15300 FIRE PROTECTION

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Cornell University Design and Construction Standards:

1. 15400 – Plumbing
2. 15542 – Water Treatment in Hydronic Systems
3. 16721 – Fire Alarm and Detection Systems

1.02 SUMMARY COMMENTS

A. All new construction of academic and residence hall facilities shall be fully protected with sprinklers.

B. For all facilities that are currently unfurnished with sprinklers and are undergoing renovations, consideration must be given to providing sprinklers within impacted areas. Discussions with Cornell University Facilities Engineering (FE) and Environmental Health & Safety (EH&S), and the authority having jurisdiction (AHJ) shall dictate code compliance and scope of work.

1.03 CODES AND STANDARDS

A. Design shall comply with the requirements of the latest recognized edition of the following codes and standards:

1. All applicable New York State Codes.
2. Factory Mutual Global (FM). Please refer to FM’s Data Sheets at [www.fmglobal.com](http://www.fmglobal.com) for additional information.
3. All applicable NFPA Standards.
5. New York State Health Department, Cross Connection Control Manual.

B. In the event of an overlap or conflict between the requirements of the codes (NFPA & FM), laws and ordinances, and this standard, then negotiations involving FM, the AHJ and EH&S shall bring resolution to the dispute.

C. As part of the Contract Document production, the Engineer shall incorporate the following language into the drawing general notes or specifications:
“Contractor shall provide copies of Shop Drawings and Hydraulic Calculations to the following for approval:

1. Ithaca Fire Department
2. Cornell Environmental Health & Safety
3. FM Global

Contractor shall not commence with construction until all parties listed above have given their approval.”

1.04 DEFINITIONS

A. Authority Having Jurisdiction (AHJ): shall be defined at the inception of the project and has the potential to vary in conjunction with project location. Consult with Cornell University Facilities Engineering to obtain appropriate AHJ.

B. EH&S – Cornell University Environmental Health and Safety Fire Protection Section. EH&S provides acceptance and inspection of all fire protection and suppression systems.

C. Contractor – When referenced within Section 15300, “contractor” shall mean the firm responsible for preparation of hydraulic calculations and shop drawings, and for installation of fire protection systems.

D. Project Engineer – The Engineer of record who represents the Design/Engineering firm. The Engineer shall seal with a Professional Engineer (PE) stamp all record contract drawings prior to distribution.

E. Owner – Cornell University and/or appointed representative shall be considered the Project Manager or Construction Manager as assigned.

F. FM – Factory Mutual

G. UL – Underwriters Laboratories

1.05 GENERAL DESIGN REQUIREMENTS

A. General Design Requirements:

1. All fire protection systems shall be hydraulically calculated and designed by a qualified designer or fire protection engineer.

2. Design densities and demand areas shall be determined by either NFPA or FM requirements, whichever is most stringent.

3. FM Global DOES NOT recognize NFPA’s reduced demand area rules, and as such, they are not allowed for use in designing sprinkler systems on campus.
4. All fire protection systems shall be monitored by the fire alarm system and Cornell University’s Central Station (Barton Hall). All buildings equipped with fire sprinkler systems shall also have an exterior local alarm (bell) located in the same vicinity as the fire department connection (FDC) and post indicator valve (PIV), and initiated by the flow detection device (water motor gongs shall not be used).

5. All drains shall discharge to sanitary. Verify capability of existing drains to accept full flow discharge. If connection to sanitary sewer is determined to be infeasible or cost prohibitive, alternatives like splash blocks to prevent erosion (during discharging water to grade) may be considered with review and approval by Cornell University Environmental Health & Safety’s Fire Protection Section and Environmental Compliance.

6. When Reduced Pressure Zone (RPZ) backflow preventers are required as part of new construction projects, without exception, they shall be located in a room that is above grade. The RPZ-dedicated drains shall be sized for the full street-side release flow potential of the RPZ and shall be directed to grade.

7. Flushing valves shall be provided on the mains, cross-mains, branch lines and run outs of new sprinklers systems (wet and dry), to facilitate post-construction cleaning and flushing of the system. Valves shall be sized per NFPA 25, in order to obtain the NFPA required minimum velocity of 10 ft/s for any given pipe size.

On piping 2” and smaller, line size ball valves can be applied. In mains larger than 2”, typically there is a need for multiple 2” ball valves (especially on 4” and larger mains) to achieve the required flow. The engineer shall use hydraulic calculations to determine the number of 2” valves required on mains larger than 2”.

8. All fire pump installations shall fully comply with NFPA 20 and shall include the following:

   a. An FM coupling between the pump and motor.

   b. A venturi flow meter for around-the-pump flow testing. Flow meter shall not be installed in the pump test header piping.

B. System Sub-Section Zones:

   1. Sub-section zoning shall be provided for the following areas:

      a. Elevator Machine Rooms and Shafts – Flow switches may be specified as deemed appropriate by the engineer. All installations shall be in accordance with ANSI A-17.1.

      b. Transformer Rooms – double interlock preaction.
c. Information Technology Rooms – shall not contain wet piping. Wet sidewall heads are acceptable, although pre-action protection is preferred, if feasible.

d. The sprinkler system shall be zoned per floor, or by multiple zones per floor (if required by FM & NFPA), in order to minimize building-wide impacts due to impairments.

e. All other zoning is at the discretion of the Engineer.

f. Global Vision Inc. Zone Check flow switch assemblies (with a key-operated wall switch) are required for all zones. This device allows the annual inspections to be performed without the discharge of system water to drain. Said assemblies shall be exposed and at an elevation (approx. 7’ above finished floor) that allows easy access for maintenance. The key-operated switch shall be installed 48” above finished floor.

g. Manual inspector’s test and drain valves are also required for zones where Zone Checks are installed.

C. Existing Equipment:

1. The re-use of existing equipment (in fire protection systems being modified or augmented) shall be evaluated in conjunction with Maintenance Management, EH&S and Facilities Engineering.

2. All equipment or piping shall be inspected and tested for operational integrity and must be in compliance with current code prior to direction being given.

D. System Design Consideration:

1. Wet-pipe systems are preferred and shall be used in the majority of applications.

2. Glycol systems shall not be designed or installed unless prior approval has been given by Cornell University Facilities Engineering. If a glycol system is the only feasible design solution, the medium employed shall be glycerin, at a concentration required by NFPA to provide freeze protection for the geographical region in which the system is installed.

3. Dry-pipe systems are discouraged and shall only be used for incidental areas susceptible to freezing conditions, or to meet specific requirements of special use facilities. The design engineer shall perform due diligence in preventing water from being trapped in dry-pipe systems.

4. During the design phase and shop drawing phases, the Engineer shall look for obstructions to gravity drainage, and provide drum drips at all low points in dry-pipe systems. During construction, the engineer shall inspect systems for potential water traps.
5. For dry-pipe systems, appropriately sized air dryers shall be employed to prevent moisture induced corrosion in the sprinkler piping.

PART 2 PRODUCTS

2.01 PREFERRED PRODUCTS

A. Portable Fire Extinguishers:
   1. Amerex Co.
   2. Badger
   3. General Fire Extinguisher Corp.

B. Resilient Seat Gate Valves:
   1. Kennedy Valve
   2. Nibco Inc.
   3. Mueller

C. Butterfly and Ball Valves:
   1. Victaulic
   6. Central
   7. Kennedy Valve
   8. Nibco Inc.
   9. Milwaukee
   10. Watts

D. Grooved Mechanical Couplings:
   1. Victaulic
   2. Grinnell
   3. Central

E. Sprinkler Heads:
   1. Tyco
   2. Reliable
   3. Viking Corp.

F. Fire Protection Specialties:
   1. Croker
   2. Potter Roemer, Inc.

G. Fire System Backflow Preventors (RPZ):
   1. Conbraco Series 4A-200
2. Watts Model 957

H. Fire System Backflow Preventors (DCV):
   1. Conbraco Series DC-4A-200
   2. Watts Model 757

I. Check Valves (must include a bolted access cover for inspection purposes):
   1. Mueller
   2. Kennedy Valve
   3. Viking Corp.

J. Specialty Valves (Dry and Preaction):
   1. Reliable
   2. Viking Corp.

K. Alarm Flow and Tamper:
   1. Potter Electric Signal
   2. System Sensor

L. Fire Department Connection (FDC); 5” STORZ, only:
   1. Croker
   2. Elkhart
   3. Guardian
   4. Potter Roemer, Inc.

M. Hydrants:
   1. Kennedy Valve Company
   2. Clow Valve Company

N. Fire Pumps
   1. Allis-Chalmers
   2. Aurora
   3. Patterson
   4. Peerless

2.02 PIPING

A. All equipment shall be UL listed for fire protection service.

B. Schedule 10 or Thin-Wall piping is not allowed.

C. All “wet-pipe” system piping shall be schedule 40 steel piping with cast or malleable-iron threaded or steel grooved end fittings.
D. All “dry-pipe” system piping shall be schedule 40 galvanized piping with galvanized fittings.

E. Copper tubing is acceptable and shall be used if the engineer identifies reasonable advantages.

F. Chlorinated Poly Vinyl Chloride (CPVC) is acceptable for areas of light hazard and residential classification in accordance with all applicable codes. Use of this product requires prior written authorization from Cornell University EH&S and Facilities Engineering.

G. Threaded fittings are preferred for exposed systems in aesthetically sensitive areas. The use of plain end fittings is discouraged.

2.03 VALVES

A. Resilient seat OS&Y valves shall be used on the suction of fire pumps and as required for the installation of backflow preventers.

B. All other valves shall be ball or butterfly with electronic position indicating tamper switches.

C. All valves shall be suitable for a minimum of 175 psi working pressure. In the event of the pressure exceeding 175 psi due to fire pump operation, 250 psi components shall be specified.

D. All fire service mains shall be controlled by a PIV (post indicator valve) at the building service entrance. All PIVs shall be lockable and supervised by the fire alarm control panel. When selecting the proper location and finish, care should be taken to maintain visibility and 3’ of clearance around the PIV for proper operation.

2.04 BACK FLOW PREVENTORS

A. All sprinkler systems shall employ a backflow preventer. Please contact Facilities Engineering for all backflow application design concepts for evaluation by Maintenance Management, Cornell Water Treatment, EH&S and Facilities Engineering prior to developing the schematic design.

2.05 FIRE DEPARTMENT HOSE VALVES AND CABINETS

A. Hose valves shall not include a pressure reducing feature.

B. All hose valves shall be 2 ½" NTS and positioned to readily accept a “storz” coupling.
C. The engineer shall not specify or require fire hoses for hose cabinets in campus buildings.

D. Hose valves shall reside on the intermediate levels (between floors) of stairways.

E. Hose valves shall be centered in cabinets to allow adequate clearance for gloved-hand operation.

2.06 FIRE DEPARTMENT CONNECTION (FDC)

A. The AHJ shall dictate the type and style of FDC connection. Location shall be on the street-side of the building, preferably in the same location as the PIV. The FDC shall be easily accessible and visible. Consideration should also be given to snow removal procedures.

B. FDC shall be located a minimum of 18" above grade. For installed heights above 18", a 22.5-degree elbow shall be provided.

2.07 CONTROL

A. Above-ceiling type sprinkler control installations are not allowed. Installations shall be located in stairways, and shall be exposed or located in properly sized wall cabinets. Valves shall be located a maximum 6 ft. above finished floor.

2.08 HYDRANTS

A. Hydrants shall not be installed on high pressure pumped fire loops.

B. Specify standard center of steamer connection height above finished grade as 18" minimum and 36" maximum

C. Steamer connections to face roadway or easiest means of access.

D. Hydrants are to have 5" or 5 1/4" valves.

E. Hydrants shall be Kennedy or Clow with two 2 1/2" hose connections and one 4 1/2" steamer connection.

F. Hydrants shall be painted with the finish coat in the following colors:

   1. Zone 1 (Cornell low pressure system; upper elevation = 984’): Yarnell brown with a white bonnet.
   2. Zone 2 (Cornell state system; upper elevation = 1065’): Fire hydrant red with a white bonnet.
   3. Zone 3 (Cornell Z3H; upper elevation = 1190’): Fire Hydrant red with Yellow Bonnet.
4. City of Ithaca system: Orange with different color bonnet (color varies).
5. Southern Cayuga Lake Intermunicipal Water Commission (Bolton Point) system: Orange or Yellow.

2.09 EMERGENCY ACCESS LOCK BOXES (KNOX BOXES)


PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

A. All testing shall be in accordance with specified procedures in the listed codes and standards.

B. A representative from Environmental Health & Safety shall witness back flushing of all new installations and hydrostatic testing of new sprinkler installations. The authority having jurisdiction (AHJ) requires that a representative witness the sprinkler and standpipe hydrostatic testing of new installations that are within their jurisdiction. Advance notice and scheduling is required through EH&S.

C. All fire protection systems shall be thoroughly cleaned and flushed with tri-sodium phosphate or a cleaning agent approved by Facilities Engineering prior to final acceptance. Once the system is filled by the Contractor, a sample will be taken to verify the concentration of the cleaning agent within the system.

D. The Engineer shall include the following language in the contract document specifications:

“CLEANING”

1. Clean dirt and debris from sprinklers.

2. Remove and replace all sprinklers having any paint on them that is other than the factory finish.

3. PIP System Cleaning:

   a. Piping with Microbiological Influenced Corrosion (MIC) coatings can be cleaned per the following procedure since MIC has not been found in sprinkler systems on this campus.

   b. Prior to introducing cleaning chemicals into sprinkler system, protect public water system from sprinkler system with a temporary RPZ (if the system is not already protected by an RPZ).
c. Clean all pipe lines or sections of lines and connected equipment in new or modified systems and/or flush free of all pipe line debris loosened or introduced as a result of this Contract. This shall include removing all debris that has settled or collected at low points, in equipment, etc. Test equipment used for piping tests may be used to circulate cleaning liquids.

d. Clean and disinfect sprinkler distribution piping as follows:

1) Purge new and reused distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.

2) Flush piping system with clean, potable water until dirty water does not appear at points of outlet.

3) Fill system with water/tri-sodium phosphate (TSP) solution containing at least 1 gallon TSP liquid per 1000 gallon of system volume, isolate and allow to stand for 24 hours.

4) Drain system of previous solution to sanitary sewer.

5) Flush system with clean, potable water until no TSP remains in water coming from system.

6) Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.

7) Prepare reports of purging and disinfecting activities.

E. Each system will have a corrosion coupon and test port rack (1" stub with valve and cap) installed at the alarm valve. The corrosion coupons shall be obtained from the FM Pipe Shop Water Treatment Lab so the water quality and corrosion data can be properly recorded and monitored by Cornell over time as part of ongoing routine maintenance.

F. New sprinkler systems shall not be treated for MIC upon completion of final system cleaning.

G. In existing systems that are currently chemically treated for MIC: after modifications or additions to existing systems have been applied, make-up water for said systems needs to also be chemically treated. Information on the types of chemicals and specific concentrations shall be obtained from the FM Pipe Shop Water Treatment Lab by the Contractor.

END OF SECTION