

DIVISION 13 – SPECIAL CONSTRUCTION

13 34 00 FABRICATED ENGINEERED STRUCTURES

A. Design Considerations

1. Rutgers University prohibits structures, including sheds, for storage or any other purpose without written consent from the University Architect. The University also prohibits shipping containers and trailers without written permission from the University Architect.
2. When pre-engineered structures are being considered to be included by the A/E, permission must be obtained by the University Architect.

B. Special Documentation Requirements

1. Require that the Contractor submit written certification prepared and signed by a Professional Engineer, registered to practice in the State of New Jersey, verifying that building design meets indicated loading requirements and codes of authorities having jurisdiction.
2. All pre-engineered building specifications shall include a complete listing of structural requirements for the building including, but not necessarily limited to the following:
 - a. Wind load both horizontal and uplift Snow load
 - b. Floor loading
 - c. Mechanical equipment loads

C. Materials and Methods of Construction

RESERVED

13851 FIRE ALARM

(Future 28 46 13 Fire-Alarm Systems)

PART I: GENERAL

It is not the intent for this document to include all components of a fire alarm system. It must be used in conjunction with the NFPA 70 & 72 codes.

Furnish and install a complete Fire Alarm System as described herein and as shown on the plans; to be wired, connected and left in first class operating condition. The system shall be fully

addressable. Include a control panel, manual pull stations, horns, strobes, tamper & flow switches, monitoring Zams, Iams etc. and all wiring connections to devices, outlet boxes, junction boxes and all other necessary material for a complete operating system.

A. Design Considerations

1. All drawing and specifications and construction shall conform to the following:

- National Electrical Code
- National Electrical Safety Code
- National Fire Protection Association Codes
- N. J. Uniform Construction Code
- Occupational Safety and Health Administration Regulations
- Factory Mutual Regulations

2. Equipment and materials shall conform to:

- Underwriters Laboratories listed
- National Electrical Code
- American National Standards Institute
- National Electrical Manufacturers Association
- Institute of Electrical & Electronics Engineers
- Insulated Cable Engineers Association
- Factory Mutual Regulations

3. Three copies of the following shop drawings should be requested from the Contractor for review by Rutgers (one hard copy shall be provided to the Fire Alarm Bureau), in addition to the normal A/E review:

- a. ALL Fire Alarm devices
- b. Wiring diagrams

4. Rutgers Fire Alarm Bureau shall receive all existing components (i.e. panels, bells, detectors, etc.) from all fire alarm systems being replaced.

B. Special Documentation Requirements

1. The engineer shall provide complete wiring diagram and shall include devices, wiring, raceways, and connections and terminal designations.

2. Indicate all duct mounted smoke detectors on the electrical drawings and remote key switches.
3. Provide detail battery calculations per NFPA 72.
4. Indicate all A/C, fans, Dampers to be monitored by fire alarm system.
5. The system manufacturer, Simplex-Grinnell, shall prepare detailed shop drawings and wiring diagrams of the entire Fire Alarm System.
6. The engineer shall provide complete wiring diagram and shall include devices, wiring, raceways, and connections and terminal designations.
7. Indicate all of the interconnection between the fire alarm system and the Elevator system.
8. The engineers shall provide As-built drawings indicating all Mapnet addresses next to their respected devices. As built drawings shall be submitted on diskette using Autcad2006 (or latest version). A copy shall be provided to the Fire Alarm Bureau.
9. The entire fire alarm system must be tested and approved by the Rutgers University Fire Sub Code Official, University Construction Code Office, prior to any university acceptance.
10. Provide detailed battery calculations per the NFPA 72.
11. Provide NFPA 72 acceptance test completion forms.

C. Materials and Methods of Construction

The Fire Alarm system shall be manufactured by SimplexGrinnell (NO SUBSTITUTIONS WILL BE ALLOWED) and shall be compatible with the existing campus systems with respect to interchangeability of spare parts. THE ENTIRE FIRE ALARM SYSTEM WILL BE FULLY ADDRESSABLE.

PART II: PRODUCTS

A. Design Considerations

1. The Fire Alarm system shall be manufactured by Simplex-Grinnell and shall be compatible with the existing campus systems with respect to interchangeability of spare parts.
2. All components to be fully addressable
3. Provide the fire alarm bureau with a minimum 10% extra spare parts.
 - a. Smoke detectors
 - b. Sounder bases
 - c. Heat detectors
 - d. Horn/strobes
 - e. Pull station

B. Special Documentation Requirements

Provide NFPA 72 acceptance test completion forms
Provide Zone and/or Mapnet list of devices and location

C. Materials and Methods of Construction

1. All panels and peripheral devices shall be the standard product of Simplex-Grinnell and shall display the manufacturer name on each component.
2. Equipment submission must include a minimum of the following:
 - a. Complete descriptive data indicating UL listing for all system components.
 - b. Complete sequence of operation of the system.
 - c. Complete wiring diagram for components capable of being connected to the system and interfaces to associated equipment.
3. Must provide a complete description of operation for fan shutdown or smoke removal, as required for building design.
4. The cover plates of all IAMS, and/or ZAMS must be labeled and painted RED indicating the device it controls and its location.

2.3 FIRE ALARM CONTROL PANEL (FACP)

(Future 28 46 21.12 Fire-Alarm Control Units)

A. Design Considerations

1. The FACP shall be a Simplex-Grinnell fully addressable sized per number of points. FACP to be a minimum 4100U(or latest version) or approved equal by Rutgers University Emergency Services . Panels shall be sized with approximately 24 spare points for future expansions. Panels must be able to perform sensitivity testing of all devices.
2. Multiple FACP within one structure is NOT ACCEPTABLE
3. Fire Alarm control panels (FACP) are to be located at the main entry to the buildings, or at the entry point, which will be used by the responding fire department.
 - a. New Brunswick Campuses: the Chief of Rutgers University Emergency Services has final approval
 - b. Newark & Camden Campuses: The Chief of the Rutgers Police Department for their respective Campus with prior consultation with Rutgers University Emergency Services.
 - c. For Satellite locations: the Chief of Rutgers University Emergency Services has final approval
4. The control panel shall receive 120 VAC power via a dedicated circuit. Circuit breaker shall be red and be provided with a lock. Provide a plaque on the fire alarm panel with the location of the 120V power source.
5. The system shall be provided with sufficient battery capacity to operate the entire system upon loss of normal 120VAC power in a normal supervisory mode for a period of twenty-four (24) hours with five (5) minutes of alarm operation at the end of this period. The system shall automatically transfer to the standby batteries upon power failure. All battery charging and recharging operations shall be automatic. FACP shall be connected to the building's emergency power source (generator).
6. Provide with the drawings all battery calculations.
7. Provide a Transient Voltage Surge Suppression Emerson TCS-HW Series (or latest version) installed in the FACP.

8. The actuation of the enable walk test program at the control panel shall activate the "Walk Test" mode of the system, which shall cause the following
 - a. The city connection circuit shall be bypassed.
 - b. Control relay functions shall be bypassed.
 - c. The control panel shall show a trouble condition.
 - d. The alarm activation of any initiation device shall cause the audible signals to code a number of pulses to match the zone number.
 - e. The panel shall automatically reset itself after signaling is complete.
 - f. Any momentary opening of an initiating or indicating appliance circuit wiring shall cause the audible signals to sound for four (4) seconds to indicate the trouble condition.

9. The contractor must install a Rutgers supplied hasp and lock to the FACP enclosure.

B. Special Documentation Requirements

RESERVED

C. Materials and Methods of Construction

RESERVED

2.4 ADDRESSABLE PULL STATIONS

(Future 28 46 31.31 Fire-Alarm Manual Initiating Devices)

A. Design Considerations

1. Addressable pull stations will contain electronics that communicate the station's status (alarm, normal, trouble) to the FACP over the MAPNET wiring which also provide power to the pull station. The address will be set on the station. They will be manufactured from high impact red Lexan. Station will mechanically latch upon operation and remain so until manually reset by opening with a key common to all system locks. Pull stations will be single action. Pull stations shall be provided with protective or vandal covers in areas prone to vandalism or damage.

2. The front of the station is to be hinged to a backplate assembly and must be opened with a key to reset the station. The key shall be common with the control panels.

3. The addressable manual station shall be capable of field programming of its “address” location on an addressable initiating circuit. The manual station shall be fitted with screw terminals for field wire attachment.
4. There shall be no limit to the number of stations, detectors or zone adapter modules, which may activate or “in alarm” simultaneously.
5. All dormitory’s pull stations shall be equipped with alarmed vandal covers.

B. Special Documentation Requirements

RESERVED

C. Materials and Methods of Construction

The addressable manual stations shall be UL listed & FM Approved.

2.5 SYSTEM SMOKE DETECTORS

(Future 28 46 11 Fire Sensors and Detectors)

A. Design Considerations

The system control panel must be capable of communicating with the type of addressable devices specified below. Addressable devices will be located as shown on the drawings. The location of addressable devices will be selected along with conventional devices to optimize the system layout in order to provide the level of protection, zone identification and control as shown on the drawings.

B. Special Documentation Requirements

RESERVED

C. Materials and Methods of Construction

1. Addressable Detector Bases

All addressable smoke and heat detector heads as specified below will be able to plug into their bases. The base will contain electronics that

communicate the detector status (normal, alarm., trouble) to the control panel over Mapnet wiring. The same wire shall be interchangeable. Upon removal of the head, a trouble signal will be transmitted to the control panel.

2. Photoelectric Detector Head

- a. The photoelectric type detector shall be a plug-in unit, which mounts to a twist-lock base, and shall be UL approved.
- b. The detectors shall be of the solid-state photoelectric type and shall contain no radioactive material. They will use a pulsed infrared LED light source and be sealed against rear airflow entry.
- c. The detector shall fit into the base that is common with the heat and shall be compatible with others addressable detectors, addressable manual stations, and addressable zone adapter modules on the same circuit. The detector shall also fit into a non-addressable base that is capable of being monitored by an addressable zone adapter module.
- d. There shall be no limit to the number of detectors or zone adapter modules, which may be activated or “in alarm” simultaneously.
- e. Smoke detectors shall be located per NFPA72 and shall also be installed in all common areas (i.e. corridors, foyers, breakrooms, stairwells, etc) and all areas of general access to the building occupants in fully sprinkled buildings.
- f. In all dormitory rooms photoelectric detectors with sounder bases WILL be installed. Each detector when activated will only initiate the local audible alarm, in that given room; it will not activate the building alarm system. It will report to the FACP as supervisory signal.. When the devices in the common areas (i.e. hallways, foyers, break areas, etc.) are activate it will initiate the building alarm and sound all horn/strobes including all sounder bases.

3. Addressable Photoelectric Duct Detector

- a. The detector shall be a non-polarized 24VDC type which is compatible with the fire alarm panel and obtains its operation power from the supervisory current in the fire alarm detection loop. Detectors shall be of the solid state photoelectric type and shall operate on the light scattering photodiode principal. To minimize

nuisance alarms, detectors shall have an insect screen and be designed to ignore invisible airborne particles or smoke densities that are below the factory set alarm point. No radioactive material shall be used.

- b. The 24 VDC detector may be reset by actuating the control panel reset switch.
- c. All HVAC units that are provided with duct mounted smoke detectors SHALL report to the FACP individually not zoned together.
- d. All duct mounted smoke detectors must shut down their respective HVAC equipment upon the detection of smoke. HVAC equipment must be programmed with delayed start up upon reset of FACP.
- e. Provide each duct mounted smoke detector with a Remote test station and power on indicator mounted for easy access. Location of test station to be wall mounted 5'-0" AFF directly under duct or where approved by Rutgers University Emergency Services, Fire Alarm Bureau.

2.7 ADDRESSABLE THERMAL DETECTORS

(Future 28 46 11 Fire Sensors and Detectors)

A. Design Considerations

Thermal detectors shall be used in areas to minimize nuisance alarms (i.e. custodial closets, mechanical spaces, kitchens etc.)

B. Special Documentation Requirements

RESERVED

C. Materials and Methods of Construction

Thermal detector heads must be UL listed & FM Approved. They will be a combination rate-of use and fixed temperature (135 F) type, automatically restorable.

2.9 AUDIO/VISUAL ALARM INDICATING APPLIANCES

(Future 28 46 23 Fire Alarm Notification Appliances)

A. Design Considerations

1. Audio / visual shall be SimplexGrinnel and shall provide common enclosures for the fire alarm audible and visual devices. The housing shall be designed to accommodate horns. The unit shall be complete with a tamper resistance.
2. Horns shall be controlled separately from strobes.
3. Warning signals shall be horn/strobe programmed for “marchtime” operation.
4. Bells WILL NOT BE ACCEPTABLE and in renovation projects must be replaced with the new standards.
5. Truealert addressable notification appliances are individually addressed and receive power, supervision and control signals from a TrueAlert signaling line circuit channel provided by a Truealert addressable controller 4009.
6. Provide each Signaling circuit with a Truealert Isolator module and termination cabinet.
7. All horns must produce the same sound. When doing a renovation to an existing alarm system, all horn/strobes must be changed.
8. All strobes must be synchronized. When doing a renovation to an existing alarm system, all horn/strobes must be changed.
9. Provide a weatherproof horn/strobe located above the main entry to the building or at the entry point where the FACP or the remote Annunciator will be located.

B. Special Documentation Requirements

RESERVED

C. Materials and Methods of Construction

Horn/strobes shall be SimplexGrinnel Truealert addressable units.

2.11 SPRINKLER SYSTEM REMOTE INDICATORS

(Future 28 46 31.41 Fire-Alarm Supervisory Signal Initiating Devices)

A. Design Considerations

All water flows and tamper switches SHALL report as individual zones. Grouping of tamper and/or flow switches is not allowed.

B. Special Documentation Requirements

RESERVED

C. Materials and Methods of Construction

RESERVED

2.12 MAGNETIC DOOR HOLDERS & ROLL DOWN FIRE DOORS

(Future 28 46 51.08 Fire-Alarm Supervised Interface Hardware for Openings)

(or future 08 33 43 Overhead Coiling Smoke Curtains)

(or future 08 33 44 Overhead Coiling Fire Curtains)

A. Design Considerations

1. Fire doors and magnetic door holders shall have a separate power source. Using FACP as a POWER source is not PERMITTED.
2. Fire Doors shall be controlled with fusible links. Smoke detectors are NOT PERMITTED.
3. All doors normally held open by door control devices should release from the activation of any manual station, automatic detection device, or sprinkler flow switch.

B. Special Documentation Requirements

RESERVED

C. Materials and Methods of Construction

RESERVED

2.13 REMOTE ANNUNCIATOR

(Future 28 46 21.22 Fire-Alarm Remote Annunciators)

A. Design Considerations

Remote Annunciate panels, when permitted at the main lobby by the Rutgers Emergency Services, Fire Alarm Bureau shall be capable of only controlling the fire alarm system, upon activating the key switch to authorize control. Mounting heights of panel must comply with all ADA requirements.

B. Special Documentation Requirements

RESERVED

C. Materials and Methods of Construction

RESERVED

2.14 ADDRESSABLE INTERFACE DEVICE: (ELEVATOR RECALL/SHUNTING)

(Future 28 46 51.14 Fire-Alarm Supervised Interface Hardware for Elevators)

A. Design Considerations

1. Each elevator lobby shall be equipped with a smoke detector zone separately.
2. Where buildings are equipped with a sprinkler system provide heat detectors in the machine room, elevator pit, and elevator shaft.
3. The alarm activation of any manual or automatic device shall, in addition to the operation listed above, cause the elevator cab to be recalled.
 - a. If the alarmed device is on any floor other than the main level of egress, the elevator cabs shall be recalled to the main level of egress.
 - b. If the alarm detector, elevator lobby, is on the main egress level, the elevator cabs shall be recalled to the predetermined alternate recall level as determined by the Chief of Emergency Services.

B. Special Documentation Requirements

1. Provide a detail wiring diagram showing the method of supervising the elevator control power using a fire alarm system per the National Electrical Code.

2. Provide a detailed riser diagram showing all smoke and heat detectors in the lobby, elevator machine room, elevator pit, and top of shaft. Providing a sequence of operation for the elevator recall.

C. Materials and Methods of Construction

RESERVED

2.15 DIGITAL ALARM COMMUNICATOR TRANSMITTER:

(Future 28 46 21 Fire-Alarm Control Units and Related Equipment)

A. Design Considerations

New Brunswick Campuses:

- a. Contractor must provide and install a Silent Knight communicator Model 5104 or latest version.
- b. Provide two phone lines from the demarcation point to the Silent Knight. Lines can be either dedicated or properly seized.
- c. Communication wiring to be protected from any damage (Metallic conduit, metallic raceway).
- d. Rutgers University fire alarm bureau will be responsible for programming the Silent Knight.

Newark & Camden Campuses:

- a. The respective Campus facilities maintenance director will have the final approval of the means used for communication.
- b. Satellite locations: The Chief of Rutgers University Emergency Services will have final approval.

B. Special Documentation Requirements

RESERVED

C. Materials and Methods of Construction

RESERVED

2.19 WIRE AND CABLE

(Future 28 46 21 Fire-Alarm Control Units and Related Equipment)

A. Design Considerations

1. The wiring methods are subjected to the National Electrical Code (NEC) latest version.
2. Only copper conductors may be used, 14AWG THHN. Signal circuit & 24VDC, 1 PR #16 twisted shielded communication.
3. Metallic conduit, metallic raceway, plastic pipe, plastic raceway may be used. All conduits and junction boxes to be painted RED.
4. All wires installed above acoustical ceiling to be plenum rated and properly secured. **OUTSIDE JACKET MUST BE RED. NO OTHER WIRING (i.e. HVAC CONTROL WIRING) SHALL BE THE SAME COLOR AS THE FIRE ALARM WIRING.**
5. Only FIRE ALARM SYSTEM WIRING may be run in a single conduit, raceway or multi-conductor cable. **SHARING OF RACEWAYS WITH OTHER SYSTEMS IS NOT ACCEPTABLE.**
6. Each peripheral device (Pull station, detector, horn, etc.) must have its own enclosure (back box, outlet box, etc) per instructions provided with each device.
7. All wiring shall be terminated with U.L. listed devices (wire nuts, pressure connector, etc.) Wiring terminated with only electrical tape is not permitted. All splicing (free ends of conductors) shall be covered with and insulation equivalent to that of the conductors.

B. Special Documentation Requirements

RESERVED

C. Material and Methods of Construction

RESERVED

2.20 CARBON MONOXIDE DETECTOR

(Future 28 46 11.21 Carbon-monoxide Detection Sensors)

A. Design Considerations

1. Provide a ZAM that must be dedicated to the carbon monoxide detector. Do not connect detectors to other alarm devices.
2. All detectors to initiate an individual alarm, trouble, and normal signal.

3. Detectors to be installed in all buildings with fuel burning appliances. Detectors to be located in accordance with the NJ UCC and NJ DFS bulletin 2017-1.

B. Special Documentation Requirements

RESERVED

C. Materials and Methods of Construction

1. Shall be U.L. listed & FM Approved for use with Fire Alarm Control Panel that has 24VDC alarm initiating circuits.

13900 FIRE SUPPRESSION SYSTEMS

(Future 21 00 00 Fire Suppression)

A. Design Considerations

1. Sprinklers are MANDATORY in all new construction, new additions and renovation projects exceeding 25% of the gross area of the facility being renovated. Sprinkler design for new facilities shall include a new fire service (including fire pump as applicable) as required to provide a complete and fully functional system. Where an addition is being added to an existing unsprinklered or partially sprinklered building, or sprinklers are being added to the renovated portion of an unsprinklered or partially sprinklered building, a new fire service (including fire pump as applicable) sized to handle the future fully sprinklered requirements of the ENTIRE facility shall be provided as required. In the event that a fire pump is required to satisfy the future fully sprinklered building needs of an existing facility being renovated or added to but is not necessary to satisfy the present sprinkler requirements of the addition or renovation project under consideration, the fire pump requirement may be waived subject to the approval of Rutgers University.

B. Special Documentation Requirements

1. Factory Mutual, University Construction Code Official, and REHS will review all project plans when they are approximately 50% complete for major topics of concern such as sprinkler system density/area specification, standpipe systems, most recent water supply information, and major construction aspects such as type of roofing system, live load roof design and drainage.

2. All 90% complete drawings and specifications will again be provided to Factory Mutual, FPA, REHS and Rutgers Construction Code Official for a more detailed review and approval.
3. A/E shall provide a complete set of drawings and specifications which can be approved for compliance with the NJ Uniform Construction Code by the authority having jurisdiction.
4. Hydraulic Design Submittal: In addition to the distribution of drawings specified in General Conditions, the installing fire protection contractor shall provide the office of the University Construction Code Official with one set of shop drawings (signed and sealed by the New Jersey licensed professional engineer employed by the installing fire protection contractor) depicting the complete automatic sprinkler system. Shop drawings shall clearly identify the hydraulically remote area, and all reference nodes shall be included from the supply to and including the remote area. In addition, the installing contractor's licensed professional engineer shall submit one complete set of hydraulic calculations, including detail and summary sheets, for retention by the University Construction Code Official. Hydraulic calculations shall be based on approved flow tests which will be performed by Rutgers. All hydraulic calculations shall be reviewed by Owner and Factory Mutual.
5. The design A/E shall review sprinkler system shop drawings in accordance with NJ Uniform Construction Code requirements and provide a written letter of confirmation that the shop drawings are "found to be in conformance with the regulations for the design of the building". This letter must accompany the sprinkler shop drawings when submitted to the University Construction Code Official for issuance of permits.
6. A Contractor's Material and Test Certificate for Aboveground Piping shall be completed and submitted, by the Contractor, to the University Construction Code Official, Factory Mutual Engineering, and the University Construction Management Representative responsible for the project. Obtain a copy of the form from Rutgers.

C. Materials and Methods of Construction

1. All fire protection systems shall be approved by Factory Mutual and shall conform to FM standards. All equipment shall bear FM label where appropriate.
2. All fire protection systems shall be wet type unless otherwise approved by the Rutgers Fire Marshall.

3. Reference Standards: Installation of automatic sprinkler systems for fire protection shall comply with the following standards:
 - a. NFPA No. 13, Installation of Sprinkler Systems
 - b. Factory Mutual Data Sheet 2-8N, Installation of Sprinkler Systems
 - c. International Building Code, the New Jersey Fire Protection Subcode
 - d. Alternate suppression systems, where approved by the Rutgers Fire Marshall, shall conform to applicable codes, standards and Factory Mutual requirements.

4. Design Density:
 - a. Design densities for hydraulically calculated sprinkler systems shall comply with the following standards (review with FM for any changes):

Classrooms and offices	0.15 gpm/sq. ft., 2000 sq. ft area
Laboratories	0.15 gpm/sq. ft., 2500 sq. ft area
Dormitories, Apartments	0.10 gpm/sq. ft., 3000 sq. ft area
 - b. Hose stream allowances shall be provided for each system and shall be not less than 150 gpm for interior hose stream and 250 gpm for outside hose stream. The interior hose stream location, for the purpose of hydraulic calculation, shall be at the hose valve nearest to the riser supplying that floor. In buildings not equipped with a combined fire standpipe/sprinkler riser, the interior hose stream allowance may be deleted.

5. Flow Velocity: The maximum permissible flow velocity through automatic sprinkler piping shall be 20.0 feet per second.

6. Minimum Pressure: The minimum starting pressure at the most remote sprinkler head shall be not less than 7 psi.

7. Test Connections - Each water flow indicator shall be provided with an Inspector's Test Connection, consisting of a test pipe of not less than 1" diameter terminating in a smooth bore corrosion resistant orifice giving a flow equivalent to one sprinkler head of the type installed on the system. Test connection shall discharge to the building exterior. The 1" control valve for the Inspector's Test Connection shall be located not more than 7' above finished floor. An alternative arrangement for the Inspector's Test Connection is the "TestMaster", manufactured by the Victaulic Corporation.

8. Equipment Type Acceptance: All sprinkler heads, valves, fittings and appurtenances shall be Factory Mutual approved types and shall bear the Factory Mutual acceptance label. All main control valves shall be provided with tamper contacts for connection to the building fire alarm system.
9. Inspections and Tests:
 - a. All sprinkler heads, valves, fittings and other appurtenances shall be installed prior to conducting the final hydrostatic test which shall be witnessed by the University Construction Code Official or his designate.
10. Hydrants on New Brunswick Campus, where served by Rutgers Fire Department, shall be as manufactured by Mueller or as approved by Owner. Elsewhere, hydrants shall conform to the City of Camden, New Brunswick, or Newark standards. Generally, use National Standard hose threads but A/E shall verify.
11. Standpipes shall be wet type without hose cabinets. Provide 2 1/2" x 1 1/2' removable valved capped connection at each floor.
12. Pre-action systems shall be used only when approved by the Rutgers Fire Marshall. These systems are not preferred. Where dry or pre-action systems are required, use standard wall galvanized pipe as approved by Factory Mutual.
13. Fire pumps on low rise buildings (buildings less than 3 stories) should not be used.
14. In seismic areas (New Brunswick and Newark), buildings covered by Section 403 of the International Building Code, "High Rise Buildings" shall be designed with a secondary source of water (10,000 gallon capacity or as required) and shall be as approved by Factory Mutual.
15. All fire pumps and sprinkler supplies from city water services shall be installed per city requirements. A/E must contact and coordinate with city officials and design all installations in accordance with their requirements.
16. Do not provide fire hoses. All fire extinguishers will be provided by Rutgers.
17. Plain end pipe couplings should not be used in systems unless they are the positive locking type specifically approved by Factory Mutual for above ground sprinkler piping.

18. The design area for gridded sprinkler systems shall be the hydraulically most demanding "rectangular area" having a dimension parallel to the branch lines equal to 1.4 times the square root of the area of sprinkler operation corresponding to the density used.
19. To facilitate flushing of the sprinkler system, the ends of all cross mains should be provided with a threaded flushing connection no more than 2" in diameter.
20. Pipe hanger installation shall be in accordance with Factory Mutual Data Sheet 2-8N (NFPA #13).
21. A permanent placard should be provided at the base of each riser stating the design criteria of the system for hydraulically designed systems.