PART 1  GENERAL

1.01 RELATED CORNELL DESIGN AND CONSTRUCTION STANDARDS
   A. Section 087100 – Door Hardware
   B. Section 220500 – Plumbing Basic Materials and Methods
   C. Section 221100 – Backflow Prevention
   D. Section 283100 – Fire Alarm and Detection Systems
   E. Section 331000 – Water distribution

1.02 SUMMARY COMMENTS
   A. All new construction of academic facilities shall be fully protected with sprinklers.
   B. All new and renovated residence hall facilities shall be fully protected with sprinklers.
   C. For all facilities that are currently not provided with sprinkler protection and are undergoing renovations, consideration must be given to providing sprinkler protection within impacted areas. Discussions with Cornell University Facilities Engineering (FE), 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. All applicable FM Global Standards. Please refer to FM’s Data Sheets at www.fmglobal.com for additional information.
      3. All applicable NFPA Standards.
B. In the event of an overlap or conflict between the requirements of the codes (NFPA & FM), laws, ordinances and this standard, negotiations involving FE, FM, the AHJ and Environmental Health & Safety (EH&S) shall bring resolution to the dispute.

C. As part of the Contract Document production, the Engineer shall incorporate the following language in 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 and Safety
3. Cornell Fire Protection Engineer
4. 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 the Cornell University Project Manager or Facilities Engineering to obtain the 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 210500, “contractor” shall refer to the firm responsible for preparation of hydraulic calculations and shop drawings, and for installation of fire protection system(s).

D. Project Engineer – The Professional Engineer (P.E.) of record who represents the Design/Engineering firm.

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

F. FM – FM Global (formerly known as Factory Mutual)

G. UL – Underwriters Laboratories
1.05 DESIGN REQUIREMENTS

A. General Requirements:

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

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

3. Systems shall be designed such that the resulting available pressure is at least 10 PSI greater than the required demand pressure.

4. FM Global’s demand area and sprinkler spacing requirements are more stringent than those of NFPA 13. Therefore, it is implicit that FM Global DOES NOT recognize NFPA’s reduced demand area or small room rules. As such, reduced demand area and small room rules are not allowed for use in designing sprinkler systems on campus. Contract Documents need to explicitly state this.

5. Contract Documents need to explicitly state that all materials shall be UL-Listed AND FM-Approved.

6. Contract Documents need to explicitly state that all installation work shall comply with the FM Datasheets.

7. All fire protection systems shall be supervised by the building fire alarm system and Cornell University Central Station (Barton Hall).

8. All buildings equipped with fire sprinkler systems shall also have an exterior local alarm (electric 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.

9. All drains shall discharge to sanitary where applicable. 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 discharging water to grade (lawn areas, only) with splash blocks to prevent erosion may be considered with review and approval by Cornell University Environmental Health & Safety Fire Protection Section and Environmental Compliance.

10. The point of delineation between the water service main and the building fire protection service shall be at the Post Indicator Valve (PIV), with the valve considered part of the water service main.
11. Flushing full-port ball valves shall still be provided on underground mains (inside the building) and above-ground mains, cross-mains, branch lines and run outs of new sprinkler systems (wet and dry), to facilitate any future periodic internal inspections, obstruction investigations and as-needed flushing work. Valves shall be sized by the Engineer of Record and per NFPA 25, in order to obtain the NFPA required minimum velocity of 10ft/s for any given pipe size. As an alternative to the hydraulic calculation valve sizing method, the following sizing rules can be applied:

- 1-inch thru 2 ½-inch pipe: Line-size full-port ball valve
- 3-inch pipe: One (1) 2 ½-inch ball valve
- 4-inch pipe: Two (2) 2 ½-inch ball valves
- 6-inch pipe: Three (3) 2 ½-inch ball valves
- 8-inch pipe: Four (4) 2 ½-inch ball valves

12. In buildings not employing fire pumps, forward flow test headers shall be provided for the purpose of annual backflow preventer testing. The number of hose connections on the header will be based on a flow rate of 250GPM from each connection required to achieve 10ft/s in the underground main. Sizing the header for the flushing rate instead of for the system demand flow eliminates the need for flushing valves on the underground main. Engineer can refer to NFPA 25-14, Table D.5.1, “Flushing Rates to Accomplish Flow of 10 ft/sec (3 m/sec)”, for flow rates based on pipe size.

13. Above-ceiling (concealed) type sprinkler zone control assemblies are not allowed. Installations shall be located in stairways, and shall be exposed or located in properly sized wall cabinets. Valves shall be located approximately 7-feet above finished floor.

14. 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.

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

16. Per the City of Ithaca and Ithaca Fire Department, fully sprinkler-protected new and existing buildings shall be allowed to employ Manual Class I standpipe systems. As a result, a fire pump should not be required unless an unusually high sprinkler demand warrants the need. The Engineer shall perform due
diligence in designing the sprinkler system such that the sprinkler demand can be satisfied with the available water distribution system pressure.

17. The use of Pressure Reducing Valves in sprinkler and standpipe systems shall not be allowed.

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

   a. An FM recommended Falk-type all-metal coupling between the pump and motor. Standard two-piece couplings with elastomeric “spiders” are not allowed.

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

   c. Main relief valves shall be pilot type (Cla-Val). Spring-type relief valves are not allowed.

   d. Relief valve discharge shall be directed to drain (see Item A.9, Section 1.05 for drain requirements). If relief valve cannot be discharged to drain, consult with Facilities Engineering for alternative solutions.

B. System Design Considerations:

1. Wet-pipe systems are preferred and shall be the primary consideration for all applications.

2. New antifreeze systems are not allowed per NFPA 13. If an existing antifreeze system requires modification or extension, consideration shall be given to converting it to a water-based system. If that is not possible, employ glycerin at a concentration required by NFPA 13 to provide freeze protection for this geographical region.

3. Dry-pipe systems are also discouraged and shall only be used for incidental areas susceptible to freezing conditions, or to meet specific requirements of special-use facilities. The Engineer shall perform due diligence in preventing water from being trapped in dry-pipe systems. 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 thoroughly inspect systems for potential water traps.
4. Perfluorooctanoic acid (PFOA-acid), ammonium perfluorooctanoate (PFOA-salt), perfluorooctane sulfonic acid (PFOS-acid), and perfluorooctane sulfonate (PFOS-salt) have been declared hazardous substances in New York State. The listing of these compounds may impact proposed fire-fighting foam systems that use these compounds and result in the need for additional infrastructure and ongoing management by Cornell in accordance with 6 NYCRR part 597.

Proposed fire-fighting foam systems shall not utilize perfluorooctanoic acid (PFOA-acid), ammonium perfluorooctanoate (PFOA-salt), perfluorooctane sulfonic acid (PFOS-acid) or perfluorooctane sulfonate (PFOS-salt) without the written approval of the University Engineer. Consultant shall provide a written justification for usage of these perfluorinated compounds in any proposed fire-fighting foam systems with a detailed explanation of why alternatives are not viable for the intended application for the University Engineer’s approval.

5. Nitrogen anti-corrosion treatment systems are required for certain wet-pipe and dry-pipe systems, depending on the application and/or environment. Please consult with Facilities Engineering for guidance on implementation of a nitrogen treatment system when designing a wet- or dry-pipe system. Air driers have been found to be ineffective, so they should not be applied in dry-pipe sprinkler systems. Chemical anti-corrosion treatment is also not allowed.

C. Application Requirements:

1. Application requirements for the following areas:

   a. Elevator Machine Rooms and Shafts – Flow switches may be specified as deemed appropriate by the engineer. Control valves shall be specified for shaft sprinklers. Design and installation shall be in accordance with ANSI A17.1.

   b. Transformer Rooms – Double interlock preaction systems shall be provided.

   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 maintenance and impairments.

   e. All other zoning is at the discretion of the Engineer.
D. Existing Equipment:

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

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

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. Central
2. Kennedy Valve
3. Nibco Inc.
4. Milwaukee
5. Victaulic
6. Watts

D. Grooved Mechanical Couplings:

1. Gruvlok
2. Tyco-Grinnell
3. Victaulic
E. Sprinkler Heads:
   1. Reliable
   2. Victaulic
   3. Viking Corp.

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

G. Fire System Backflow Preventers (RPZ):
   1. Refer to Reduced Pressure Backflow Prevention Standard 221100 for acceptable devices. Detector assemblies are not allowed.

H. Fire System Backflow Preventers (DCV):
   1. Refer to Reduced Pressure Backflow Prevention Standard 221100 for acceptable devices. Detector assemblies are not allowed.

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. Post Indicator Valves:
   1. Refer to 331000 for acceptable manufacturers

N. Hydrants
   1. Refer to 331000 for acceptable manufacturers

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

2.02 PIPING

A. All piping and fittings shall be UL-listed and FM-Approved for fire protection service.

B. All aboveground piping between the building service entrance and the backflow preventer shall be considered part of the municipal water distribution system. Therefore this piping and associated fittings shall be cement-lined ductile or copper. Galvanized and black steel pipe is not allowed.

C. Schedule 10, Thin-Wall or any other piping with a wall thickness less than that of Schedule 40 piping is not allowed.

D. All “wet-pipe” system piping shall be Schedule 40 black steel, Type F or Type S piping with cast or malleable-iron threaded or ductile iron grooved-end fittings. Type E is not allowed.

E. All “dry-pipe” system piping shall be Schedule 40 black steel piping with cast or malleable-iron threaded or ductile iron grooved-end fittings. Grooved-end coupling gaskets employed shall be specific to dry-pipe systems. Type E and Galvanized piping are not allowed.
F. Copper tubing is acceptable and shall be used if the engineer identifies reasonable advantages.

G. 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.

H. Threaded fittings are preferred for exposed systems in aesthetically sensitive areas.

I. The use of plain end fittings shall not be allowed.

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 control 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. Please refer to 331000 – Water Distribution for PIV specifics.

2.04 BACK FLOW PREVENTERS

A. Regarding acceptable RPZs and DCVAs, please refer to 221100 – Backflow Prevention for acceptable backflow preventer makes and models. Detector assemblies are not allowed.

2.05 FIRE DEPARTMENT HOSE VALVES AND CABINETS

A. Hose valves shall NOT include a pressure restriction 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 EMERGENCY ACCESS LOCK BOXES (KNOX BOXES)
A. See Cornell Design & Construction Standard 087100 - Door Hardware.

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 of Environmental Health and Safety shall witness flushing of the underground main, hydrostatic and air testing of new sprinkler installations and alterations. The authority having jurisdiction (AHJ) requires that one of their representatives witnesses underground main hydrostatic testing and flushing, and sprinkler/standpipe hydrostatic testing of new installations that are within their jurisdiction. Advance notice and scheduling is required through EH&S. The Engineer shall include this information in the contract documents.

C. New sprinkler systems shall not be treated for MIC.

D. In existing systems that were previously chemically treated for MIC: After modifications or additions to existing systems have been applied, make-up water for said systems no longer needs to be chemically treated.

E. For all new sprinkler systems, underground piping requires hydrostatic testing and flushing (per the edition of NFPA 24 referenced in the current Building Code) before it can be connected to the new sprinkler system.
The Engineer shall include this requirement in the Contract Documents, as well as the requirement for the contractor to flush per the minimum velocity as dictated in NFPA 24. The Engineer shall also include requirements for the appropriate number of 2 ½-inch valves applied during flushing, based on the size of the main (see item A.11, Section 1.05 for specifics).

F. Pre-acceptance hydrostatic testing and flushing of new and existing aboveground sprinkler systems shall be performed per NFPA 13 (sprinklers) or NFPA 14 (standpipes).