



Facilities Planning and Construction Design & Building Standards

Division 21 – Fire Suppression

Preface

The Texas Tech University System's 'Design and Construction Standards', as administrated by Facilities Planning and Construction, are intended to serve as guidelines to the Design Professional and Construction Management teams for design development and construction administration of Texas Tech University System (TTUS) Capital Projects. They communicate the minimum expectations and requirements relative to specific building systems, design provisions, general specification requirements, and administrative procedures for new facilities being constructed on Texas Tech University System (ASU, MSU, TTU, TTUHSC, and TTUHSC El Paso) campuses. Several, but not all requirements for each component Institution or Agency within the TTU System are covered. Design Professionals, Construction Managers at Risk and/or Design-Build Firms shall also refer to provisions covered in their service Agreements, as well as within the project's Basis of Design (BOD) document.

In addition, the 'Design and Construction Standards' shall also be utilized in conjunction with the approved project specific Program and Schematic Design development. In the event of conflict between this document and specific project requirements, Design Professionals and Construction Managers shall contact Facilities Planning & Construction for clarification.

The guidelines within the 'Design and Construction Standards' are not intended to prohibit the use of alternative design solutions, methods, systems, products or devices not covered in this document. Offered alternatives deviating from or not covered in these standards shall be documented by the Design Professional and/or Construction Management teams and submitted to Facilities Planning & Construction for approval prior to implementation.

Throughout the 'Design and Construction Standards' there are references to manufacturer specific products. These are to be considered the 'Basis of Design' to establish the expected minimum quality requirements. Design Professionals are encouraged to identify and include equivalent products and/or manufacturers offering comparable products to facilitate open bidding environments.

General Requirements for Fire Suppression

Fire Suppression Systems

Fire suppression system design and installation shall conform to the current versions of NFPA, the ICC International Building Code and International Fire Code, the component Institution Fire Marshall's Office, and FM Global recommendations. Where latest adopted editions vary between codes, the component Institution Fire Marshall's Office is the Authority Having Jurisdiction (AHJ) for all life safety systems.

All Work shall be performed by a contractor with a current certificate of registration from the State Fire Marshall as an independent fire protection sprinkler contractor (Registered Firm). The Work shall be performed under the supervision of a licensed Responsible Managing Employee (RME) as defined by Texas Insurance Code (TIC), Article 5.43-3, Fire Protection Sprinkler Systems. This contractor shall be fully responsible for all design requirements, including items exceeding those specifically illustrated or mentioned in the contract documents. The fire protection contractor shall have a minimum of 5 years successful experience in the installation of fire suppression systems of the type specified. References will be made available upon request.

Submittals will be reviewed by the Design Professional, component Institution Fire Marshall's Office, TTUS Facilities Planning and Construction, and FM Global. Perform all calculations, prepare, and submit shop drawings, and secure all required approvals from approving authorities.

All materials and equipment, where applicable, should be listed by Underwriters Laboratories and FM Approvals and the installation should be in accordance with the manufacturer's recommendations and FM Global Recommended Good Practices.

At start of the project, perform flow tests or secure new/current pressure/flow capacity data from the component Institution Fire Marshall's office or local water utility to verify line size are sufficient for the project. Include flow test data on plans and in submittals.

All systems will be hydraulically designed and shall include a minimum safety factor of 10 psi to account for future variations in water supply pressure, deterioration of piping system and future renovations to system. Hydraulic calculations shall show inclusion of this "safety factor."

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Install fire risers and fire pumps (if required) in a dedicated fire pump room.

At the end of the one-year warranty period, the Fire Suppression contractor shall execute a documented annual inspection, acceptable to the component Institution Fire Marshall's Office, without change in the Contract amount. The Inspection form shall be filled out in triplicate and submitted to the component Institution Fire Marshall's Office and TTUS Facilities Planning and Construction.

21 05 23 General Duty Valves for Fire Protection Piping

This section encompasses and provides general requirements for ball valves, butterfly valves, check valves, OS&Y gate valves, NRS gate valves, indicator posts, trim and drain valves. Valves must be UL Listed and FM Global Approved.

Refer to NFPA 24 for valve compliance.

ASME Compliance:

- ASME B16.1 for flanges on iron valves
- ASME B1.20.1 for threads for threaded-end valves
- ASME B31.9 for building services piping valves.

AWWA Compliance:

- Comply with AWWA C606 for grooved-end connections.

Valve pressure ratings shall not be less than the minimum pressure rating indicated or higher as required by system pressures. Valve Sizes shall be the same as upstream piping unless otherwise indicated.

Valve actuators shall be either worm-gear actuator with handwheel for quarter-turn valves (except for trim and drain valves), handwheel (for other than quarter-turn trim and drain valves), and/or hand lever for quarter-turn trim and drain valves NPS 2 and smaller.

Two-piece ball valves with indicators: Per UL 1091 - Brass or Bronze body with minimum pressure rating of 175 psig, full port size, PTFE seats, chrome plated brass ball instead of disc, stainless stems,

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and FM Global standard for indicating valves (ball type), Class Number 1112. Actuators can be worm gear of traveling nut. Supervisory switch to be internal or external dependent on valve. End connections for valves to be threaded ends.

Butterfly valves with indicators: Per UL 1091 - Bronze body with minimum pressure rating of 175 psig, full port size, EPDM seats, stainless steel stems and disc, and FM Global standard for indicating valves (butterfly type), Class Number 1112. Actuators can be worm gear of traveling nut. Supervisory switch to be internal or external dependent on valve. End connections for valves to be threaded ends.

21 05 53 Identification for Fire-Suppression Piping and Equipment

To be developed.

21 11 00 Facility Fire-Suppression Water-Servicing Piping

Underground piping to be C900 PVC or C151 ductile iron water pipe. Underground piping under footings and penetrating flooring to be Class 300 AWWA C151 ductile iron water pipe or FM approved stainless steel spigot assembly.

Specify double check backflow preventer assembly, complete with OS&Y valves, and tamper switches. Backflow prevention assembly testers may test and repair assemblies on fire lines only if they are permanently employed by an approved fire line contractor. The State Fire Marshal's office requires that any person performing maintenance on fire lines must be employed by an approved fire line contractor.

A post indicating valve will be provided for each building and located as directed by the component Institution Fire Marshall's office.

21 11 16 Fire Hydrants

To be developed.

21 11 19 Fire Department Connections

A fire department connection will be provided for each building and located as directed by the Owner and the component Institution Fire Marshal's Office. Specify the fire department connection to be either wall mounted flush type or 90-degree sidewalk type depending on project location. Sidewalk type will be marked with a FDC marking sign and a metal sign identifying the specific building it serves. The NFPA and TTU required signage will have white raised letters at least one inch in size on a red background. Exact verbiage will be determined by the component Institution Fire Marshal's Office.

21 12 00 Fire Suppression Standpipes

To be developed.

21 13 13 Wet-Pipe Sprinkler Systems

Aboveground piping for wet systems to be schedule 40 black steel piping conforming to ASTM A53 installed with approved screwed, grooved, flanged, and welded fittings. Schedule 40 galvanized pipe will be required for dry systems and pre-action systems. Comply with applicable governing regulations and industry standards. Piping shall be domestically manufactured. All non-galvanized black steel piping used in water-based fire protection systems shall be provided with an antimicrobial coating designed to inhibit the growth of microbiologically influenced corrosion (MIC). The use of thin wall sprinkler piping shall not be acceptable.

All piping shall be fully reamed for all joint types.

Submit welding procedures and welder's certificates for shop and job site welding of piping work.

All grooved pipe to be roll grooved. Cut groove is not acceptable. Repair all pipe coatings disturbed by the grooving process.

All fire protection piping shall be thoroughly flushed to remove any slag or debris prior to being tested or put into service. The system shall be thoroughly flush without sprinkler heads installed.

Screwed pipe fittings to be Class 150 black malleable or Class 125 cast iron fittings.

Mechanical grooved couplings to malleable iron housing clamps to engage and lock "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers: galvanized for galvanized pipe.

No plain end fittings will be allowed.

All fire sprinkler systems will have an outdoor rated Horn/Strobe that will be activated from water flow on the system mounted outside of the riser room. Water motor gongs and electric bells are not acceptable.

All water flow switches, tamper switches, or other supervisory switches will be monitored by the Fire Alarm System. Refer to Division 28 - Digital Addressable Fire-Alarm Systems.

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Fire suppression piping is not allowed in IDF/MDF rooms, elevator machine rooms, and electrical rooms except where serving that specific room.

For pendant heads in finished ceilings, specify white concealed sprinkler heads with round cover plates Unless approved otherwise by the FP&C Project Manager. All sprinkler heads are to be installed center of the tile, unless approved otherwise. Other pendant sprinkler head options will only be allowed if approved by the component Institution Fire Marshall.

FM approved flexible drop connections are allowed for center of tile applications only.

Fire protection design for each system should include a 1-inch inspector's test with a smooth bore corrosion resistant orifice giving a flow equal to one sprinkler of a type having the smallest K-factor installed on the system. Inspector's test should be located at the most accessible remote location. Each system shall include a 2" main drain with gauges for the dual purpose of draining the entire sprinkler system and for conducting future main drain test.

System piping and components will be hydrostatically tested per NFPA 13 requirements. All aboveground and underground pipe joints will remain uncovered during the test for visible inspections. The Contractor will be responsible for the component Institution Fire Marshall's Office inspection fees for any failed test.

FM Global Field Engineer and component Institution Fire Marshal's Office shall be notified of all acceptance tests. Please notify FP&C fourteen (14) days in advance for scheduling.

At the end of the one-year warranty period, the Fire Suppression Subcontractor shall execute a documented annual inspection, acceptable to the component Institution Fire Marshall's Office, without change in the Contract amount. The Inspection form shall be filled out in triplicate and submitted to the component Institution Fire Marshall's Office and TTUS Facilities Planning and Construction.

21 13 16 Dry-Pipe Sprinkler Systems

To be developed.

21 22 00 Clean-Agent Fire-Extinguishing Systems

To be developed.

21 31 13 Electric Drive, Centrifugal Fire Pump

Provide a dedicated fire pump room for the fire pump, if project constraints require a fire pump.

If required, fire pumps should be sized so that the maximum expected discharge pressure at churn does not exceed 175 psi. If this is not possible, a pressure reducing valve (PRV), set for 175 psi, should be installed after the pump at required locations. The PRV shall be tested upon completion to ensure proper operation under flow and no flow conditions per NFPA 13. All PRV test results shall be recorded on the Contractor's Material and Test Certificate. Means shall also be provided downstream of the PRV to conduct flow tests to simulate the sprinklers system's demand requirements to confirm proper operation of the installed PRV.

Fire pump arrangements shall include an inline flow meter and outside test header.

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Arrange the fire pump for manual stop only. According to *FM Global Data Sheet 3-7*, the fire pump should be arranged to automatically start as follows:

1. The jockey pump start point equals the pump pressure at churn (zero flow) plus the maximum static pump suction pressure plus 5 psi.
2. The jockey pump stop point is 10 psi more than the jockey pump start point.
3. The fire pump start point is 5 to 10 psi less than the jockey pump start point.

Connect the electric motor fire pump controller feeder circuit directly to the facility power source ahead of all other facility power loads or as required per the applicable electrical code and FM Global recommendations.

Pipe sizes for the fire pump installations should be in accordance with *FM Global Data Sheet 3-7, Table 1*.

Fire pumps should report a “general fire alarm” back to CHACP 1 upon operation.

Fire pump acceptance tests will be performed in strict accordance with NPFA and FM Global’s recommendations. FM Global requires the test curve to be developed with a minimum of five (5) test points at 0%, 50%, 100%, 125%, and 150% rated flow. Automatic and manual starts will be performed. Video the final pump acceptance test and submit to the component Institution Fire Marshall’s office.

21 34 00 Pressure-Maintenance Pumps

To be developed.