

PART 1 - GENERAL

1.1 SCOPE

A. Through Class III Commodity Classification, up to 40 ft of single, double or multiple row rack storage, up to 48 ft building height (QUELL™ Fire Sprinkler System). Cartoned Group A Plastics Commodity, up to 30 ft of single, double or multiple row rack storage, up to 35 ft of building height (QUELL™ Fire Sprinkler System).

1. The QUELL™ fire protection system for cold storage and/or unheated warehouses shall be designed and installed by a QUELL™ Licensee sprinkler contractor based upon section 2.2 (A) or (B) of this specification, taking into consideration the information contained in Tyco Fire & Building Products (TF&BP) Technical Data Sheet #370.
2. The fire sprinkler system shall utilize Tyco® double interlock pre-action dry system components with Tyco Ultra K 17 (k-16.8) 286°F sprinklers, all as manufactured by TF&BP. The contractor shall be responsible for complete working systems throughout the facility. All equipment is to be U.L Listed and/or Factory Mutual approved for the intended use. The fire sprinkler system shall be hydraulically calculated, and water delivery times for each pre-action system shall be verified by the contractor using SprinkFDT Q™ software as applicable. The system design including shop drawings, calculations, equipment drawings, and water delivery calculations shall be submitted to the owner, his insurance company, and all local authorities having jurisdiction for approval prior to the commencement and completion of installation. All drawings, hydraulic calculations, and water delivery calculations shall be revised for the actual as-built system and shall be submitted to the owner or the owner's representative following installation of the system(s).

1.2 QUALIFICATIONS

- A. Installation of the entire sprinkler system is to be performed by a QUELL™ Licensee sprinkler contractor with a minimum of five years of design and installation experience with sprinkler system installations in cold and unheated warehousing similar to the one specified under this contract. Evidence of such experience must be submitted with the bid for this project. If such information is lacking or incomplete, the owner and/or the owner's representative reserve the right to refuse to accept said contractor(s) quotation for the project.
- B. The preparation of the sprinkler shop drawings is to be performed by, or be under the direct supervision of, an employee of the contractor with a minimum NICET III certification in Automatic Sprinkler System Layout and Design. Evidence of such experience must be submitted with the bid for this project.
- C. A Quality Assurance check of the completed installation shall be performed by a QUELL™ Licensee possessing a minimum NICET certification of level III in Automatic Sprinkler System Layout. Evidence of such experience must be submitted with the bid for this project. The finished installation is to be compared to the sprinkler contractor's design drawings for completeness and correctness. The shop drawings, hydraulic calculations and water delivery calculations shall be amended and re-submitted to the owner's representative to document the 'as built' conditions. The revised hydraulic and water delivery calculations will confirm the ability of the installed system to meet the required system performance. Should the revision result in unacceptable performance, the sprinkler contractor will be responsible for all required modifications to correct the performance at said contractor's expense. Substitution of material or equipment for previously submitted materials required by this specification will not be accepted, and all costs associated with the removal and replacement will be at the sprinkler contractor's expense. The individual certifying the system shall sign the contractor(s) material and test certificate.
- D. The Fire Detection contractor shall be or be represented by an authorized representative of Safe Fire Detection, Inc. (SAFE) for the design and installation of linear heat detection components required by section 2.2C2. This person must have successfully completed SAFE's technical training seminar and show proof of same by means of a Safe Detection issued certification. The

individual(s) listed on the certificate must be in the employ of the company and be present at the time of the testing and commissioning or the certification is invalid. The certification is valid for a period of two years from the date of issuance shown on the certificate.

PART 2 - DESIGN CONSIDERATIONS, SYSTEM COMPONENTS AND HARDWARE

2.1 GENERAL

- A. All materials and devices essential to successful system operation shall be UL Listed and/or FM Approved. Within this specification, “listed” shall mean UL Listed or FM Approved.
- B. The installing sprinkler contractor shall submit data sheets for all intended materials and equipment. Such information shall include but not be limited to sprinklers, valves, valve trim, pipe, fittings, and all other items that are incorporated into the fire sprinkler system(s). Materials purchased by the sprinkler contractor prior to receiving all required approvals and authorization will be done at said contractor’s risk.
- C. The installing sprinkler contractor shall install all sprinklers, pipe, fittings, and other equipment in accordance with the material submission. Substitution of alternate products or materials for previously submitted and approved items will not be accepted.
- D. The use of anti-freeze in the fire sprinkler systems is not permitted.

2.2 DESIGN CONSIDERATIONS

- A. Cartoned Group A Plastic Commodity, up to 30 ft of single, double or multiple row rack storage, up to 35 ft building height (QUELL™ Fire Sprinkler System).
 - 1. A Quell™ Fire Sprinkler System **utilizing performance based design** shall be furnished and incorporate the following:
 - a. The system shall be in accordance with TF&BP Technical Data Sheet #370 including minimum water delivery time for the 4 **least** hydraulically remote sprinklers, **and** maximum water delivery time for the 4 **most** hydraulically remote sprinklers. Design guidance within TF&BP Technical Data Sheet #370 also includes requirements for **sequential** operation of the first, second, third, and fourth most hydraulically remote and least hydraulically remote sprinklers.
 - b. Guidance on design number of sprinklers:
 - i. Utilization of Underwriters Laboratories “Fire Performance Evaluation of Dry-pipe Sprinkler Systems for Protection of Class I, II, III and Group A Plastic Commodities Using K-16.8 Sprinkler” Project 06NK05814, EX 4991), “Fire Performance Evaluation of Dry-pipe Sprinkler Systems for Protection of Group A Unexpanded Plastic Commodity Using K-16.8 Sprinkler” Project 06NK25135, EX 4991 and guidance provided by TF&BP Technical Data Sheet #370.
 - ii. Accurate water delivery times for the QUELL™ design require the utilization of SprinkFDT Q™ (Fluid Delivery Time Quell™) software. This software can also calculate the required minimum water delivery of the 4 **least** hydraulically remote sprinklers and maximum water delivery of the 4 **most** hydraulically remote sprinklers. Design guidance also includes requirements for **sequential** sprinkler operation of the first, second, third, and fourth **least** hydraulically remote and **most** hydraulically remote sprinklers. Such calculations shall be submitted for review and approval as a part of the sprinkler shop drawing and equipment submittal package
- B. Class I,II & III Commodity, up to 40 ft of single, double or multiple row rack storage, up to 48 ft building height (QUELL™ Fire Sprinkler System).

1. A QUELL™ Fire Sprinkler System **utilizing performance based design** shall be furnished and incorporate the following:
 - a. The system shall be in accordance with TF&BP Technical Data Sheet #370 including minimum water delivery time for the 4 **least** hydraulically remote sprinklers, **and** maximum water delivery time for the 4 **most** hydraulically remote sprinklers. TF&BP Technical Data Sheet #370 also includes requirements for **sequential** operation of the first, second, third, and fourth most hydraulically remote and least hydraulically remote sprinklers.
 - b. Guidance on design number of sprinklers:
 - i. Utilization of Underwriters Laboratories “Fire Performance Evaluation of Dry-pipe Sprinkler Systems for Protection of Class II, III and Group A Plastic Commodities Using K-16.8 Sprinkler” Project 06NK05814, EX 4991), “Fire Performance Evaluation of Dry-pipe Sprinkler Systems with 40 ft. of Class III Commodity Stored Under a 48 ft. Ceiling Using K-16.8 Sprinkler” Project 06NK23629, EX 4991 and guidance provided by TF&BP Technical Data Sheet #370.
 - ii. Accurate water delivery times for the QUELL™ Fire Sprinkler System design require the utilization of SprinkFDT Q™ (Fluid Delivery Time QUELL™) software. This software is capable of calculating the required minimum water delivery of the 4 **least** hydraulically remote sprinklers and maximum water delivery of the 4 **most** hydraulically remote sprinklers. This software can also the required **sequential** sprinkler operation of the first, second, third, and fourth **least** hydraulically remote and **most** hydraulically remote sprinklers. Such calculations shall be submitted for review and approval as a part of the sprinkler shop drawing and equipment submittal package.
- C. Fire Detection in areas protected by the QUELL™ Fire Sprinkler System shall be furnished and incorporated in the following manner:
 1. Fire Detection shall be arranged such that during a fire event the fire detection shall occur prior to sprinkler operation.
 2. Linear heat detection manufactured by SAFE shall be installed on each pipe fitted with sprinklers in accordance with the manufacturers recommended installation instructions and TF&BP Technical Data Sheet #370.
 - a. Guidance on placement and location of linear heat detection:
 - i. Utilization of Underwriters Laboratories “Fire Performance Evaluation of Dry-Pipe Sprinkler Systems with 40 ft. of Class III Commodity Stored Under a 48 ft. Ceiling Using K-16.8 Sprinklers” Project 06NK23629 EX4991.

2.3 AUTOMATIC SPRINKLERS

A. General

1. Automatic sprinklers shall be warranted by the manufacturer for ten (10) years against defects in material and workmanship.

B. Automatic Sprinklers used for the Protection of Refrigerated Warehousing

1. Tyco Model Ultra K17 (16.8 K-factor) Upright, Standard Response, 286 degree F / 141 degree C. (TY7153)
2. Sprinklers installed in areas not subject to cold storage/unheated warehousing shall meet the requirements as set forth in NFPA 13-2007, and shall be Tyco appropriate model sprinkler(s).

2.4 ABOVEGROUND PIPING AND FITTINGS

A. General

1. Grooved fittings and couplings shall be warranted by the manufacturer for ten (10) years against defects in material and workmanship

B. Steel Sprinkler Piping and Fittings

1. Sprinkler pipe shall be carbon steel and meet ASTM A-795 and/or A-135, and shall be UL listed and FM approved for fire protection service. Dry system piping shall be “hot-dip” internally galvanized in accordance with ASTM A-123 Zinc coating specifications. Steel piping shall be Allied Tube & Conduit Schedule-10 and/or Schedule-40 sprinkler pipe.
2. Grooved mechanical pipe couplings and fittings shall be cast iron, class 125, conforming to ANSI B16.1, ductile iron, conforming to ASTM A-536 Grade 65-45-12, or fabricated steel conforming to ASTM A-53 Grade B.
3. Grooved couplings used in refrigerated spaces shall be Grinnell® Figure 772 rigid type using Tri-Seal Grade E gaskets. Only silicone gasket lubricant shall be utilized.
 - a. In other portions of the occupancy, where ambient temperatures are maintained above 40 F, Grinnell Figure 772 rigid type couplings or Grinnell Figure 705 flexible type couplings, both using a standard Grade A gasket, are acceptable.
4. Where steel pipe is used in pre-action and dry pipe systems using the Ultra K17 sprinkler, piping materials shall meet section 2.4.B.1 for dry system piping. Non-galvanized fittings and couplings shall be permitted.

2.5 VALVES

A. General

1. Tyco grooved butterfly control valves, wet riser valves, dry pipe valves, pre-action single/double interlock valves, and Tyco Model CV-1F check valves shall be warranted by the manufacturer for ten (10) years against defects in material and workmanship.

B. Pre-action Valves

1. General

- a. Fire protection valves and appurtenances for refrigerated and cold storage areas shall meet or exceed the requirements of NFPA #13 for such service. Where jurisdictional requirements exceed or conflict with those of NFPA, the more stringent shall apply.
- b. All components of pneumatic, hydraulic, or electrical systems shall be compatible and shall be listed for their intended use.
- c. The system(s) shall be provided with a mechanical manual means for operation that is independent of detection devices and sprinklers (Pre-action systems).
- d. Conforming, listed pressure gauges shall be installed.
- e. Where a system in a refrigerated space is supplied by an automatic air compressor or plant air system, the air shall be moisture free, and any device or apparatus used for automatic maintenance of air pressure shall be of a type specifically listed for such service and capable of controlling the required air pressure on, and maximum airflow to, the system. Piping details shall be consistent with those referenced in NFPA #13-2007, Section 7.9 - Refrigerated Spaces. Where utilized, nitrogen shall be introduced through a pressure regulator set to maintain system pressure.
- f. Spacing of detection devices shall be in accordance with their listing and manufacturer’s specifications and shall be positioned to operate **prior** to the

automatic sprinklers protecting the area. All detection devices shall be listed and suitable for the environment into which they are installed.

2. Pre-action Systems
 - a. Pre-action systems shall be double interlock systems using listed valves and trim that actuate and admit water to sprinkler piping upon operation of both detection devices and automatic sprinklers.
 - b. Double interlock pre-action systems shall be of a tree design. Grid and loop designs shall not be permitted.
 - c. All electronic controls for the pre-action system shall be listed for their intended use and shall be capable of signaling 'trouble' and 'alarm' conditions. The controls shall operate on 115v AC input and all outputs shall be 24v DC. The panels shall be equipped with added contacts for local and remote transmission of trouble and alarm signals, and shall also be equipped with a minimum of four DPDT dry contacts for associated equipment shutdown. Controls shall be provided with 24v DC battery back-up capable of providing a 72 hour stand-by function in the event of a loss of power. All alarm and detection circuits shall be supervised with Class B supervision per the requirements of NFPA 72. Where the requirements of Factory Mutual must be met, the circuits shall be supervised, Class A type.

C. Components and Hardware

1. Double Interlock Pre-action Systems utilizing Electric/Electric Actuation shall be a listed combination of the Tyco Model DV-5 deluge valve fitted with a Tyco Model CV-1F Check Valve to create the pre-action system or equivalent. A QUELL™ Fire Sprinkler System shall utilize the Tyco Model DV-5 deluge valve, Tyco Model CV-1F check valve, Potter 4410RC control panel and the Tyco Model QRS electronic accelerator configured as an electric/electric double interlock pre-action system.
2. Dry Pipe Systems (**Non QUELL™ applications-Example-Loading dock protection**) shall utilize the Tyco Model DPV-1 Dry Pipe Valve, Tyco Model QRS electronic accelerator with Potter 4410RC control panel (when a quick opening device is required), and corresponding trim assembly.

2.6 FIRE DETECTION

A. General

1. Fire Detection devices and auxiliary components for refrigerated and cold storage areas shall meet or exceed the requirements specified in NFPA #72. Where jurisdictional requirements exceed or conflict with those of NFPA, the more stringent shall apply.
2. Fire Detection in those areas protected by a Quell™ system shall consist of an approved linear heat detector designed and installed to activate prior to the first sprinkler head.
3. Linear heat detection circuits shall be supervised, Class B. Where the requirements of Factory Mutual must be met, the circuits shall be supervised, Class A type.
4. Linear Heat Detector shall be warranted by the manufacturer for one (1) year against defects in material and workmanship.

B. Linear Heat Detection

1. The Linear Heat Detector shall be a fixed temperature 155°F (68°C) single line-sensing element consisting of two electrical current carrying wires separated by a heat sensitive coating. The temperature must be clearly printed on the detector.

C. Components and Hardware

1. Linear heat detector shall be SAFE ThermoCable™ digital linear heat detection cable.

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2. Installation accessories such as linear heat detector mounting hardware, splicing kits, and End of Line Resistor Junction Boxes shall be of the same make and brand as the linear heat detector.

2.7 ALARMS

- A. Alarms - the alarm apparatus for pre-action systems shall consist of alarms actuated independently by the detection system and the flow of water.