 4 & 6P enclosures.

CHECK VALVES:
3” and smaller: Bronze body, threaded end, Y-pattern, regrindable bronze seat, renewable bronze disc, 175 psig, suitable for installation in a horizontal or vertical line with flow upward.
2-1/2” and larger: Cast or ductile iron body, flanged or grooved ends, bronze trim, bolted cap, renewable bronze seat and disc, 175 psig, suitable for installation in a horizontal or vertical line with flow upward.
Provide 1/2” automatic drip drain on inlet of fire dept. connection check valve.

SPRING LOADED CHECK VALVES:
2” and smaller: Bronze body, threaded ends, bronze trim, stainless steel spring, stainless steel center guide pin, 175 psig, teflon seat unless only bronze available.
2-1/2” and larger: Cast or ductile iron body, wafer or globe type, bronze trim, bronze or EPDM seat, stainless steel spring, stainless steel stem if stem is required, 175 psig.

DRAIN VALVES:
3/4” minimum, two piece bronze body ball valve; threaded ends, chrome plated bronze ball; glass filled teflon seat; teflon packing and threaded packing nut; blowout-proof stem; 400 psig WOG, with hose thread outlet and cap.

HOSE OUTLET VALVES
Manufacturer: Badger-Powhatan, Croker, Elkhart Brass, Potter-Roemer, or Guardian.

CLASS I AND CLASS III SYSTEMS:
2-1/2” brass angle valve, 300 psig, with removable red handwheel, 2-1/2”x1-1/2” reducing lug pin connector coupling and National Standard male hose thread outlet, cap and chain. Provide N.P.T. female outlet where hose is required.
PART 3 - EXECUTION

GENERAL
Install pipe fittings, and other fire suppression system components in accordance with reference standards, manufacturers recommendations and recognized industry practices.

PREPARATION
Cut pipe ends square. Ream ends of piping to remove burrs. Clean scale and dirt from interior and exterior of each section of pipe and fitting prior to assembly.

ERECTION
Install all piping parallel to building walls and ceilings and at heights which do not obstruct any portion of a window, doorway, stairway, or passageway. Where interferences develop in the field, offset or reroute piping as required to clear such interferences. Coordinate locations of fire protection piping with piping, ductwork, conduit and equipment of other trades to allow sufficient clearances. In all cases, consult drawings for exact location of pipe spaces, ceiling heights, ceiling grid layout, light fixtures and grilles before installing piping.

Where copper or steel piping is embedded in masonry or concrete, provide protective sleeve covering of elastomeric pipe insulation.

Provide 3/32" min. thickness steel nailing plates behind or on either side of piping where the possibility of penetration from nails or drywall screws exists.

Maintain piping in clean condition internally during construction.

Provide clearance for access to valves and piping specialties.

Provide anchors, expansion joints, swing joints and/or expansion loops so that piping may expand and contract without damage to itself, equipment, or building.

Install piping so that system can be drained. Where possible, slope to main drain valve. Slope dry pipe and pre-action systems subject to freezing at minimum 1/4"/10' on mains and 1/2"/10' on branches. Where piping not susceptible to freezing cannot be fully drained, install nipple and cap for drainage of less than 5 gallons or ball valve with hose thread outlet and cap for drainage over 5 gallons. Pipe main drain valve to grade or to air gap sewer receptor.

Mitered ells, notched tees, and orange peel reducers are not acceptable. On threaded piping, bushings are not acceptable.

Do not route piping within exterior walls.

Do not route piping through transformer vaults or above transformers, panelboards, or switchboards, including the required service space for this equipment, unless the piping is serving this equipment.

Install all valves and piping specialties, including items furnished by others, as specified and/or detailed. Provide access to valves and specialties for maintenance. Make connections to all equipment, fixtures and systems installed by others where same requires the piping services indicated in this section.

WELDED PIPE JOINTS
Make all welded joints by fusion welding in accordance with ASME Codes, ANSI B31, and State Codes where applicable. "Weldolets" and "Threadolets" may be used up to following sizes:
<table>
<thead>
<tr>
<th>Maximum</th>
<th>Main</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weldolet</td>
<td>Threadolet</td>
</tr>
<tr>
<td>Diameter</td>
<td>Diameter</td>
</tr>
<tr>
<td>3/4&quot;</td>
<td>1 1/4&quot;</td>
</tr>
<tr>
<td>1&quot;</td>
<td>1 1/2&quot;</td>
</tr>
<tr>
<td>1 1/4&quot;</td>
<td>2&quot;</td>
</tr>
<tr>
<td>1 1/2&quot;</td>
<td>2 1/2&quot;</td>
</tr>
<tr>
<td>2&quot;</td>
<td>3&quot;</td>
</tr>
<tr>
<td>3&quot;</td>
<td>4&quot;</td>
</tr>
<tr>
<td>4&quot;</td>
<td>6&quot;</td>
</tr>
<tr>
<td>6&quot;</td>
<td>8&quot;</td>
</tr>
</tbody>
</table>

**THREADED PIPE JOINTS**

Use a thread lubricant or teflon tape when making joints; no hard setting pipe thread cement or caulking will be allowed.

**MECHANICAL GROOVED PIPE CONNECTIONS**

Use pipe factory grooved in accordance with the coupling manufacturer’s specifications or field grooved pipe in accordance with the same specifications using specially designed tools available for the application. Lubricate pipe and coupling gasket, align pipe, and secure joint in accordance with the coupling manufacturer's specifications.

**UNIONS AND FLANGES**

Install a union, flange or grooved coupling combination at each connection to each piece of equipment and at other items which may require removal for maintenance, repair, or replacement. Where a valve is located at a piece of equipment, locate the flange or union or grooved coupling combination connections on the equipment side of the valve. Concealed unions, flanges or couplings are not acceptable.

**FLEXIBLE SPRINKLER DROP FITTINGS**

Install in accordance with manufacturer’s installation instructions following minimum bend radii, maximum number of bends and bend distance from end requirements.

**PIPING SYSTEM LEAK TESTS**

Conduct pressure test with test medium of water. If leaks are found, repair the area with new materials and repeat the test; caulking will not be acceptable.

Test piping in sections or entire system as required by sequence of construction. Do not conceal pipe until it has been successfully tested. If required for the additional pressure load under test, provide temporary restraints at fittings or expansion joints. Entire test must be witnessed by the Division's representative.

Use clean water and remove air from the piping being tested where possible. Measure and record test pressure at the high point in the system.

Test system at 200 psi for 2 hours showing no leakage. Where system design is in excess of 150 psig, test at a pressure 50 psig above system design pressure.

All pressure tests are to be documented on NFPA Contractor's Material and Test Certificate forms.

**INSTALLATION**

Install fire protection system components in accordance with NFPA rulings, listings and manufacturers recommendations. Locate where accessible for servicing and replacement.
Sprinkler Heads: Locate sprinkler heads as indicated on fire protection plan and reflected ceiling plan maintaining minimum clearances from obstructions, ceilings and walls. Install sprinkler heads level in locations not subject to spray pattern interference. Provide fire sprinkler head installations below ductwork, soffits, etc.

Switches: Locate flow and pressure switches where indicated and where required to obtain specified zoning to isolate floors and major areas of floors. Provide valved test connection for flow switch adjacent to flow switch. Pipe to floor drain. Test flow switch to verify proper operation.

Valves: Properly align piping before installation of valves. Do not support weight of piping system on valve ends. Mount valves in locations which allow access for operation, servicing and replacement. Install all valves with the stem in the upright or horizontal position. Valves installed with the stems down will not be accepted. Provide a riser shutoff valve and a capped hose thread drain valve at the bottom of each riser. Provide capped hose thread drain valves to allow draining of each portion of piping.

Hose Outlet Valves: Install at each standpipe outlet and elsewhere where indicated approximately 4’ above floor.

**CONSTRUCTION VERIFICATION ITEMS**
Contractor is responsible for utilizing construction verification checklists supplied under specification Section 21 08 00 in accordance with procedures defined for construction verification in Section 01 91 01.

END OF SECTION
Page Intentionally Left Blank