

PART III – CSU FACILITIES PLANNING, DESIGN AND CONSTRUCTION STANDARDS

DIVISION 21 – FIRE SUPPRESSION

Housing and Dining Facilities (HDS) has adopted amendments for all HDS facilities. Confirm applicable standards with Project Representative on a per Project basis. Refer to HDS amendments here – <https://housing.colostate.edu/about/construction/>.

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21 05 00 – COMMON WORK RESULTS FOR FIRE SUPPRESSION

A. Codes and Standards:

1. This Standard includes requirements for the installation of Fire Suppression Systems including materials, fittings and valves with the intent of providing a high level of fire safety at Colorado State University (CSU). It is not to be used as a guide specification.
 - a. Existing Buildings:
 - i. Any remodel requiring the addition of 20 or more heads must be re-calculated and hydrostatically tested.
 - ii. Building Upgrades:
 - a) All buildings involved in a major remodel shall be upgraded to meet all the current standards set forth within this document, the extent of which shall be reviewed and approved by CSU Facilities Management (FM) Fire Systems.
 - b. New Additions:
 - i. All new additions shall be constructed to meet all the current standards set forth within this document subject to the review and approval FM Fire Systems.
 - ii. All major additions shall have the entire building upgraded to meet all the current standards set forth within this document subject to the review and approval of FM Fire Systems.
2. Each item of equipment shall be new and listed by Underwriters Laboratories (UL) and approved by FM Global.
3. Each major item of equipment shall bear the Manufacturer's name or trademark, serial number and UL and/or FM label and shall be listed for fire suppression where applicable.
 - a. All materials and performance shall meet the appropriate American National Standard Institute (ANSI), American Society of Mechanical Engineers (ASME) and American Society for Testing and Materials (ASTM) Codes.
4. The complete installation shall conform to the current Office of the State Architect (OSA) adopted edition of applicable codes including but not limited to:
 - a. International Building Code (IBC)
 - b. International Fire Code (IFC)
 - c. National Fire Protection Association (NFPA) 13 – Installation of Sprinkler Systems
 - d. NFPA 14 – Standard for the Installation of Standpipe and Hose Systems
 - e. NFPA 20 – Standard for the Installation for Fire Pumps
 - f. NFPA 24 – Installation of Private Fire Service Mains and their Appurtenances
 - g. NFPA 25 – Standard for the Inspection, Testing, and Maintenance of Water Based Fire Protection Systems
 - h. NFPA 72 – National Fire Alarm and Signaling Code
 - i. FM Global Fire Suppression Data Sheets (<https://www.fmglobal.com/research-andresources/fm-global-data-sheets>)

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5. Provide all design, materials and installation required for a complete Fire Suppression System to protect the specified building in accordance with design requirements.
 - a. The University prefers to connect to the City of Fort Collins, to provide code compliant combination wet automatic fire sprinklers and, where possible, Automatic Standpipe Systems that do not contain alarm valves and without requiring a building fire pump.
6. The complete installation shall conform to FM Global, the CSU Facilities Planning, Design, and Construction Standards and the Manufacturer’s recommendations.
7. The complete installation shall conform to Shop Drawings approved by FM Global, Poudre Fire Authority (PFA) and CSU reviewers.

B. Quality Assurance:

1. Manufacturer’s Qualifications:
 - a. Firm regularly engages in the manufacture of Fire Suppression System of types, sizes, and characteristics compatible with the current campus Systems, and whose products have been in satisfactory use in similar service for not less than five years.
2. Installers Qualifications:
 - a. System design and installation shall be supervised by a NICET Level III in Water–Base Systems Layout or Fire Protection Engineer with not less than five years of experience with sprinkler systems.
 - i. All field installation Work shall be continuously supervised by at least a NICET Level II in Water–Base Systems Layout.
3. System Authority:
 - a. The Contractor is responsible for receiving written acceptance for both plan review and final acceptance by the following departments:
 - i. FM Fire Systems is responsible for the operation, service and maintenance of all Fire Suppression Systems on the CSU Fort Collins Campuses and shall be referred to as FM Fire Systems throughout this document.
 - a) FM Fire Systems can be contacted at fac_dl_fire_system_shop@colostate.edu.
 - ii. PFA, whose review and approval is required for all Fire Safety Systems, shall be referred to as Fire Department or PFA throughout this document.
 - iii. FM Global Design Review Committee
4. Welders:
 - a. All welders must be certified in accordance with ANSI/ASME Section 9, no substitution.
 - b. Welding Materials and Procedures shall conform to the ASME Code.
5. Meetings:
 - a. Technical code and design review meetings shall be required with FM Fire Systems for project coordination at 50% design, and any other meeting the Project Representative feels would benefit the Project.
 - b. FM Fire Systems shall be involved in any Project meetings that involve PFA.
 - c. Preconstruction meetings shall be organized by Project Representative between Fire Suppression Contractor and FM Fire Systems representatives.
 - i. FM Global Representatives shall be present when requested by FM Global.

C. Products:

1. Underground Pipe:

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- a. Each underground pipe joint or connection shall include a compression-type joint restraint device (Mega Lug or equal).
 - b. Any changes in direction of underground piping shall be provided with a thrust block or joint restraint as required per NFPA 13 and NFPA 24.
 - c. Changes in direction where entering buildings shall be provided with both thrust blocks and joint restraint.
 - d. Underground pipe shall be installed by either a Fire Sprinkler Contractor or an Underground Contractor licensed by the State of Colorado to install underground fire service mains.
 - e. Pipe shall be hydrostatically tested and be witnessed by FM Fire Systems before joints are covered up for two hours at 200 psi, including fire department connections per NFPA 24
 - f. The Contractor is responsible for assuring all inspections are recorded on the Project Building Inspection Record at the time of inspection.
 - i. This applies both to successful and failed inspections
 - ii. Copies of the underground flush certificate shall be provided.
2. Aboveground Pipe:
- a. All Wet Sprinkler System piping shall be a minimum of schedule 10 or equivalent black steel pipe with rolled groove ends for pipe sizes 1 ¼" and larger and schedule 40 or equivalent black steel for threaded pipe up to 2" and cut groove for 1" to 8" pipe, unless otherwise required by FM Global or Fire Protection Engineer.
 - b. All fire suppression systems shall be provided with a main flow installed prior to any system or sectional valves.
 - c. All Dry and Pre-action System piping and fittings shall be externally and internally galvanized. Unless approved by FM Fire Systems.
 - i. Exception: Black steel pipe for dry systems will only be allowed to be installed with an approved Nitrogen System.
 - d. CPVC piping shall not be used.
 - e. Pipe shall be hydrostatically tested and be witnessed by FM Fire Systems before being covered up for two hours at 200 psi, including fire department connections per NFPA 24
3. Mechanical Grooved Couplings:
- a. Grooved couplings and fittings shall be designed for a working pressure of 300 psi.
 - b. Malleable iron housing clamps:
 - i. ASTM A47, UL listed, engage and lock, designed to permit some angular deflection, contraction, and expansion (Firelock fittings acceptable)
 - c. Galvanized couplings are required for galvanized pipe.
 - d. "C" shaped composition sealing gasket: ASTM D2000.
 - e. Steel bolts, nuts and washers:
 - i. ASTM A183 heat treated with a minimum tensile strength of 110,000 psi
 - f. Victaulic grooved couplings Style 009 not permitted on Dry Systems with tank mounted air compressors.
4. Valves:
- a. Unless specified otherwise, all valves shall be UL listed and/or FM approved and be suitable for the maximum anticipated System pressure or a minimum of 175 psi working pressure, whichever is greater.
 - b. All valves in the Sprinkler System shall be UL listed and/or FM approved butterfly, gate or ball type indicating valves except for the following, which shall be OS&Y:
 - i. All indicating valves on the suction side of a fire pump.
 - ii. Where indicated on the Construction Drawings

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- iii. Backflow device shall have internally wired butterfly valves unless it is on the suction side of a fire pump then it shall require an OS&Y.
 - c. All butterfly valves shall have a built-in tamper resistant switch for supervision of the open position.
 - i. The switch shall be contained within a NEMA Type 1, general purpose indoor rated housing. Either unauthorized removal of the switch housing (when the valve is open) or closing the valve, shall cause the switch contacts to change position.
 - ii. The switch shall have four conductors to accommodate connections to Style 4 or Style 6 signaling line circuit devices.
 - d. Where OS&Y indicating valves are installed, the following shall apply:
 - i. Valves 2–1/2" and larger shall be iron body with soft seats discs and stems. Include tamper switches listed for use with OS&Y valves.
 - ii. No OS&Y valves under 2–1/2" shall be used.
 - e. Check valves shall comply with the following:
 - i. Check valves 2–1/2" and larger shall be iron body swing check with cast brass hinge, rod, and soft faced discs.
 - ii. Check valves 2" and smaller shall be UL listed brass body and all brass fitted.
 - f. Ball valves shall be constructed of forged brass with Teflon seats and shall be provided with a vinyl-covered handle.
 - g. Post Indicator Valve:
 - i. Gate valve on incoming water service shall be operable by a UL listed post indicator valve with tamper switch monitored by the associated building fire alarm panel.
5. Piping Accessories:
- a. All hanger components other than All-Thread shall be UL listed and/or FM approved.
 - b. Sprinkler piping shall never be supported from any mechanical or electrical devices and/or equipment (ducts, lights, etc.).
 - c. Hanger assemblies installed outside, or otherwise exposed to weather, shall be externally galvanized.
 - d. Pipe sleeves entering building through foundations for underground pipe shall have watertight mechanical rubber seals.
 - e. Floor, wall and ceiling plates shall be pressed steel or cast-iron split plates, chromium plated.
 - f. Pressure gauges shall be UL listed or FM approved for fire service.

D. Design Standard:

1. New Construction:
- a. Automatic sprinkler protection shall be provided throughout as follows per CSU and FM Global requirements.
 - b. Office, classroom, lab, kitchen, apartments, residence halls, meeting rooms, attic space and other concealed spaces:
 - i. Ceilings to 30'–0" can be protected with Wet or Dry Sprinkler Systems designed to provide 0.10 gpm/sq. ft. over the most remote 1500 sq. ft. using sprinkler heads with a minimum K-factor of 5.6. Design shall include a 250-gallon hose stream allowance.
 - ii. Ceilings 30'–0" to 60'–0". can be protected with Wet Sprinkler Systems designed to provide 0.20 gpm/sq. ft. over the most remote 2500 sq. ft. using sprinkler heads with a minimum K factor of 11.2. Design shall include a 250-gallon hose stream allowance.

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- iii. Ceilings 30'–0" to 60'–0" can be protected with Dry Sprinkler Systems designed to provide 0.20 gpm/sq. ft. over the most remote 3500 sq. ft. using sprinkler heads with a minimum K factor of 11.2. Design shall include a 250–gallon hose stream allowance.
 - iv. Ceilings 60'–0" to 100'–0" can be protected with Wet Sprinkler Systems using K–25.2 pendant quick response automatic sprinklers on a System designed to provide 12 sprinklers at 7 psi. K25.2EC sprinkler heads can be used and the design reduced to 6 sprinklers at 7 psi. Design shall include a 500–gallon hose stream allowance.
 - c. Atriums, auto parking garages, theaters and auditoriums (including backstage), utility rooms, boiler rooms, mechanical rooms, gymnasiums and retail areas, electrical rooms, telecom rooms, storage rooms and custodial rooms:
 - i. Ceilings to 30'–0" can be protected with Wet Sprinkler Systems designed to provide 0.20 gpm/sq. ft. over the most remote 2500 sq. ft. using sprinkler heads with a minimum K–factor of 8.0. Design shall include a 250–gallon hose stream allowance.
 - ii. Ceilings to 30'–0" can be protected with Dry Sprinkler Systems designed to provide 0.20 gpm/sq. ft. over the most remote 3500 sq. ft. using sprinkler heads with a minimum K–factor of 8.0. Design shall include a 250–gallon hose stream allowance.
 - iii. Ceilings 30'–0" to 60'–0" can be protected with Wet Sprinkler Systems designed to provide 0.20 gpm/sq. ft. over the most remote 2500 sq. ft. using sprinkler heads with a minimum K factor of 11.2. Design shall include a 250–gallon hose stream allowance.
 - iv. Ceilings 60'–0" to 100'–0" can be protected with Wet Sprinkler Systems using K–25.2 pendant quick response automatic sprinklers on a System designed to provide 12 sprinklers at 7 psi. K25.2EC sprinkler heads can be used and the design reduced to 6 sprinklers at 7 psi. Design shall include a 500–gallon hose stream allowance.
 - d. All storage areas shall be provided with automatic sprinkler protection.
 - i. The protection design shall be determined at the time of construction and shall be based on commodity type, storage configuration, storage height and building height.
 - ii. K8.0 heads are to be used in all storage, electrical, mechanical, data and custodial rooms unless the design requires a more stringent supply of water.
2. General Details:
- a. Provide a minimum safety factor as required by FM Global or 10 psi or 10% safety factor when approved by CSU.
 - b. Provide a complete Automatic Sprinkler System as defined by the edition of NFPA 13 per the adopted edition of the IFC.
 - c. All Fire Sprinkler Systems installed on campus shall be Wet Pipe Systems unless the area being protected cannot be maintained above 40°F , as required per NFPA 13.
 - i. Such areas shall require installation of a Dry–Pipe System.
 - ii. Where approved by CSU, dry type heads shall be used.
 - d. Antifreeze Systems shall be permitted only on approval of the FM Fire Systems and PFA.
 - e. Areas where it is not desirable to have water–filled piping within the room (special collections, computer rooms, etc.) may use double interlock Pre–action Systems.
 - f. Pre–action Systems must be approved by FM Fire Systems prior to System design.
 - g. All initiating devices for the fire suppression system shall be addressed separately. i.e. tamper switches, water flow devices, low air switches, pressure switches and solenoids.
3. Underground Pipe:
- a. No underground pipe shall be covered until a joint inspection and hydrostatic test has been completed and documented by FM Fire Systems or CSU Water Representative.

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- b. The Contractor is responsible for assuring all inspections are recorded on the Project Building Inspection Record at the time of inspection.
 - i. This applies both to successful and failed inspections.
 - ii. Copies of the underground flush certificate shall be provided.
4. Aboveground Pipe:
 - a. Piping shall be concealed above suspended ceilings where installed, in a craftsman–like manner, and shall not interfere in the complete function of other Systems such as cable trays, access panels, or pedestrian passageways.
 - i. Piping in all occupied areas and mechanical area passageways shall not be lower than 7’–6”. Specific written approval may be granted for unavoidable projections, but under no circumstance shall overhead piping be installed lower than 6’–8” above the floor.
 - ii. Piping shall not reduce the required width of any means of egress. The width of stairs or clear width of a corridor or passageway shall not be less than 44”.
 - iii. Installation of all piping shall be in coordination with piping, ducts, light fixtures and any other Work that may obstruct sprinklers.
 - iv. The Contractor shall coordinate with all trades having materials installed above the ceiling prior to commencement of any Work.
 - b. Piping that is retrofit into an existing building with suspended ceilings shall be installed above the existing ceiling, unless exposed piping is approved by the Project Representative.
 - c. All exposed Sprinkler and Standpipe System pipe located in areas without suspended ceilings shall be painted upon approval of the Project Team.
5. Valves:
 - a. All valves controlling water supply for sprinklers shall be readily accessible for use by emergency and maintenance personnel at a maximum of 7’–0” above finished floor (AFF) unless approved by FM Fire Systems.
 - b. Except for underground water supply valves located in roadway boxes, all valves controlling water supply to sprinklers shall be individually supervised by the Fire Alarm System.
 - c. A control valve shall be installed at the base of each riser, no higher than 7’–0” AFF.
 - d. Systems shall be zoned according to size and location. Each zone shall be annunciated at the building fire annunciator and installed to NFPA regulations.
 - i. Separate zones shall be provided with a control valve, check valve, main drain, inspectors test connection, flow switch and express drain.
 - e. Each floor shall be zoned separately unless approved by CSU.
 - f. Each System shall require venting valves located in pre–approved locations.
6. Drains and Test Piping:
 - a. All portions of the System shall be equipped with drains of the size specified in NFPA 13.
 - b. The Sprinkler System shall be designed to drain to the riser.
 - i. All drains, including auxiliary drains, shall be piped to an appropriate location designed to handle full flow of the drain and approved by CSU.
 - c. Every water flow switch shall have an inspector’s test connection located at the riser and piped to the appropriate location designed to handle full flow from the drain and approved by CSU.
7. Express Drains:
 - a. A remote express drain line is required for all buildings with floor control assemblies in addition to the main/inspectors test drain.

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- b. This drain line shall be installed in the remote stairwell from the supply standpipe.
 - c. The drain line shall be piped to an appropriate location approved by CSU.
8. Backflow Preventer:
- a. A double check backflow prevention assembly shall be installed prior to any Sprinkler or Standpipe System connected to the City of Fort Collins Water Distribution System, including connection of pressure maintenance pumps to the building's domestic water line used to fill Sprinkler System piping.
 - b. Reduced pressure backflow required on High Hazard Systems.
 - c. Backflow preventer shall be tested prior to Fire System being placed into service.
 - d. Each valve on the backflow shall be independently supervised.
 - e. The backflow shall be installed with a tampered butterfly valve and drain equal to the size of the backflow for full flow testing per NFPA and piped outside.
9. Identification/Labeling:
- a. Identification signs shall be porcelain enameled 18 gauge and shall be affixed securely by chain to all valves.
 - i. The signs shall be red and white in color.
 - b. Provide an approved laminated valve chart in frame and Plexiglas cover showing location and use of each valve, including drain valves.
 - i. The chart shall be secured in a visible location acceptable to the University.
 - c. The main drain sign shall be labeled "MAIN DRAIN". Riser drains shall be labeled "RISER DRAIN" or "DRAIN".
 - d. Auxiliary drain signs shall be labeled "AUXILIARY DRAIN".
 - e. Inspector's test connection signs shall be labeled "INSPECTOR'S TEST".
 - f. All water supply control valves shall have a standard sign identifying the portion of the System controlled, noting that the valve shall be kept open, and leaving a blank space for notification information.
 - g. All isolation valves shall be marked on identification tag whether valve is to be "normally open" (NO) or "normally closed" (NC).
 - h. All concealed pipe and exposed pipe that is not painted red shall be marked "Fire Suppression".
 - i. Pipe markers shall be wrap-around type with white letters having a minimum of height of 1".
 - i. All pipe markers must be visible from the floor.
 - i. Spacing and location shall be:
 - i. Above Ceiling, Corridors:
 - a) Every 20'-0" for mains. One on each branch line.
 - ii. Above Ceilings, Rooms:
 - a) One in every room on each branch line. Every 20'-0" for mains (at least one in each room).
 - iii. Exposed Areas, Non-painted Pipe:
 - a) Every 20'-0" for mains and branch lines (at least one on each branch line) and in each room.
 - iv. Exposed Areas, Painted Pipe:
 - a) Pipe markers not required if pipe is painted red. For any other color, comply with requirements above.

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E. Plan Review and Submittals:

1. Prior to preparing Shop Drawings and hydraulic calculations, the Design Engineer shall verify the adequacy of the water pressure and other pertinent water supply data from either the FM Utility Services or the City of Fort Collins Water Distribution System, depending on which System shall be used to supply the new Sprinkler and/or Standpipe System.
2. Hydrant flow tests performed on the University Distribution System shall incorporate erosion control requirements in compliance with the regulations and permits administered by FM Environmental Engineering.
3. The Design Engineer shall immediately notify FM Fire Systems, Project Representative and CSU Environmental Health Services (EHS) of the need for testing the appropriate water supply.
4. The Engineer shall provide the record data at the point of the new utility connection as follows:
 - a. Building Name and flange elevation (ft.).
 - b. Test hydrants (hydrant numbers and location) and hydrant elevations (ft.).
 - c. Flow rate (gpm), static pressure (psi), and residual pressure (psi).
 - d. All turning of valves and operation of hydrants to be performed by CSU Facilities Management.
 - i. Actual test to be performed by Contractor or Engineer utilizing their own equipment.
 - e. Prior to flowing water on campus, the Project Representative shall submit a request for approval to EHS and FM Environmental Engineering.
5. A plan review shall be completed by PFA, FM Global and FM Fire Systems for each phase of the fire alarm and fire suppression design.
6. Fire Suppression Drawings shall be separate from other building Drawings.
 - a. Refer to Division 01 – General Requirements regarding responsibility for review fees.
7. Electronic PDF files must be submitted to FM Global and FM Fire Systems within 30 days after the award of an Agreement. Drawings and electronic files shall be received by the Project Representative and distributed to the following:
 - a. FM Fire Systems (electronic file)
 - b. FM Global (electronic file)
 - c. CSU Design and Construction (one paper set and electronic file)
 - d. PFA (current requirement as distributed by Contractor)
8. Shop Drawings shall be prepared in accordance with NFPA 13, NFPA 14, NFPA 20, NFPA 24 and FM Global Fire Suppression Data Sheets for approval of all equipment to be constructed and installed.
 - a. Shop Drawings shall identify all materials and list all equipment to be used.
 - b. Shop Drawings shall include ceiling grid or reflected ceiling layout and shall be coordinated with other trades prior to submittal.
 - c. Hydraulic calculations for Standpipe Systems shall comply with FM Global Data Sheet 3–26 and NFPA 13 and shall include comprehensive hydraulic data sheets. Provide a safety factor required by FM Global or 10 psi and 10%, whichever is greater, for all Standpipe Systems hydraulic calculations.
 - d. Where required per NFPA 14 and FM Global Data Sheets, provide hydraulic calculations for automatic standpipes to provide 100 psi when flowing, with 500 gpm at the most remote standpipe outlet and 250 gpm at each additional standpipe.

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- i. Provide hydraulic calculations for manual standpipes to demonstrate the pressure available at the top of each standpipe while flowing, and the demand required per FM Global and NFPA 14 using both the available water supply and the nominal PFA fire truck pumper through the fire department connection.
9. Manufacturer's data sheets shall be provided for all materials and equipment for approval before purchase or installation.
 - a. Data sheets shall describe the type of material, capacities, Manufacturer, and part numbers of equipment and give sufficient information for equipment verification and approval.
10. No Work shall be performed until the University has approved the Shop Drawings, calculations, and data sheets.
 - a. The Contractor is solely liable for any Work performed prior to this approval.
11. Record Drawings in both PDF and AutoCAD files shall be received no later than five days prior to the CSU test and verification and distributed to FM Fire Systems. One set of As-Built Drawings shall be received by the Project Representative during the same time frame, which shall be distributed to the following:
 - a. FM Fire Systems (electronic file)
 - b. PFA (one set) – This set shall remain on-site to be used during final inspection.
 - c. FM Global (electronic file)

21 13 00 – FIRE SUPPRESSION SPRINKLER SYSTEMS

A. Sprinklers:

1. Sprinklers shall be UL listed or FM approved and shall not include O-ring seals. Any sprinkler that incurs damage, is painted, or is sprayed with any obstructive material during construction shall be replaced at no cost to the University.
 - a. Installation of sprinklers shall be coordinated with other Work, including duct and electric fixture installation, to prevent sprinkler obstructions.
2. Sprinklers located less than 8'-0" above finished floor or that may be subject to mechanical damage shall be provided with guards listed for use with the model of sprinkler installed.
3. Quick Response (QR) sprinklers that are required throughout all light-hazard occupancies may also be installed in ordinary-hazard occupancies for the quick response hydraulic design area reduction per NFPA 13 for utilizing quick response sprinklers.
 - a. FM Global does not recognize Quick Response sprinklers, therefore, they do not usually allow the design reduction for QR heads
 - b. Extended coverage sprinklers may be used if proven in the hydraulic calculations.
4. Unless specific aesthetic appearance is required for the Project, white or chrome recessed pendent sprinklers with matching escutcheons shall be provided in areas with suspended ceilings, and brass upright sprinklers shall be provided in areas without suspended ceilings.
 - a. Verify with the Project Representative prior to specifying sprinkler type and finish.
5. Sprinklers shall be centered in two directions (quarter point or center point) in the ceiling tile.
 - a. Pendent sprinklers shall be placed in the center or quarter point of ceiling tiles.
 - b. Other methods must be approved by CSU.

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21 13 16 – DRY-PIPE SPRINKLER SYSTEMS

A. Dry-Pipe System:

1. Dry-Pipe Systems shall only be installed where the area being protected cannot be maintained above 40°F, as required per NFPA 13.
2. In areas subject to freezing that cannot be protected by dry type sprinklers on a Wet Sprinkler System, a Dry-Pipe System shall be installed.
3. Pitch Dry-Pipe System piping a minimum of 1/4" per 10'-0" for Dry System mains and minimum of 1/2" per 10'-0" for Dry System branch lines.
4. Provide full length dry pendent sprinklers that connect directly to the Dry System branch line with "goose neck" riser into tee fittings "on the run" in areas with suspended ceilings.
 - a. Do not install dry pendent sprinklers on drops.
5. Provide a pipe mounted or tank mounted air compressor listed for fire protection use and sized to refill the entire Dry-Pipe System within 30 minutes as required per NFPA 13.
6. All dry-pipe valves must be externally resettable.
7. Dry System piping shall be galvanized schedule 10 unless otherwise required per FM Global or CSU.
 - a. Exception: Black steel pipe shall be permitted with an approved Nitrogen system.
8. Install permanent, typed, local labels at devices showing "LOW AIR" setting, "COMPRESSOR ON" setting, "COMPRESSOR OFF" setting, and "TRIP PRESSURE" setting.

21 13 19 – PREACTION SPRINKLER SYSTEMS

A. Pre-Action Sprinkler System:

1. Provide a double interlock Pre-action System where the Project Representative prefers to eliminate water filled piping within the room, such as special collections, computer rooms, etc.
2. Pitch Pre-action System piping a minimum of 1/4" per 10' for Pre-action System mains and minimum of 1/2" per 10'-0" for Pre-action System branch lines.
3. Provide full length dry pendent sprinklers that connect directly to the Pre-action System branch line with "goose neck" riser into tee fittings "on the run" in areas with suspended ceilings.
 - a. Do not install dry pendent sprinklers on drops.
4. Provide a pipe mounted or tank mounted air compressor listed for fire protection use and sized to refill the entire Pre-action System within 30 minutes as required per NFPA 13.
5. Requirements for detection, Pre-action System releasing, Pre-action System monitoring, and the Pre-action release control panel are noted in Division 28 – Electronic Safety and Security.
6. All Pre-action valves must be externally resettable.

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7. Pre-action System piping shall be galvanized schedule 10 unless otherwise required by FM Global or CSU.
 - a. Exception: Black steel pipe shall be permitted with an approved Nitrogen system.
9. Install permanent, typed, local labels at devices showing “LOW AIR” setting, “COMPRESSOR ON” setting, “COMPRESSOR OFF” setting, and “TRIP PRESSURE” setting.

B. System Testing and Acceptance:

1. All rough-in and hydrostatic inspections, pretesting, backflow prevention certification, punch list items and record documents shall be complete and received by FM Fire Systems prior to Final Inspection.
2. All Fire Suppression valves, flow switches, pressure switches, solenoids, fire pump panel contacts and all other applicable devices shall be independently addressed and labeled.
3. Three different System tests shall be completed on any and all Fire Alarm Systems.
 - a. Preliminary Testing:
 - i. A preliminary test shall be completed by the installers to ensure proper operation of the Fire Suppression System valves and switches without the assistance of CSU or PFA.
 - b. CSU Test and Verification:
 - i. This 100% System test, which entails testing and verifying every input and output, shall be completed by FM Fire Systems in the presence of the Installation Contractors per NFPA 25 testing procedures.
 - ii. Prior to scheduling this test, the preliminary testing shall be completed.
 - iii. Prior to scheduling this test, As-Built Drawings, updated CAD files and O&M Manuals shall be received by necessary parties.
 - iv. Prior to scheduling this test, all hydrostatic testing shall be successfully completed.
 - v. The Contractor shall submit a written request for this inspection to the Project Representative and Facilities Dispatch at least five business days in advance. The Project Representative shall coordinate and schedule the inspection with FM Fire Systems and the building proctor.
 - vi. The Contractor shall have all Subcontractors scheduled to be in attendance on the day of inspection that shall be needed in order to complete a 100% System test.
 - vii. The Contractor shall furnish all test equipment necessary to complete the testing.
 - c. PFA Test and Verification:
 - i. Prior to scheduling the Final Acceptance Test the CSU Test and Verification shall be completed.
 - ii. The Contractor shall furnish all test equipment necessary to complete the testing.

C. Warranty and Training:

1. The Contractor shall guarantee all workmanship and material free from inherent mechanical, defects for a period of three years from the date of acceptance as set forth in the general conditions.
2. The Contractor shall guarantee an on-site response, if requested by FM Fire Systems, for all warranty related issues of no longer than 24 hours.
 - a. Work to correct the warranty issue shall begin no later than 48 hours starting from the initial on-site response, unless approved by FM Fire Systems.

PART III – CSU FACILITIES PLANNING, DESIGN AND CONSTRUCTION STANDARDS

DIVISION 21 – FIRE SUPPRESSION

3. Any part of the warranty shall not be made void due to any required inspection or operation of the System performed by FM Fire Systems during the warranty period.
4. Failure to comply with all contractual obligations resulting in costs incurred by the Project Representative shall result in those costs being transferred to the appropriate Contractor for payment.
5. Contractor shall be financially responsible for all fees incurred to the Project Representative and all lost research due to false alarms or water leaks as a result of construction or Contractor error for the duration of the warranty.

21 20 00 – FIRE EXTINGUISHING SYSTEMS

A. Fire Extinguishers:

1. Fire extinguishers shall conform to NFPA 1 Standard for Portable Fire Extinguishers and OSHA 29 CFR 1910 Subpart L.
2. Fire extinguishers shall be provided as a part of the Construction Agreement after consultation with the Project Representative unless noted otherwise.
3. Fire extinguisher cabinets shall not have break glass doors.
4. Full recess cabinets are preferred.

END OF DIVISION