Fire Protection and Life Safety Systems

Acceptance Inspections & Testing Manual

ENGINEERING DEPARTMENT | APRIL 2022

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I. INTRODUCTION

This Manual defines requirements and provides guiding information for acceptance inspection and testing for new or altered Fire Protection and Life Safety (FPLS) systems. FPLS systems include but are not limited to fire sprinkler systems, fire detection systems, fire pumps, smoke management systems, emergency lighting systems, and fire rated doors.

FPLS systems provide protection of life and property for tenants, the general public, patrons, and employees throughout PANYNJ facilities. In compliance with building and fire code requirements, in the respective jurisdictions, all FPLS systems must be inspected and tested to assure designed performance in emergencies.

The information provided in this Manual for inspection and testing is designed to conform with national, state, and local code requirements for FPLS systems. Careful review of the Manual should be done to confirm that the tasks performed are correct for each facility.

The information provided in this Manual, including tables and figures, is taken directly from NFPA standards as well as the building and fire codes of the respective jurisdictions.

II. ROLES AND RESPONSIBILITIES

Design Professional

The architect/engineer of record (A/EOR) is responsible for defining the FPLS systems/equipment installed or altered. Responsibilities include provision of approved drawings, system performance requirements, and sequence of operations prior to the start of inspections and tests. The A/EOR provides written certification that all work has been completed and pretested as per the approved plans. Confirmation that work is complete and ready for inspection is done by inspecting and monitoring the work through the construction phases. The A/EOR is also required to attend all inspections and respond to non-conformance issues as they arise.

Contractor

For fire protection and life safety systems, contractors are required to be licensed/certified by the state or city. In NYC, this could be a FDNY Certificate of Fitness or similarly, in NJ, the contractor is documented in the list of permitted businesses for fire protection equipment contractors. The contractor is responsible for completing work in accordance with the PA approved drawings, maintaining the approved documents on the work site, and maintaining a safe construction site in compliance with all applicable laws and regulations.

Engineering Department

Construction Management Division

The Construction Management Division (CMD) is the Engineering Department's onsite point of contact for PA contracts and tenant alteration applications. CMD, through a resident engineer's office (REO), provides construction management and inspection services to assure construction projects are completed in accordance with the contract documents. The REO hosts pre-construction meetings, coordinates fire protection and life safety system tie-ins, and schedules inspections for final acceptance testing.

Quality Assurance Division

Design Standards and Construction Standards are units that perform building department functions for the Chief Engineer.

Design Standards

Design Standards function as code officials reviewing Tenant Alterations Applications and selected Port Authority Contracts for conformance with applicable codes and standards. After drawings and specifications are confirmed as satisfactory, approval to proceed with construction is the signal to start work.

Construction Standards

Construction Standards attends acceptance inspections and tests of all projects with special emphasis on structural integrity and fire protection systems. Satisfactory completion of inspections and tests is required to facilitate closing projects with the issuance of Permits to Occupy or Use and/or Certificates of Completion.

Line Departments

Facility management and their respective staffs are responsible to facilitate efforts to complete work for construction projects. This includes providing staff to coordinate with contractors, minimizing negative impacts on facility operations, and archiving record documents. For tenant work, line departments provide coordinators to serve as the point of contact, assists in the coordination of work, and oversight for compliance with the Tenant Construction and Alteration Process (TCAP). For contract work, the line departments are the end user of the completed work and are responsible for continued operation of all fire protection and life safety systems. Most importantly, Line departments are responsible for archiving record documents.

III. How to use this Manual

This Manual is divided into 13 chapters that provide information and requirements for acceptance inspections and testing. Each chapter has a table of contents that will assist with finding information relevant to the work performed. Noting that fire protection and life safety systems consist of several components, different chapters may need to be consulted to cover the completed system.

The goal of each chapter is to identify the inspections, tests, and the documentation required for accepting a FPLS system into service. Acceptance work can only be completed when all parties cooperate to show satisfactory performance and operation. Design professionals, contractors, PA Engineering, PA Line Departments, and occupants have their own roles through the process however, responsibilities are not delineated in the Manual. A good example is the approved plans needed for the job. The design professional is responsible for completing the design of the system, PA Engineering is responsible for review and approval of the drawings, the contractor is responsible for completing the installation following the approved drawings, CMD is responsible to make sure that construction is completed in conformance with the approved drawings, and QAD Construction Standards utilizes the approved drawings to complete the final acceptance inspections and tests confirming satisfactory installation and operation.

All groups have a connection to each step in the process. Each group should review the information provided in the chapters related to the work proposed. Special focus should be placed on the need for CMD and QAD Construction Standards to work together through the project. Starting with the preconstruction meeting, CMD and QAD should use the Manual to clarify project completion requirements. The construction management team, including construction management staff, need to be aware of acceptance requirements including test plans, pretesting certification, and scheduling for inspections to confirm satisfactory operation. CMD and QAD should work cooperatively to confirm that all requirements for satisfactory acceptance are completed and documented.

In general, the Manual does not include step by step instructions on how to perform acceptance inspections and testing. Fire protection and life safety systems are required to be installed by knowledgeable and experienced personnel. The contractors should be well versed on requirements for acceptance inspections and testing. Details of acceptable inspection and testing should be clearly identified in a written test plan provided for review early in the construction process. The test plan is required prior to the scheduling of final acceptance inspections and tests. It should be clearly understood that the A/EOR remains responsible for confirming that all systems and equipment are correctly installed and pretested in preparation for the final acceptance inspections and tests.

IV. Documentation

The Manual is consistent with requirements for documentation. Documentation is always required for work on fire protection and life safety systems/equipment, not only for initial acceptance work, but also for ongoing routine inspection, testing, and maintenance. Prior to acceptance inspections and testing, documentation is required to confirm that plans have been

approved, all work has been completed as per the approved drawings, and that systems and equipment have been successfully pretested for satisfactory operation. Acceptance inspection and test records are vital for the ongoing care and maintenance of the systems and equipment installed. Chapters include NFPA forms that should be used to document acceptance work needed for future comparison with routine inspection, testing, and maintenance tasks.

Documentation includes but is not limited to the following:

- NFPA Contractor Material and Test Certificates.
- NFPA Standard forms
- System care and maintenance instructions.
- Documentation from the A/EOR confirming and documenting that all required testing has been successfully completed.
- Special Inspection Reports
- Plans (shop drawings)
- Test plans
- Record of completion
- Records of acceptance tests

Review of building codes, fire codes, and NFPA standards, identifies the intent to keep acceptance testing records for the life of systems and equipment. Availability of this information is essential for routine inspection, testing, and maintenance. It is also necessary to revise and update information as systems and equipment are added or modified. Location of this information can vary but must be readily available if requested. Acceptance testing records should be kept onsite and in the same location as routine inspection, testing, and maintenance documentation.

V. ACRONYMS

A/EOR	Architect/Engineer of Record
QAD	PA Quality Assurance Division
CMD	PA Construction Management Division
TCAP	PA Tenant Construction & Alteration Process
REO	PA Resident Engineer's Office
FPLS	Fire Protection and Life Safety
ITM	Inspection, Testing, and Maintenance
PANYNJ	Port Authority of NY & NJ
NFPA	National Fire Protection Association
NJ	New Jersey
IFCNJ	International Fire Code, New Jersey Edition
IBCNJ	International Building Code, New Jersey Edition
NYC	New York City
NYCFC	New York City Fire Code
NYCBC	New York City Building Code
NYS	New York State
FCNYS	Fire Code of New York State
BCNYS	Building Code of New York State
ANSI	American National Standards Institute

VI REFERENCES

New York City Building Code – 2022
New York City Fire Code – 2022
Fire Code of New York State – 2020
Building Code of New York State – 2020
International Fire Code – New Jersey Edition – 2015
International Building Code – New Jersey Edition – 2018

The latest edition of NFPA Standards were used to compile the information in this Manual including but not limited to:

NFPA 11 Low, Medium and High Expansion Foam
NFPA 12 Carbon Dioxide Extinguishing Systems
NFPA 13 Standard for the Installation of Sprinkler Systems
NFPA 14 Standard for the Installation of Standpipe and Hose Systems
NFPA 15 Standard for Water Spray Fixed Systems for Fire Protection
NFPA 16 Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray systems
NFPA 17 Dry Chemical Extinguishing Systems
NFPA 17A Wet Chemical Extinguishing Systems
NFPA 20 Standard for the Installation of Centrifugal Fire Pumps
NFPA 22 Water Tanks for Private Fire Protection
NFPA 24 Installation of Private Fire Service Mains and Their Appurtenances
NFPA 25 Standard for the Inspection, Testing and Maintenance of Water Based Fire Protection Systems
NFPA 33 Standard for Spray Application Using Flammable or Combustible Materials
NFPA 70 National Electrical Code
NFPA 72 National Fire Alarm Code
NFPA 80 Standard for Fire Doors and Other Opening Protectives
NFPA 92 Standard for Smoke Control Systems
NFPA 96 Standard for Ventilation Control and Fire Protection of Commercial Cooking
NFPA 409 Standard on Aircraft Hangars

CHAPTER 1
AUTOMATIC SPRINKLER SYSTEMS

Contents

This summary is provided as a general guideline for acceptance inspection and testing and does not ensure coverage for all systems and equipment. This summary is intended to provide support for inspection staffs but the information included should not be construed as the only requirements for the systems and equipment. Codes and standards should be reviewed to confirm that all requirements are completed.

Approved Plans

1. New installation or modification.
2. No outstanding rider comments from QAD Design Standards.
3. Confirmation that installation has been completed as per approved drawings.
4. Plans (shop drawings) are on site and available to inspection staff.
    a. Sequence of operations is on the approved drawings.

Piping and Fittings

1. Confirm the type of piping and fittings used

Sprinkler Heads

1. Document the following information for all sprinklers installed:
    a. Make
    b. Model
    c. Year of Manufacture
    d. Orifice Size
    e. Quantity
    f. Temperature Rating

Sprinkler System Alarm Valve

1. Document:
    a. Location
    b. Type
    c. Make
    d. Model

System Equipment:

1. Identify system components including but not limited to:
    a. Fire pump
        i. Power supply and controller
    b. Automatic detection system
    c. Air maintenance device
    d. Test Connection
    e. Fire department connection(s)
    f. Pressure regulating device(s)
    g. Backflow preventer device(s)

Visual Inspection

1. Conduct a walkthrough of the installation to confirm:
    a. Clear access to all control valve(s).
    b. Clear access to fire department connection(s).
    c. All control valves are in their normal position.
    d. Satisfactory sprinkler spacing and location.
    e. Test connection is in the correct location and is the correct orifice size

Control Valves

1. Identify the number of control valves installed.
2. Identify the make and model of each control valve.
3. Identify how each control valve is supervised.
4. Confirm that all control, drain, venting, and test connection valves are provided with permanently marked metal or rigid plastic identification signs.
    a. Confirm that each control valve has the correct signage including but not limited to:
        i. General Information Sign
        ii. Hydraulic Design Information Sign
        iii. Antifreeze Information Sign
        iv. Auxiliary Drain Sign
5. Operate each control valve through its full range and return to normal position.
6. Test the operation of each electronic valve supervision device.

Underground Piping

1. Confirm that all underground piping is flushed.
    a. Flushing shall be in accordance with NFPA 24.
2. Confirm that the installing contractor completes and signs the contractor's material and test certificate(s).

Painting of Dedicated Sprinkler Piping and Valve Handles

NYC only

1. Dedicated sprinkler piping shall be painted and such painting certified in accordance with NYCBC Sections 903.6.1 through 903.6.5 *(shown below as Nos. 2 through 6)*. In addition to painting, sprinkler piping may also be identified by lettered legend in accordance with ANSI A13.1. Where the piping is required to be listed and labeled such painting shall not obscure such labeling.

    Exceptions:

    (1) Attachments, gauges, valves and operable parts of sprinkler systems other than valve handles.

    (2) Horizontal branch lines.

    (3) Where different color coding may be required by Section 3406 of the New York City Fire Code for facilities storing, handling, and using flammable and combustible liquids in connection with special operations.
2. New Buildings
    a. Cross connections and risers in new buildings, including buildings constructed pursuant to Section 28-101.4.2 of the NYC Administrative Code, shall be painted red and the handles of valves serving dedicated sprinklers shall be painted green prior to the hydrostatic pressure test regardless of whether they will be enclosed at a later point in time.

        Exception:

        Where a standpipe system is used as a combination standpipe and sprinkler system, the sprinkler risers and cross connections that are also used for the standpipe system shall be painted red and the handles of valves serving such combination system shall be painted yellow.

3. Alterations
   a. Cross connections and risers for independent (stand-alone) existing sprinkler systems that are exposed during alterations, including alterations pursuant to Section 28-101.4.2 of the Administrative Code, shall be painted red and the handles of valves serving such existing sprinkler systems shall be painted green. Where the alteration requires a hydrostatic pressure test such painting shall be completed prior to such test.

      Exception:
      Where a standpipe system is used as a combination standpipe and sprinkler system, the sprinkler risers and cross connections that are also used for the standpipe system shall be painted red and the handles of valves serving such combination system shall be painted yellow.
4. Retroactive Requirement for Completed Buildings
   a. Notwithstanding any other provision of law, all exposed risers and cross connections of completed buildings in existence on March 2, 2010 shall be painted red and all handles of valves serving such sprinkler system shall be painted green.

      Exception:
      Where a standpipe system is used as a combination standpipe and sprinkler system, the sprinkler risers and cross connections that are also used for the standpipe system shall be painted red and the handles of valves serving such combination system shall be painted yellow.
5. Buildings Under Construction on March 2, 2010
   a. Notwithstanding any other provision of law, where construction documents were approved and permits issued for the construction of a new building or alteration of an existing building prior to March 2, 2010 and the work is not signed off by the department prior to such date, all exposed cross connections and risers in any such building shall be painted red prior to the hydrostatic pressure test, including cross connections and risers that will be enclosed at a later point in time, and handles of valves serving such sprinkler system shall be painted green.

      Exception:
      (1) Where a standpipe system is used as a combination standpipe and sprinkler system, the sprinkler risers and cross connections that are also used for the standpipe system shall be painted red and the handles of valves serving such combination system shall be painted yellow.
      (2) Cross connections and risers enclosed prior to March 2, 2010 need not be painted.
6. Certification of Completion of System Painting
   a. For all buildings where sprinkler and combination sprinkler and standpipe systems are not subject to a special inspection pursuant to NYCBC Section 1705.29 of this code, a licensed master plumber, licensed master fire suppression piping contractor, registered design professional or an individual holding an appropriate certificate of fitness from the Fire Department for the operation and/or maintenance of such system shall certify on forms provided by the department that all required painting has been completed in accordance with NYCBC Section 903.6. Such certification shall be maintained on the premises and made available for inspection by the department and the Fire Department.

Hydrostatic Testing

1. In NJ and NYS
   a. Hydrostatic tests shall be made at not less than 200 psi (13.8 bar) for 2 hours or 50 psi (3.4 bar) above static pressure in excess of 150 psi (10.3 bar) for 2 hours.
   b. Where modification is made to an existing system affecting more than 20 sprinklers, the new portion shall be isolated and tested at not less than 200 psi (13.8 bar) for 2 hours.
   c. Piping between the exterior fire department connection and the check valve in the fire department inlet pipe shall be hydrostatically tested in the same manner as the balance of the system. After repair or replacement work affecting the fire department connection, the piping between the exterior and the check valve in the fire department inlet pipe shall be isolated and hydrostatically tested at 150 psi (10.3 bar).
2. In NYC
   a. Hydrostatic tests shall be made at not less than 200 psi (13.8 bar) for 1 hour or 50 psi (3.4 bar) above static pressure in excess of 150 psi (10.3 bar) for 1 hour
   b. Where addition or modification is made to an existing system affecting more than 20 sprinklers, the new portion shall be isolated and tested at not less than 200 psi (13.8 bar) for 1 hour.
   c. Piping between the exterior fire department connection and the check valve in the fire department inlet pipe shall be hydrostatically tested in the same manner as the balance of the system. After repair or replacement work affecting the fire department connection, the piping between the exterior and the check valve in the fire department inlet pipe shall be isolated and hydrostatically tested at 200 psi (13.8 bar).
3. Test new piping prior to connection with existing piping.
4. Underground water piping shall be tested in accordance with NFPA 24.

Fire Department Connections

1. The fire department connection shall be on the system side of the water supply check valve.
   a. The fire department connection shall not be attached to branch line piping.
2. The fire department connection shall be located not less than 18 in. (450 mm) and not more than 4 ft (1.2 m) above the level of the adjacent grade or access level.
3. For single systems, the fire department connection shall be installed as follows:
   a. Wet system — on the system side of system control, check, and alarm valves *[see Figure A.16.9.3 below]*
   b. Dry system — between the system control valve and the dry pipe valve
   c. Preaction system — between the preaction valve and the check valve on the system side of the preaction valve
   d. Deluge system — on the system side of the deluge valve
4. For multiple systems, the fire department connection shall be connected between the supply control valves and the system control valves.
5. Each fire department connection to sprinkler systems shall be designated by a sign having raised or engraved letters at least 1 in. (25 mm) in height on plate or fitting reading service design — for example, AUTOSPKR., OPEN SPKR., AND STANDPIPE.
6. There shall be no shutoff valve in the fire department connection piping.
7. The piping between the check valve and the outside hose coupling shall be equipped with an approved automatic drain valve in areas subject to freezing.

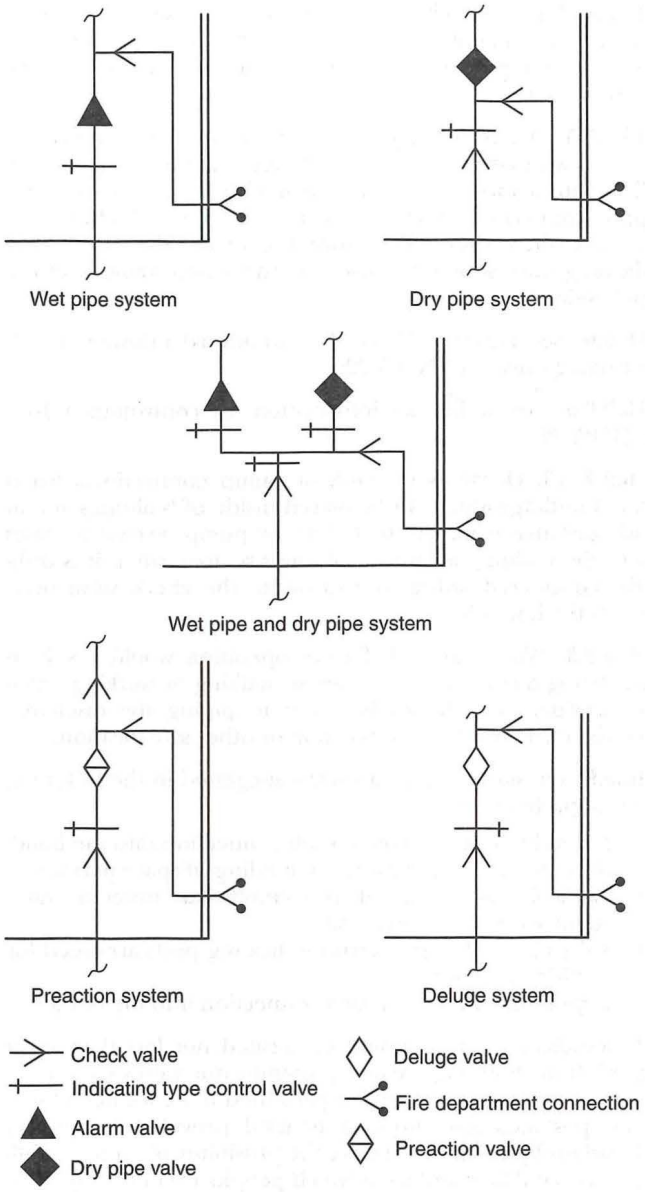

FIGURE A.16.9.3 Examples of Acceptable Valve Arrangements.

Dry Pipe and Preaction Sprinkler Systems with Supervisory Air Pressure.

1. In addition to the standard hydrostatic test, an air pressure leakage test at 40 psi (2.7 bar) shall be conducted for 24 hours.
   a. Any leakage that results in a loss of pressure in excess of 1½ psi (0.1 bar) for the 24 hours shall be corrected.
   b. Retest the piping after corrective work has been completed.

Pressure Regulating Devices

1. Record static inlet and outlet pressures.
2. Record residual inlet and outlet pressures while demonstrating satisfactory minimum and maximum flow rates.
3. Where pressure-reducing valves are arranged in series, the downstream pressure-reducing valve shall be tested at both the discharge pressure from the upstream pressure-reducing valve and with the upstream pressure-reducing valve bypass open.

Backflow Prevention Devices

1. The backflow prevention assembly shall be forward flow tested to ensure proper operation.
2. The minimum flow rate shall be the system demand.

Main Drain Flow Test

1. The main drain valve shall be opened and shall remain open until the system pressure stabilizes.
2. The static and residual pressure shall be recorded on the contractor's test certificate.
3. Main drain flow tests are not required for manual systems that do not have a permanently attached water supply.

Waterflow Alarm Device

1. Document the type of waterflow alarm device including make and model.
2. Confirm that the water alarm device is satisfactorily installed and pretested.
3. Confirm that waterflow alarm initiates all functions as per the approved sequence of operations.

Air Maintenance Device

1. Identify the air maintenance device including:
    a. Air compressor
    b. Air receiver
    c. Relief valve
        i. An approved relief valve shall be provided between the air supply and the shutoff valve and shall be set to relieve pressure no less than 10 psi (0.7 bar) in excess of system air pressure and shall not exceed the manufacturer's limitations.
        ii. Relief valves shall be permitted to be omitted for the type of preaction system when the air pressure is supplied from a source that is not capable of developing pressures in excess of 15 psi (1.0 bar).
2. Confirm that the air maintenance device is dedicated to the system.
3. Witness restoration of the system to normal air pressure confirming maximum time of 30 minutes.
4. Identify and confirm satisfactory operation of the air pressure relief valve.

Wet Sprinkler Systems

1. Test the waterflow alarm device.
   a. Confirm transmission of all alarm, trouble, and supervisory signals to the approved monitoring station.

Dry Pipe Sprinkler Systems

1. If installed, document the make and model of the quick opening device.
2. Inspect the test connection and verify:
   a. The correct orifice size.
   b. Most distant location on the upper most story.
   c. Connection has a shutoff valve and plug.
3. Conduct the acceptance trip test with the control valve fully open documenting the following:
   a. Record the time for the valve to trip when operated through the test connection.
   b. Record the water pressure at the dry pipe valve prior to test
   c. Record the air pressure in the system prior to the test
   d. Record the air pressure when the dry pipe valve trips
   e. Record the time for the water to reach the test connection (full flow).
   f. Confirm that the air pressure supervisory signal(s) and waterflow alarm operate as designed.
4. Confirm transmission of all alarm, trouble, and supervisory signals to the approved monitoring station.

Deluge Sprinkler Systems

1. Identify how the deluge valve operates:
   a. Hydraulically
   b. Pneumatically
   c. Electrically
2. Identify and document the detection system.
   a. Test each circuit to confirm operation of the supervision loss alarm.
   b. Test each detection circuit to confirm operation of the valve release.
   c. Test each initiation device to confirm satisfactory operation.
3. Test the operation of the valve from all manual, remote, and control stations.
4. Test and document the time for detection system to operate the valve release.
5. Demonstrate satisfactory operation of the water spray system(s).
   a. Confirm that the water discharge pattern is satisfactory.
   b. Record the time required to deliver water to the most remote nozzle.
6. Confirm that all required systems operate simultaneously.
7. Record pressure readings:
   a. At the most hydraulically most remote nozzle.
   b. At the actuation valve.
   c. Obtain a copy of the documentation from the A/EOR confirming that the system is operating as satisfactorily based on the pressure readings measured when compared to design criteria.
8. Confirm transmission of all alarm, trouble, and supervisory signals to the approved monitoring station.

Preaction Sprinkler Systems

1. Document if the preaction system is:
   a. Non-interlock
   b. Single Interlock
   c. Double Interlock
2. Document if the piping is supervised
3. Document the detection system and its components
   a. Test each circuit to confirm operation of the supervision loss alarm.
   b. Test each detection circuit to confirm operation of the valve release.
   c. Test each initiation device to confirm satisfactory operation.
4. Test the operation of the valve from all manual, remote, and control stations.
5. Trip test the system.
6. Confirm transmission of all alarm, trouble, and supervisory signals to the approved monitoring station.

Spare Sprinklers

1. A supply of at least six spare sprinklers shall be maintained on the premises so that any sprinklers that have operated or been damaged in any way can be promptly replaced.
   a. A minimum of two sprinklers of each type and temperature rating should be provided.
2. The sprinklers shall be kept in a cabinet located where the temperature to which they are subjected will at no time exceed the maximum ceiling temperatures specified in Table 7.2.4.1 for each of the sprinklers within the cabinet.
3. The stock of spare sprinklers shall include all types and ratings installed and shall be as follows:
   (1) For protected facilities having under 300 sprinklers — no fewer than six sprinklers
   (2) For protected facilities having 300 to 1000 sprinklers — no fewer than 12 sprinklers
   (3) For protected facilities having over 1000 sprinklers — no fewer than 24 sprinklers
4. One sprinkler wrench as specified by the sprinkler manufacturer shall be provided in the cabinet for each type of sprinkler installed to be used for the removal and installation of sprinklers in the system.
5. A list of the sprinklers installed in the property shall be posted in the sprinkler cabinet.
   a. The list shall include the following:
      (1) Sprinkler Identification Number (SIN) if equipped; or the manufacturer, model, K-factor, deflector type, thermal sensitivity, and pressure rating
      (2) General description
      (3) Quantity of each type to be contained in the cabinet
      (4) Issue or revision date of the list
         i. The minimum information in the list contained in the spare sprinkler cabinet should be marked with the sprinkler identification described in NFPA 13 7.2.1; a general description of the sprinkler, including upright, pendent, residential, ESFR, and so forth; and the quantity of sprinklers that is to be maintained in the spare sprinkler cabinet.

            An example of the list is shown in NFPA 13 Figure A.16.2.7.7.1.

Sprinklers Contained in this Cabinet			
Sprinkler Identification, SIN	**General Description**	**Temperature Rating, °F**	**Sprinkler Quantity Maintained**
TY9128	Extended Coverage, K-25, upright	165	6
VK494	Residential concealed pendent	155	6
Issued: 8/31/19	Revised:		

FIGURE A.16.2.7.7.1 Sample List.

Acceptance Testing Records

1. Summary of all fire protection and life safety system equipment installed for the suppression system.
2. Accepting testing report for each system installed.
3. Applicable NFPA Contractor Material and Test Certificates *[see Forms]*.
4. Other documentation from the A/EOR confirming and documenting that all required testing has been successfully completed.
5. As built drawings including sequence of operations.
6. Identification of the onsite location for acceptance testing records.

Operation and Maintenance Information

1. System component instructions.
2. System care and maintenance instructions.
3. Copy of NFPA 25.
4. Acceptance testing report.

Routine Inspection, Testing, And Maintenance.

1. Sprinkler systems shall be inspected, tested, and maintained in accordance with NFPA 25
    a. See Chapter 1 of the Port Authority Manual “Inspection, Testing, and Maintenance Requirements for Fire Protection and Life Safety Systems”.
2. Confirm that records of acceptance testing will be kept on site and for the life of the system.
3. Confirm if tasks will be completed by building or facility maintenance, outside contractor, or a combination.
4. Confirm that routine inspection, testing, and maintenance documentation will be kept on site and available upon request.
5. Confirm that routine inspection, testing, and maintenance documentation is required to be retained for a minimum of 3 years.

FORMS

Contractor's Material and Test Certificate for Aboveground Piping

PROCEDURE

Upon completion of work, inspection and tests shall be made by the contractor's representative and witnessed by the property owner or their authorized agent. All defects shall be corrected and system left in service before contractor's personnel finally leave the job.

A certificate shall be filled out and signed by both representatives. Copies shall be prepared for approving authorities, owners, and contractor. It is understood the owner's representative's signature in no way prejudices any claim against contractor for faulty material, poor workmanship, or failure to comply with approving authority's requirements or local ordinances.

Property name	Date
Property address	
New installation?	❑ Yes ❑ No
Modification? If yes, complete applicable portions of the form.	❑ Yes ❑ No
Provide a description of the scope of work on page 3.	

Plans	Accepted by approving authorities (names)	
	Address	
	Installation conforms to accepted plans	❑ Yes ❑ No
	Equipment used is approved	❑ Yes ❑ No
	If no, explain deviations	
Instructions	Has person in charge of fire equipment been instructed as to location of control valves and care and maintenance of this new equipment? If no, explain	❑ Yes ❑ No
	Have copies of the following been left on the premises?	❑ Yes ❑ No
	1. System components instructions	❑ Yes ❑ No
	2. Care and maintenance instructions	❑ Yes ❑ No
	3. NFPA 25	❑ Yes ❑ No
Location of system	Supplies buildings	

Sprinklers	Make	Model	Year of manufacture	Orifice size	Quantity	Temperature rating

Pipe and fittings: Type of pipe _____ Type of fittings _____

Alarm valve or flow indicator	Alarm device			Maximum time to operate through test connection	
	Type	Make	Model	Minutes	Seconds

Dry pipe operating test	Dry valve			Q. O. D.		
	Make	Model	Serial no.	Make	Model	Serial no.

	Time to trip through test connection[a,b]		Water pressure	Air pressure	Trip point air pressure	Time water reached test outlet[a,b]		Alarm operated properly	
	Minutes	Seconds	psi	psi	psi	Minutes	Seconds	Yes	No
Without Q.O.D.									
With Q.O.D.									

If no, explain

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[a] Measured from time inspector's test connection is opened.
[b] NFPA 13 only requires the 60-second limitation in specific sections.

FIGURE 28.1 Contractor's Material and Test Certificate for Aboveground Piping.

Deluge and preaction valves

Operation ❑ Pneumatic ❑ Electric ❑ Hydraulics

Piping supervised ❑ Yes ❑ No | Detecting media supervised ❑ Yes ❑ No

Does valve operate from the manual trip, remote, or both control stations? ❑ Yes ❑ No

Is there an accessible facility in each circuit for testing? ❑ Yes ❑ No | If no, explain

Make	Model	Does each circuit operate supervision loss alarm? Yes	Does each circuit operate supervision loss alarm? No	Does each circuit operate valve release? Yes	Does each circuit operate valve release? No	Maximum time to operate release: Minutes	Maximum time to operate release: Seconds

Pressure-reducing valve test

Location and floor	Make and model	Setting	Static pressure: Inlet (psi)	Static pressure: Outlet (psi)	Residual pressure (flowing): Inlet (psi)	Residual pressure (flowing): Outlet (psi)	Flow rate: Flow (gpm)

Backflow device forward flow test

Indicate means used for forward flow test of backflow device: _____

When means to test device was opened, was system flow demand created? ❑ Yes ❑ No ❑ N/A

Test description

Hydrostatic: Hydrostatic tests shall be made at not less than 200 psi (13.8 bar) for 2 hours or 50 psi (3.4 bar) above static pressure in excess of 150 psi (10.3 bar) for 2 hours. Differential dry pipe valve clappers shall be left open during the test to prevent damage. All aboveground piping leakage shall be stopped.

Pneumatic: Establish 40 psi (2.7 bar) air pressure and measure drop, which shall not exceed 1½ psi (0.1 bar) in 24 hours. Test pressure tanks at normal water level and air pressure and measure air pressure drop, which shall not exceed 1½ psi (0.1 bar) in 24 hours.

Tests

All piping hydrostatically tested at ____ psi (____ bar) for ____ hours ❑ Yes ❑ No | If no, state reason

Dry piping pneumatically tested ❑ Yes ❑ No

Equipment operates properly ❑ Yes ❑ No

Do you certify as the sprinkler contractor that additives and corrosive chemicals, sodium silicate or derivatives of sodium silicate, brine, or other corrosive chemicals were not used for testing systems or stopping leaks? ❑ Yes ❑ No

Drain test: Reading of gauge located near water supply test connection: ____ psi (____ bar) | Residual pressure with valve in test connection open wide: ____ psi (____ bar)

Underground mains and lead-in connections to system risers flushed before connection made to sprinkler piping

Verified by copy of the Contractor's Material and Test Certificate for Underground Piping. ❑ Yes ❑ No | Other | Explain

Flushed by installer of underground sprinkler piping ❑ Yes ❑ No

If powder-driven fasteners are used in concrete, has representative sample testing been satisfactorily completed? ❑ Yes ❑ No | If no, explain

Blank testing gaskets

Number used	Locations	Number removed

Welding

Welding piping ❑ Yes ❑ No

If yes . . .

Do you certify as the sprinkler contractor that welding procedures used complied with the minimum requirements of AWS B2.1, ASME Section IX *Welding and Brazing Qualifications,* or other applicable qualification standard as required by the AHJ? ❑ Yes ❑ No

Do you certify that all welding was performed by welders or welding operators qualified in accordance with the minimum requirements of AWS B2.1, ASME Section IX *Welding and Brazing Qualifications,* or other applicable qualification standard as required by the AHJ? ❑ Yes ❑ No

Do you certify that the welding was conducted in compliance with a documented quality control procedure to ensure that (1) all discs are retrieved; (2) that openings in piping are smooth, that slag and other welding residue are removed; (3) the internal diameters of piping are not penetrated; (4) completed welds are free from cracks, incomplete fusion, surface porosity greater than 1/16 in. (1.6 mm) diameter, undercut deeper than the lesser of 25% of the wall thickness or 1/32 in. (0.8 mm); and (5) completed circumferential butt weld reinforcement does not exceed 3/32 in. (2.4 mm)? ❑ Yes ❑ No

FIGURE 28.1 *Continued*

Cutouts (discs)	Do you certify that you have a control feature to ensure that all cutouts (discs) are retrieved? ❑ Yes ❑ No	
Hydraulic data nameplate	Nameplate provided ❑ Yes ❑ No	If no, explain
Sprinkler contractor removed all caps and straps? ❑ Yes ❑ No		
Remarks	Date left in service with all control valves open	
Signatures	Name of sprinkler contractor	
	Tests witnessed by	
	The property owner or their authorized agent (signed) Title Date	
	For sprinkler contractor (signed) Title Date	

Additional explanations and notes

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FIGURE 28.1 *Continued*

Contractor's Material and Test Certificate for Underground Piping

PROCEDURE

Upon completion of work, inspection and tests shall be made by the contractor's representative and witnessed by an owner's representative. All defects shall be corrected and system left in service before contractor's personnel finally leave the job.

A certificate shall be filled out and signed by both representatives. Copies shall be prepared for approving authorities, owners, and contractor. It is understood the owner's representative's signature in no way prejudices any claim against contractor for faulty material, poor workmanship, or failure to comply with approving authority's requirements or local ordinances.

Property name	Date
Property address	

Plans	Accepted by approving authorities (names)		
	Address		
	Installation conforms to accepted plans	❑ Yes	❑ No
	Equipment used is approved If no, state deviations	❑ Yes	❑ No
Instructions	Has person in charge of fire equipment been instructed as to location of control valves and care and maintenance of this new equipment? If no, explain	❑ Yes	❑ No
	Have copies of appropriate instructions and care and maintenance charts been left on premises? If no, explain	❑ Yes	❑ No
Location	Supplies buildings		
Underground pipes and joints	Pipe types and class / Type joint		
	Pipe conforms to _____ standard Fittings conform to _____ standard If no, explain	❑ Yes ❑ Yes	❑ No ❑ No
	Joints needing anchorage clamped, strapped, or blocked in accordance with _____ standard If no, explain	❑ Yes	❑ No
Test description	Flushing: Flow the required rate until water is clear as indicated by no collection of foreign material in burlap bags at outlets such as hydrants and blow-offs. Flush in accordance with the requirements of 6.10.2.1.3. Hydrostatic: All piping and attached appurtenances subjected to system working pressure shall be hydrostatically tested at 200 psi (13.8 bar) or 50 psi (3.4 bar) in excess of the system working pressure, whichever is greater, and shall maintain that pressure ±5 psi (0.34 bar) for 2 hours. Hydrostatic Testing Allowance: Where additional water is added to the system to maintain the test pressures required by 6.10.2.2.1, the amount of water shall be measured and shall not exceed the limits of the following equation (for metric equation, see 6.10.2.2.6): $L = \frac{SD\sqrt{P}}{148{,}000}$ L = testing allowance (makeup water), in gallons per hour S = length of pipe tested, in feet D = nominal diameter of the pipe, in inches P = average test pressure during the hydrostatic test, in pounds per square inch (gauge)		
Flushing tests	New underground piping flushed according to _____ standard by (company) If no, explain	❑ Yes	❑ No
	How flushing flow was obtained: ❑ Public water ❑ Tank or reservoir ❑ Fire pump / Through what type opening: ❑ Hydrant butt ❑ Open pipe		
	Lead-ins flushed according to _____ standard by (company) If no, explain	❑ Yes	❑ No
	How flushing flow was obtained: ❑ Public water ❑ Tank or reservoir ❑ Fire pump / Through what type opening: ❑ Y connection to flange and spigot ❑ Open pipe		

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FIGURE 6.10.1 Sample of Contractor's Material and Test Certificate for Underground Piping. [24:Figure 10.10.1]

Hydrostatic test	All new underground piping hydrostatically tested at _____ psi for _____ hours	Joints covered ❑ Yes ❑ No
Leakage test	Total amount of leakage measured _____ gallons _____ hours	
	Allowable leakage _____ gallons _____ hours	
Forward flow test of backflow preventer	Foward flow test performed in accordance with 6.10.2.5.2: ❑ Yes ❑ No	
Hydrants	Number installed / Type and make	All operate satisfactorily ❑ Yes ❑ No
Control valves	Water control valves left wide open If no, state reason	❑ Yes ❑ No
	Hose threads of fire department connections and hydrants interchangeable with those of fire department answering alarm	❑ Yes ❑ No
Remarks	Date left in service	
Signatures	Name of installing contractor	
	Tests witnessed by	
	For property owner (signed) / Title / Date	
	For installing contractor (signed) / Title / Date	

Additional explanation and notes

FIGURE 6.10.1 *Continued*

CHAPTER 2
FIRE STANDPIPE SYSTEMS

Contents

Approved Plans

1. New installation or modification.
2. No outstanding rider comments from QAD Design Standards.
3. Confirmation that installation has been completed as per approved drawings.
4. Plans (shop drawings) are on site and available to inspection staff.
    a. Sequence of operations is on the approved drawings.

Piping and Fittings

1. Confirm the type of piping and fittings used.

Standpipe System Type

1. Define the type of standpipe system as:
    a. Automatic dry
    b. Automatic wet
    c. Semiautomatic dry
    d. Manual dry
    e. Manual wet
    f. Combination standpipe/sprinkler
    g. Other

System Equipment

1. Identify individual system components including but not limited to:
    a. Fire pump
        i. Power supply and controller
    b. Automatic detection system
    c. Air maintenance device
    d. Test Connection
    e. Fire department connection(s)
    f. Pressure regulating device(s)
    g. Backflow preventer device(s)

Visual inspection

1. Conduct a walkthrough of the installation to confirm:
    a. Clear access to all control valve(s).
    b. Clear access to fire department connection(s).
    c. All control valves are in their normal position.

Manual Valve Test

1. Each valve intended to be manually opened or closed shall be operated by turning the handwheel crank or wrench for its full range and returning it to its normal position.
2. Hose valve caps shall be tightened sufficiently to avoid leaking during the test and removed after the test to drain water and relieve pressure.

Control Valves

1. Identify the number of control valves.
2. Identify the make and model of each control valve.
3. Identify how each control valve is supervised.
4. Operate each control valve through its full range and return to normal position.
5. Test the operation of each electronic valve supervision device.

Flushing of Piping

1. Underground piping supplying the system shall be flushed in accordance with NFPA 24.
2. Piping between the fire department connection and the check valve in the inlet pipe shall be flushed with a sufficient volume of water in order to remove any construction debris and trash accumulated in the piping prior to the completion of the system and prior to the installation of the fire department connection.

Signs

1. The installation of required signs shall be verified.
2. Signs shall be permanently marked and shall be constructed of weather-resistant metal or rigid plastic materials.
3. All control, drain, and test connection valves shall be provided with signs indicating their purpose.
4. Where hose connections are not located in exit stairways, signs shall be provided in accordance with NFPA 170, to identify the location of the hose connection in an approved manner.
5. Hydraulic Design Information Sign.
   a. The installing contractor shall provide a sign identifying the basis of the system design.
   b. The sign shall be located at the water supply control valve for automatic or semiautomatic standpipe systems and at an approved location for manual systems.
   c. The sign shall indicate the following:
      i. Location of the two hydraulically most remote hose connections
      ii. Design flow rate for the connections
      iii. Design residual inlet and outlet pressures for the connections
      iv. Design static pressure and the design system demand (i.e., flow and residual pressure) at the system control valve, or at the pump discharge flange where a pump is installed, and at each fire department connection.

Painting of Dedicated Standpipes

NYC only.

1. Dedicated standpipes and the handles of valves serving standpipes shall be painted and such painting certified in accordance with [NYCBC] Sections 905.11.1 through 905.11.6 (shown as Items 2 through 7 below). In addition to painting, standpipe piping may also be identified by lettered legend in accordance with ANSI A13.1. Where the piping is required to be listed and labeled such painting shall not obscure such labeling.

   Exceptions:

   (1) Attachments, gauges, valves and operable parts of standpipes other than valve handles.

(2) Where different color coding may be required by Section 3406 of the New York City Fire Code for facilities storing, handling, and using flammable and combustible liquids in connection with special operations.

2. New Buildings
   a. All portions of a standpipe system and the handles of valves serving the standpipe system in new buildings, including buildings constructed pursuant to Section 28-101.4.2 of the NYC Administrative Code, shall be painted red prior to the hydrostatic pressure test whether or not they are intended to be enclosed at the end of construction.
3. Alterations
   a. Existing handles of valves serving existing standpipe systems and existing unpainted standpipe risers that are exposed during alterations, including alterations pursuant to Section 28-101.4.2 of the NYC Administrative Code shall be painted red. Where the alteration requires a hydrostatic pressure test such painting shall be completed prior to such test.
4. Retroactive Requirement for Completed Buildings
   a. Notwithstanding any other provision of law, all portions of exposed standpipe systems and handles of valves serving the standpipe system of completed buildings in existence March 2, 2010 shall be painted red.
5. Buildings Under Constructionon March 2, 2010.
   a. Notwithstanding any other provision of law, where construction documents were approved and permits issued for the construction of a new building or alteration of an existing building prior to March 2, 2010 and the work is not signed off by the department prior to such date, all exposed portions of the standpipe system and handles of valves serving the standpipe system shall be painted red prior to the hydrostatic pressure test, including portions that will be enclosed at a later point in time.

      Exception:

      (1) Portions of the standpipe system enclosed prior to March 2, 2010 need not be painted.
6. Combination Standpipe and Sprinkler Systems
   a. Where a standpipe system that is used as a combination standpipe and sprinkler system is required to be painted pursuant to NYC BC Section 905.11.1, 905.11.2, 905.11.3 or 905.11.4, the sprinkler risers and cross connections that are also used for the standpipe system shall be painted red, and the handles of valves serving such combination standpipe and sprinkler system shall be painted yellow.
7. Certification of completion of system painting.
   a. For all buildings where standpipe and combination sprinkler and standpipe systems are not subject to a special inspection pursuant to NYC BC Section 1705.30 of this code, a licensed master plumber, licensed master fire suppression piping contractor, registered design professional or an individual holding an appropriate certificate of fitness from the Fire Department for the operation and/or maintenance of such system shall certify on forms provided by the department that all required painting has been completed in accordance with NYC BC Section 905.11. Such certification shall be maintained on the premises and made available for inspection by the department and the Fire Department.

Hydrostatic testing.

1. In NJ and NYS.
   a. All new systems, including yard piping and fire department connection piping, shall be tested hydrostatically at not less than 200 psi (13.8 bar) or 50 psi (3.5 bar) in excess of the system working pressure, whichever is greater for 2 hours.

2. In NYC.
   a. All new systems, including yard piping and fire department connections, shall be tested hydrostatically at not less than 20.7 bar (300 psi) of pressure for 1 hour, or at 3.5 bar (50 psi) in excess of the maximum pressure where the maximum pressure is in excess of 17.3 bar (250 psi).
3. The hydrostatic test pressure shall be measured at the low elevation point of the individual system or zone being tested.
4. Underground pipe shall be tested in accordance with NFPA 24.
5. Where cold weather prevents testing with water, an interim air test shall be permitted to be conducted prior to the standard hydrostatic test
   a. An air pressure leakage test at 40 psi (2.8 bar) shall be conducted for 24 hours.
   b. Any leakage that results in a loss of pressure in excess of 1 ½ psi (0.1 bar) during a continuous 24-hour period shall be corrected.
6. Fire Department Connections
   a. Piping between the fire department connection and the check valve in the inlet pipe shall be tested hydrostatically in the same manner as the balance of the system.
7. Existing Systems
   a. Where an existing standpipe system, including yard piping and fire department connection, is modified, the new piping shall be independently tested in accordance with jurisdictional requirements (shown as 9.1 and 9.2 above).
   b. Modifications that cannot be isolated, such as new valves or the point of connection for new piping, shall not require testing in excess of system static pressure.
8. Gauges.
   a. During the hydrostatic test, the pressure gauge at the top of each standpipe shall be observed and the pressure recorded.
   b. The test pressure shall be read from a gauge located at the low elevation point of the system or portion being tested. The pressures in piping at higher elevations shall be permitted to be less than the pressures required by 1, 2, and 3 above, when accounting for elevation losses. Systems or portions of systems that can be isolated shall be permitted to be tested separately.

Flow Tests

1. The standpipe system shall be tested to verify system demand.
   a. The hydraulically most remote hose connections in a building are generally at a roof manifold, if provided, or at the top of a stair leading to the roof. In a multizone system, the testing means is generally at a test header at grade or at a suction tank on higher floors.
   b. Where a flow test at the hydraulically most remote hose connection is not practicable, the AHJ should be consulted for the appropriate location of the test.
2. This test shall be conducted by flowing water simultaneously from the outlet(s) indicated in the approved hydraulic calculations of each standpipe as required.
3. For each additional standpipe, the required flow shall be permitted to be taken from any hose connection on that standpipe.
4. For a manual standpipe, a fire department pumper, portable pump of a capacity to provide the required flow and pressure, or other approved means shall be used to verify the system design by pumping into the fire department connection.
5. The filling arrangement for suction tanks shall be verified by shutting down all supplies to the tank, draining the tank to below the designated low water level, and then opening the supply valve to ensure operation of its automatic features.

Testing of Automatic Dry and Semiautomatic Systems

1. Automatic dry and semiautomatic systems shall be tested by initiating a flow of water from the hydraulically most remote hose connection.
2. The system shall deliver a minimum of 250 gpm (946 L/min) at the hose connection within 3 minutes of opening the hose valve if the system capacity exceeds 750 gal (2480 L).
3. Each remote control activation device for operating a semiautomatic system shall be tested in accordance with the manufacturer's specifications and instructions.
4. In addition to the standard hydrostatic test, an air pressure leakage test at 40 psi (2.7 bar) shall be conducted for 24 hours. Any leakage that results in a loss of pressure in excess of 1½ psi (0.1 bar) for the 24 hours shall be corrected.
5. These tests shall be conducted in addition to all the tests required for automatic and manual systems.
6. Where pumps are part of the water supply for a standpipe system, testing shall be conducted while the pumps are operating.

Pressure-Regulating Devices

1. Each pressure-regulating device shall be tested to verify that the installation is correct, that the device is operating, and that the inlet and outlet pressures and flow at the device are in accordance with the design.
   a. It is important to test pressure-regulating devices at the maximum and minimum anticipated flow rates. Minimum flow can be from a single sprinkler for combined systems or flow from a 1½ in. (40 mm) hose connection on standpipe systems that do not supply sprinklers. This can require a sustained flow to demonstrate the continued performance of the pressure-regulating device at the minimum flow rate.
   b. Where pressure-reducing valves are arranged in series, the downstream pressure-reducing valve shall be tested at both the discharge pressure from the upstream pressure-reducing valve and with the upstream pressure-reducing valve bypass open.
2. Static and residual inlet pressure and static and residual outlet pressure and flow shall be recorded on the contractor's test certificate.

Backflow Prevention Assemblies.

1. The backflow prevention assembly shall be forward flow tested to ensure proper operation.
2. The minimum flow rate shall be the system demand.
3. The filling arrangement for suction tanks shall be verified by shutting down all supplies to the tank, draining the tank to below the designated low water level, and then opening the supply valve to ensure operation of its automatic features.

Main Drain Flow Test

1. The main drain valve shall be opened and shall remain open until the system pressure stabilizes.
2. The static and residual pressure shall be recorded on the contractor's test certificate.
3. Main drain flow tests are not required for manual systems that do not have a permanently attached water supply.

Alarm and Supervision Tests.

1. Each alarm and supervisory device provided shall be tested in accordance with NFPA 72.
2. Waterflow Alarm Device
   a. Identify and document the type of waterflow alarm device.
   b. Confirm that the water alarm device is satisfactorily installed and pretested.
   c. Test waterflow alarm device and confirm transmission to local panel and central monitoring station.
   d. Confirm that all functions are performed as per the approved sequence of operations.

Air Maintenance Device

1. Identify the air maintenance device including:
   a. Air compressor
   b. Air receiver
   c. Relief valve
2. Confirm that the air maintenance device is dedicated to the system.
3. Witness restoration of the system to normal air pressure confirming maximum time of 30 minutes.
4. Confirm satisfactory operation of the air pressure relief valve.

Acceptance Test Records

1. Summary of all fire protection and life safety system equipment installed including fans, dampers, and control equipment for the suppression system.
2. The installing contractor shall complete and sign the appropriate contractor's material and test certificate(s) as shown in NFPA 14 Figure 11.1.3(a) and Figure 11.1.3(b) *(see Forms)*.
3. One copy of the completed test report shall be provided to the building owner.
4. Acceptance test reports shall be maintained by the system owner for the life of the system.
5. Other documentation from A/EOR confirming that all work has been completed.
6. As built drawings including sequence of operations.
7. Identification of the onsite location for acceptance testing records.

Operation and Maintenance Information

1. One set of instruction manuals for all major components of the standpipe system shall be provided to the building owner. The manual shall contain the following:
   a. An explanation of the operation of the component
   b. Manufacturer’s instructions for routine maintenance
   c. Manufacturer’s instructions concerning repairs
   d. Manufacturer’s parts list and identification for serviceable components
   e. A copy of the current edition of NFPA 25
2. Hydraulic data/calculations
3. One set of record drawings shall be provided to the building owner.
4. Acceptance testing report.

Routine Inspection, Testing, and Maintenance.

1. A standpipe system installed in accordance with this standard shall be properly inspected, tested, and maintained by the property owner or an authorized representative in accordance with NFPA 25 to provide at least the same level of performance and protection as originally designed.
   a. See Chapter 2 in the Port Authority Manual “Inspection, Testing, and Maintenance Requirements for Fire Protection and Life Safety Systems”.
2. Confirm that records of acceptance testing will be kept on site and for the life of the building.
3. Confirm if tasks will be completed by building or facility maintenance, outside contractor, or a combination.
4. Confirm that inspection, testing, and maintenance documentation will be kept on site and available upon request.
5. Confirm that inspection, testing, and maintenance documentation is required to be retained for a minimum of 3 years.

FORMS

CONTRACTOR'S MATERIAL AND TEST CERTIFICATE FOR ABOVEGROUND PIPING

Standpipe System NFPA 14

PROCEDURE

Upon completion of work, inspection and tests shall be made by the contractor's representative and witnessed by an owner's representative. All defects shall be corrected and the system left in service before the contractor's personnel finally leave the job.

A certificate shall be filled out and signed by both representatives. Copies shall be prepared for approving authorities, owners, and contractor. It is understood that the owner's representative's signature in no way prejudices any claim against the contractor for faulty material, poor workmanship, or failure to comply with the approving authority's requirements or local ordinances.

Property name	Date
Property address	

Plans	Accepted by approving authorities (names) Address Installation conforms to accepted plans? ❑ Yes ❑ No Equipment used is approved or listed? ❑ Yes ❑ No If no, explain deviations. _____
Type of System	❑ Automatic dry ❑ Automatic wet ❑ Semiautomatic dry ❑ Manual dry ❑ Manual wet ❑ Combination standpipe/sprinkler If other, explain. _____
Water Supply Data Used for Design and As Shown on Plans	Fire pump data Manufacturer _____ Model _____ Type: ❑ Electric ❑ Diesel ❑ Other (explain) _____ Rated, gpm _____ Rated, psi _____ Shutoff, psi _____
Water Supply Source Capacity, Gallons	❑ Public waterworks system _____ (gal) ❑ Storage tank _____ (gal) ❑ Gravity tank _____ (gal) ❑ Open reservoir _____ (gal) ❑ Other (explain) _____
If Public Waterworks System:	Static, psi _____ Residual, psi _____ Flow, gpm _____
Have Copies of the Following Been Provided to the Owner or Owner's Representative?	❑ System components instructions ❑ Care and maintenance of system ❑ NFPA 25 ❑ Copy of accepted plans ❑ Hydraulic data/calculations
Supplies Building(s)	Main waterflow shutoff location _____ Number of standpipe risers _____ Do all standpipe risers have base of riser shutoff valves? ❑ Yes ❑ No
Valve Supervision	❑ Locked open ❑ Sealed and tagged ❑ Tamperproof switch ❑ Other If other, explain. _____
Pipe and Fittings	Type of pipe _____ Type of fittings _____
Hose Threads	Hose threads have been verfied for compliance with local fire department ❑ Yes ❑ No
Backflow Preventor	❑ Double check assembly ❑ Reduced-pressure device Size _____ Make and model _____

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▲ **FIGURE 11.1.3(a) Sample Contractor's Material and Test Certificate for Aboveground Piping.**

This summary is provided as a general guideline for acceptance testing and does not ensure coverage for all systems and equipment. This summary is intended to provide support for inspection staffs but the information included should not be construed as the only requirements for the systems and equipment. Codes and standards should be reviewed to confirm that all requirements are completed.

CONTROL VALVE DEVICE

Type	Size	Make	Model

Time to trip through remote hose valve _____ Min _____ Sec Water pressure _____ Air pressure _____
Time water reached remote hose valve outlet _____ Min _____ Sec Trip point air pressure _____ psi
Alarm operated properly? ❑ Yes ❑ No If no, explain. _____

Time water reached remote hose valve outlet _____ Min _____ Sec
Hydraulic activation ❑ Yes
Electric activation ❑ Yes
Pneumatic activation ❑ Yes
Make and model of activation device _____
Each activation device tested? ❑ Yes ❑ No If no, explain. _____

Each activation device operated properly? ❑ Yes ❑ No If no, explain. _____

PRESSURE-REGULATING DEVICE

Location & Floor	Model	Nonflowing (psi)		Flowing (psi)		gpm
		Inlet	Outlet	Inlet	Outlet	

All hose valves on system operated properly? ❑ Yes ❑ No If no, explain. _____

△ FIGURE 11.1.3(a) *Continued*

Test Description	*Hydrostatic:* Hydrostatic tests shall be made at not less than 200 psi (13.6 bar) for 2 hours or 50 psi (3.4 bar) above static pressure in excess of 150 psi (10.2 bar) for 2 hours. Differential dry pipe valve clappers shall be left open during test to prevent damage. All aboveground piping leakage shall be stopped. *Pneumatic:* Establish 40 psi (2.7 bar) air pressure and measure drop, which shall not exceed 1½ psi (0.1 bar) in 24 hours. Test pressure tanks at normal water level and air pressure and measure air pressure drop, which shall not exceed 1½ psi (0.1 bar) in 24 hours.
Tests	Hydrostatic Test — Pressure at top of standpipe(s) STP# _____ Pressure _____ (psi) (_____ bar) STP# _____ Pressure _____ (psi) (_____ bar) STP# _____ Pressure _____ (psi) (_____ bar) STP# _____ Pressure _____ (psi) (_____ bar) STP# _____ Pressure _____ (psi) (_____ bar) STP# _____ Pressure _____ (psi) (_____ bar) All piping hydrostatically tested at _____ psi (____ bar) for _____ hrs — If no, state reason. Dry piping pneumatically tested? ❑ Yes ❑ No Equipment operates properly? ❑ Yes ❑ No Do you certify as the standpipe contractor that additives and corrosive chemicals, sodium silicate, or derivatives of sodium silicate, brine, or other corrosive chemicals were not used for testing systems or stopping leaks? ❑ Yes ❑ No Drain test — Reading of gauge located near water supply test connection _____ psi (____ bar) — Residual pressure with valve in test connection open wide _____ psi (____ bar) Underground mains and lead-in connections to system risers flushed before connection made to standpipe piping. Verified by copy of the underground test form? ❑ Yes ❑ No ❑ Other (explain) _____ Flushed by installer of underground standpipe piping? ❑ Yes ❑ No _____
Flow Test	Flow water from the hydraulically most remote standpipe outlet(s). Record: Static pressure: _____ psi (____ bar) Residual pressure: _____ psi (____ bar) Nozzle diameter: _____ in. (____ cm) Pitot pressure: _____ psi (____ bar) Total flow: _____ gpm (____ L/min)
Blank Testing	Number used _____ Locations _____ Number removed _____
Welding	Welded piping ❑ Yes ❑ No **If yes . . .** Do you certify as the standpipe contractor that welding procedures comply with the requirements of at least AWS D10.9, Level AR-3? ❑ Yes ❑ No Do you certify that the welding was performed by welders qualified in compliance with the requirements of at least AWS D10.9, Level AR-3? ❑ Yes ❑ No Do you certify that welding was carried out in compliance with a documented quality control procedure to ensure that all discs are retrieved, that openings in piping are smooth, that slag and other welding residue are removed, and that the internal diameters of piping are not penetrated? ❑ Yes ❑ No
Cutouts (Discs)	Do you certify that you have a control feature to ensure that all cutouts (discs) are retrieved? ❑ Yes ❑ No
Hydraulic Data Nameplate	Nameplate provided? ❑ Yes ❑ No ❑ If no, explain. _____
Remarks	Date left in service with all control valves open: _____
Name of Sprinkler/ Standpipe Contractor	Name of contractor _____ Address _____ State license number (if applicable) _____
System Operating Test Witnessed by	Property owner _____ Title _____ Date _____ Sprinkler/standpipe contractor _____ Title _____ Date _____ Approving authorities _____ Title _____ Date _____
Additional Explanation and Notes	

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△ FIGURE 11.1.3(a) *Continued*

Contractor's Material and Test Certificate for Underground Piping

PROCEDURE

Upon completion of work, inspection and tests shall be made by the contractor's representative and witnessed by an owner's representative. All defects shall be corrected and system left in service before contractor's personnel finally leave the job.

A certificate shall be filled out and signed by both representatives. Copies shall be prepared for approving authorities, owners, and contractor. It is understood the owner's representative's signature in no way prejudices any claim against contractor for faulty material, poor workmanship, or failure to comply with approving authority's requirements or local ordinances.

Property name	Date
Property address	

Plans	Accepted by approving authorities (names)	
	Address	
	Installation conforms to accepted plans	❑ Yes ❑ No
	Equipment used is approved If no, state deviations	❑ Yes ❑ No
Instructions	Has person in charge of fire equipment been instructed as to location of control valves and care and maintenance of this new equipment? If no, explain	❑ Yes ❑ No
	Have copies of appropriate instructions and care and maintenance charts been provided to the owner or owner's representative? If no, explain	❑ Yes ❑ No
Location	Supplies buildings	
Underground pipes and joints	Pipe types and class / Type joint	
	Pipe conforms to _____ standard Fittings conform to _____ standard If no, explain	❑ Yes ❑ No ❑ Yes ❑ No
	Joints needing anchorage clamped, strapped, or blocked in accordance with _____ standard If no, explain	❑ Yes ❑ No
Test description	Flushing: Flow the required rate until water is verified to be clear of debris at outlets such as hydrants and blow-offs. Flush at one of the flow rates as specified in 10.10.2.1.3 of NFPA 24. Hydrostatic: All piping and attached appurtenances subjected to system working pressure shall be hydrostatically tested at 200 psi (13.8 bar) or 50 psi (3.4 bar) in excess of the system working pressure, whichever is greater, and shall maintain that pressure ±5 psi (0.34 bar) for 2 hours. Hydrostatic Testing Allowance: Where additional water is added to the system to maintain the test pressures required by 10.10.2.2.1 of NFPA 24, the amount of water shall be measured and shall not exceed the limits of the following equation (for metric equation, see 10.10.2.2.6 of NFPA 24): $L = \frac{SD\sqrt{P}}{148{,}000}$ L = testing allowance (makeup water), in gallons per hour (lpm) S = length of pipe tested, in feet (m) D = nominal diameter of the pipe, in inches (mm) P = average test pressure during the hydrostatic test, in pounds per square inch (gauge) (bar)	
Flushing tests	New underground piping flushed according to _____ standard by (company) If no, explain	❑ Yes ❑ No
	How flushing flow was obtained: ❑ Public water ❑ Tank or reservoir ❑ Fire pump / Through what type opening: ❑ Hydrant butt ❑ Open pipe	
	Lead-ins flushed according to _____ standard by (company) If no, explain	❑ Yes ❑ No
	How flushing flow was obtained: ❑ Public water ❑ Tank or reservoir ❑ Fire pump / Through what type opening: ❑ Y connection to flange and spigot ❑ Open pipe	

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Δ FIGURE 11.1.3(b) Sample of Contractor's Material and Test Certificate for Underground Piping. [24:Figure 10.10.1]

Hydrostatic test	All new underground piping hydrostatically tested at _____ psi (bar) for _____ hours	Joints covered ❑ Yes ❑ No
Leakage test	Total amount of leakage measured _____ gallons (liters) _____ hours	
	Allowable leakage _____ gallons (liters) _____ hours	
Forward flow test of backflow preventer	Forward flow test performed in accordance with 10.10.2.5.2 of NFPA 24:	❑ Yes ❑ No
Hydrants	Number installed / Type and make	All operate satisfactorily ❑ Yes ❑ No
Control valves	Water control valves left wide open If no, state reason	❑ Yes ❑ No
	Hose threads of fire department connections and hydrants interchangeable with those of fire department answering alarm	❑ Yes ❑ No
Remarks	Date left in service	
Signatures	Name of installing contractor	
	Tests witnessed by	
	For property owner (signed) / Title / Date	
	For installing contractor (signed) / Title / Date	

Additional explanation and notes

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Δ FIGURE 11.1.3(b) *Continued*

CHAPTER 3
PRIVATE SERVICE MAINS

Contents

Approved Plans

1. New installation or modification.
2. No outstanding rider comments from QAD Design Standards.
3. Confirmation that installation has been completed as per approved drawings.
4. Plans (shop drawings) are on site and available to inspection staff.

Pipe and Fittings

1. Confirm the type of piping and fittings used.

Private Fire Service Mains Under Buildings.

1. Except as allowed by NFPA 24 10.4.3, private fire service mains shall not be allowed to run under buildings.
   1.1. Private fire service mains supplying fire protection systems within the building shall be permitted to extend no more than 10 ft (3.0 m), as measured from the outside of the building, under the building to the riser location.

Visual Inspection

1. Conduct a walkthrough of the installation to confirm:
   1.1. Clear access to control valves.
   1.2. All control valves are in their normal position.
   1.3. Location of all fire hydrants and their respective control valves

Control Valves

1. Identify all control valves.
2. Operate all control valves through their full range and return to normal positions.

Flushing of piping

1. Underground piping, from the water supply to the system riser, and lead-in connections to the system riser, including all hydrants, shall be completely flushed before the connection is made to downstream fire protection system piping.

Hydrostatic Testing

1. All piping and attached appurtenances subjected to system working pressure shall be hydrostatically tested at gauge pressure of 200 psi (14 bar) or 50 psi (3.4 bar) in excess of the system working pressure, whichever is greater, and shall maintain that pressure at gauge pressure of ±5 psi (.3 bar) for 2 hours.
2. Test new piping prior to connecting to existing piping.
3. Obtain documentation for successful hydrostatic testing including confirmation that all piping was included.

Operating Tests

1. Operate each hydrant to be fully opened and closed under system water pressure.
2. Dry barrel hydrants shall be checked for proper drainage.
3. All control valves shall be fully closed and opened under system water pressure to ensure proper operation.
4. Where fire pumps supply the private fire service main, the operating tests shall be completed with the pumps running.

Backflow Prevention Assemblies.

1. Demonstrate satisfactory operation of the backflow prevention assembly.
   1.1. The backflow prevention assembly shall be forward flow tested to ensure proper operation.

Aboveground Pipe and Fittings

1. Confirm that aboveground piping is properly protected from hazards.

Signs

1. All control, drain, and test connection valves shall be provided with signs indicating their purpose.
2. Signs shall be permanently marked and shall be constructed of weather-resistant metal or rigid plastic materials.

Approval of Underground Piping

1. Confirm that the installing contractor:
   1.1. Instructed building management/representative of location of control valves and care and maintenance of new equipment.
   1.2. Provided instructions to building management/representative with documentation
   1.3. Performs all required acceptance tests
   1.4. Completes and signs the NFPA 24 Contractor's Material And Test Certificate(s) shown in NFPA 24 Figure 10.10.1 (see Forms).

Operation and Maintenance Information

1. Location of all control valves
2. System care and maintenance instructions
3. Acceptance testing report

Acceptance Testing Records

1. Summary of equipment installed including all control valves.
2. Confirm that all required acceptance tests are performed.
3. Complete and sign the contractor's material and test certificate shown in NFPA 24 Figure 10.10.1 *[see Forms]*.
4. Identification of the onsite location for acceptance testing records.

Routine inspection, testing, and maintenance.

1. Confirm that records of acceptance testing will be kept for the life of the system.
2. Confirm if tasks will be completed by building or facility maintenance, outside contractor, or a combination.
3. Confirm that inspection, testing, and maintenance documentation will be kept on site and available upon request.
4. Confirm that inspection, testing, and maintenance documentation is required to be retained for a minimum of 3 years.

FORMS

Contractor's Material and Test Certificate for Underground Piping

PROCEDURE

Upon completion of work, inspection and tests shall be made by the contractor's representative and witnessed by an owner's representative. All defects shall be corrected and system left in service before contractor's personnel finally leave the job.

A certificate shall be filled out and signed by both representatives. Copies shall be prepared for approving authorities, owners, and contractor. It is understood the owner's representative's signature in no way prejudices any claim against contractor for faulty material, poor workmanship, or failure to comply with approving authority's requirements or local ordinances.

Property name		Date
Property address		

Plans	Accepted by approving authorities (names)		
	Address		
	Installation conforms to accepted plans	❑ Yes	❑ No
	Equipment used is approved If no, state deviations	❑ Yes	❑ No
Instructions	Has person in charge of fire equipment been instructed as to location of control valves and care and maintenance of this new equipment? If no, explain	❑ Yes	❑ No
	Have copies of appropriate instructions and care and maintenance charts been provided to the owner or owner's representative? If no, explain	❑ Yes	❑ No
Location	Supplies buildings		
Underground pipes and joints	Pipe types and class / Type joint		
	Pipe conforms to _____ standard Fittings conform to _____ standard If no, explain	❑ Yes ❑ Yes	❑ No ❑ No
	Joints needing anchorage clamped, strapped, or blocked in accordance with _____ standard If no, explain	❑ Yes	❑ No
Test description	Flushing: Flow the required rate until water is verified to be clear of debris at outlets such as hydrants and blow-offs. Flush at one of the flow rates as specified in 10.10.2.1.3. Hydrostatic: All piping and attached appurtenances subjected to system working pressure shall be hydrostatically tested at 200 psi (13.8 bar) or 50 psi (3.4 bar) in excess of the system working pressure, whichever is greater, and shall maintain that pressure ±5 psi (0.34 bar) for 2 hours. Hydrostatic Testing Allowance: Where additional water is added to the system to maintain the test pressures required by 10.10.2.2.1, the amount of water shall be measured and shall not exceed the limits of the following equation (for metric equation, see 10.10.2.2.6): $L = \frac{SD\sqrt{P}}{148{,}000}$ L = testing allowance (makeup water), in gallons per hour (lpm) S = length of pipe tested, in feet (m) D = nominal diameter of the pipe, in inches (mm) P = average test pressure during the hydrostatic test, in pounds per square inch (gauge) (bar)		
Flushing tests	New underground piping flushed according to _____ standard by (company) If no, explain	❑ Yes	❑ No
	How flushing flow was obtained: ❑ Public water ❑ Tank or reservoir ❑ Fire pump / Through what type opening: ❑ Hydrant butt ❑ Open pipe		
	Lead-ins flushed according to _____ standard by (company) If no, explain	❑ Yes	❑ No
	How flushing flow was obtained: ❑ Public water ❑ Tank or reservoir ❑ Fire pump / Through what type opening: ❑ Y connection to flange and spigot ❑ Open pipe		

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▲ **FIGURE 10.10.1 Sample of Contractor's Material and Test Certificate for Underground Piping.**

Hydrostatic test	All new underground piping hydrostatically tested at _____ psi (bar) for _____ hours		Joints covered ❑ Yes ❑ No
Leakage test	Total amount of leakage measured _____ gallons (liters) _____ hours		
	Allowable leakage _____ gallons (liters) _____ hours		
Forward flow test of backflow preventer	Forward flow test performed in accordance with 10.10.2.5.2:		❑ Yes ❑ No
Hydrants	Number installed	Type and make	All operate satisfactorily ❑ Yes ❑ No
Control valves	Water control valves left wide open If no, state reason		❑ Yes ❑ No
	Hose threads of fire department connections and hydrants interchangeable with those of fire department answering alarm		❑ Yes ❑ No
Remarks	Date left in service		
Signatures	Name of installing contractor		
	Tests witnessed by		
	For property owner (signed)	Title	Date
	For installing contractor (signed)	Title	Date

Additional explanation and notes

 NFPA 24 (p. 2 of 2)

Δ FIGURE 10.10.1 *Continued*

CHAPTER 4
FIRE PUMPS

Contents

The information in this chapter focuses on electric and diesel driven centrifugal fire pumps. Requirements for steam driven fire pumps, vertical fire pumps, right angle gear fire pumps, and positive displacement pumps must be reviewed independently and should be coordinated with the information below. The information in this chapter also does not address equipment installed outside of the pump unit including pressure regulating and backflow devices.

Approved plans.

1. New installation or modification.
2. No outstanding rider comments from QAD Design Standards.
3. Confirmation that installation has been completed as per approved drawings.
4. Plans (shop drawings) are on site and available to inspection staff.

Piping and Fittings

1. Confirm the type of piping and fittings used.

System Equipment

1. Identify system components including but not limited to:
   a. Pump
      i. Nameplate
         (1) Pumps shall be provided with a nameplate.
         (2) The name plate shall be made of and attached using corrosion resistant material.
   b. Driver
   c. Controller
   d. Pressure gauges
      i. Discharge gauge shall be connected near the discharge casting
      ii. Suction gauge shall be connected to the suction pipe near the pump.
   e. Circulation Relief Valve
      i. The valve shall be installed on the discharge side of the pump before the discharge check valve.
      ii. The valve shall provide sufficient water flow to prevent the pump from overheating when operating with no discharge.
      iii. Provisions shall be made for discharge to a drain.
   f. Ventilation.
      i. Provision shall be made for ventilation of a pump room or pump house.
   g. Emergency Lighting
      i. Pump rooms shall be provided with emergency lighting.
      ii. The emergency lighting shall be capable of maintaining the lighting level for a minimum of 2 hours.
   h. Valves
      i. A listed outside screw and yoke (OS&Y) gate valve shall be installed in the suction pipe.
      ii. Relief Valves for Centrifugal Pumps
         (1) The relief valve shall be located between the pump and the pump discharge check valve and shall be so attached that it can be readily removed for repairs without disturbing the piping.
         (2) Pressure relief valves shall be either a listed springloaded or a pilot-operated diaphragm type.
         (3) The relief valve shall discharge into an open pipe or into a cone or funnel secured to the outlet of the valve.
         (4) Water discharge from the relief valve shall be readily visible or easily detectable by the pump operator.
         (5) A shutoff valve shall not be installed in the relief valve supply or discharge piping.

i. Pressure Maintenance (Jockey or Make-Up) Pumps.
    i. Pressure maintenance pumps shall not be required to be listed. Pressure maintenance pumps shall be approved.
j. Water supply tanks
    i. Where provided, water tanks shall be installed in accordance with NFPA 22.
    ii. Water Supply Tanks for Very Tall Buildings.
        (1) An automatic refill valve shall be provided for each tank or tank compartment.
        (2) A manual refill valve shall be provided for each tank or tank compartment.
k. Any special tools and testing devices required for routine maintenance shall be available for inspection by the authority having jurisdiction at the time of the field acceptance test.

Visual Inspection

1. Conduct a walkthrough of the installation to confirm:
    a. Clear access to fire pump.
        i. Clearance between components for installation and maintenance
        ii. Clearance between a component and the wall for installation and maintenance
        iii. Clearance between energized electrical equipment and other equipment in accordance with NFPA 70
        iv. Orientation of the pump to the suction piping to allow compliance with NFPA 20 4.15.6.3
    b. All control valves are in their normal positions
    c. Fire pump room is fire rated.
        i. High rise buildings – 2 hour fire rated
        ii. Non-high-rise buildings – Fully sprinklered (including the pump room) 1 hour fire rated. Not fully sprinklered – 2 hour fire rated.

Control Valves

1. Identify the make and model of each control valve.
2. Identify how each control valve is supervised.
3. Operate each control valve through its full range and return to normal position.
4. Test the operation of each electronic valve supervision device.

Underground Piping

1. Confirm that the installing contractor:
    a. Instructed building management/representative of location of control valves and care and maintenance of new equipment.
        i. Provided instructions to building management/representative with documentation
        ii. Notifies the Port Authority of the time and date testing is to be performed.
2. Flushing
    a. Confirm that all underground piping is flushed.
        i. Flushing shall be in accordance with NFPA 24.
        ii. Suction piping shall be flushed at a flow rate not less than indicated in NFPA 20 Table 14.1.1.1 or at the hydraulically calculated water demand rate of the system, whichever is greater.
        iii. Flushing shall occur prior to hydrostatic test.
    b. Completes and signs the contractor's material and test certificate(s).

Hydrostatic testing

1. Suction and discharge piping shall be hydrostatically tested at not less than 200 psi (13.8 bar) pressure or at 50 psi (3.4 bar) in excess of the maximum pressure to be maintained in the system, whichever is greater.
2. The pressure required above shall be maintained for 2 hours.
3. Test new piping prior to connecting to existing piping.
4. Obtain documentation for successful hydrostatic testing including confirmation that all piping was included prior to the start of field test acceptance tests.

Pump Room Electrical Wiring

1. All electric wiring to the fire pump motor(s), including control (multiple pumps) interwiring, normal power supply, alternate power supply where provided, and jockey pump, shall be completed and checked by the electrical contractor prior to the initial startup and acceptance test.

Field Acceptance Tests.

1. The pump manufacturer, the engine manufacturer (when supplied), the controller manufacturer, and the transfer switch manufacturer (when supplied) or their factory-authorized representatives shall be present for the field acceptance test. *(See NFPA 20 Section 4.4.)*
   a. In addition, representatives of the installing contractor, insurance company, and owner should be present.
2. Certified Pump Curve.
   a. A copy of the manufacturer's certified pump test curve shall be available for comparison with the results of the field acceptance test.
3. Test Equipment
   a. The test equipment should be furnished by either the authority having jurisdiction, the installing contractor, or the pump manufacturer, depending upon the prevailing arrangements made between the aforementioned parties. The equipment should include, but not necessarily be limited to, the following:
      i. Equipment for Use with Test Valve Header. 50 ft (15 m) lengths of 2 ½ in. (65 mm) lined hose should be provided including Underwriters Laboratories' play pipe nozzles as needed to flow required volume of water. Where test meter is provided, however, these might not be needed.
      ii. Instrumentation. The following test instruments should be of high quality, accurate, and in good repair:
      iii. Clamp-on volt/ammeter
      iv. Test gauges
      v. Tachometer
      vi. Pitot tube with gauge (for use with hose and nozzle)
   b. Calibrated test equipment shall be provided to determine net pump pressures, rate of flow through the pump, volts and amperes, and speed.
   c. Calibrated test gauges, transducers, and other devices used for measurements required in NFPA 20 14.2.6.1.1 during the test shall be used and shall bear a label with the latest date of calibration.
   d. Fixed outlet flow devices shall be inspected for damage, but they shall not require calibration.

Testing Pump Operation

1. Motor-Driven Pump. To start a motor-driven pump, the following steps should be taken in the following order:
   a. See that pump is completely primed.
   b. Close isolating switch and then close circuit breaker.
   c. Automatic controller will start pump if system demand is not satisfied (e.g., pressure low, deluge tripped).
   d. For manual operation, activate switch, pushbutton, or manual start handle. Circuit breaker tripping mechanism should be set so that it will not operate when current in circuit is excessively large.
2. Diesel Engine–Driven Pump.
   a. To start a diesel engine–driven pump, the operator should be familiar beforehand with the operation of this type of equipment. The instruction books issued by the engine and control manufacturer should be studied to this end. The storage batteries should always be maintained in good order to ensure prompt, satisfactory operation of this equipment (i.e., check electrolyte level and specific gravity, inspect cable conditions, corrosion, etc.).
3. Fire Pump Settings. The fire pump system, when started by pressure drop, should be arranged as follows:
   a. The jockey pump stop point should equal the pump churn pressure plus the minimum static supply pressure.
   b. The jockey pump start point should be at least 10 psi (0.68 bar) less than the jockey pump stop point.
   c. The fire pump start point should be 5 psi (0.34 bar) less than the jockey pump start point. Use 10 psi (0.68 bar) increments for each additional pump.
   d. Where minimum run times are provided, the pump will continue to operate after attaining these pressures. The final pressures should not exceed the pressure rating of the system.
   e. Where the operating differential of pressure switches does not permit these settings, the settings should be as close as equipment will permit. The settings should be established by pressures observed on test gauges.

Fire Pump Flow Testing

1. The fire pump shall perform at minimum, rated, and peak loads without objectionable overheating of any component.
2. Vibrations of the fire pump assembly shall not be of a magnitude to pose potential damage to any fire pump component.
3. The minimum, rated, and peak loads of the fire pump shall be determined by controlling the quantity of water discharged through approved test devices.
4. The minimum, rated, and peak loads of the fire pump shall be determined by controlling the quantity of water discharged through approved test devices.
5. Where simultaneous operation of multiple pumps is possible or required as part of a system design, the acceptance test shall include a flow test of all pumps operating simultaneously.
6. Where the suction to the fire pump is from a break tank, the tank refill rate shall be tested and recorded.
   a. The refill device shall be operated a minimum of five times.
7. Measurement Procedure – A sample procedure is as follows:

a. Make a visual check of the unit. If hose and nozzles are used, see that they are securely tied down. See that the hose valves are closed. If a test meter is used, the valve on the discharge side of the meter should be closed.
b. Start the pump.
c. Partially open one or two hose valves, or slightly open the meter discharge valve.
d. Check the general operation of the unit. Watch for vibration, leaks (oil or water), unusual noises, and general operation. Adjust packing glands.
e. Measure water discharge.
    i. Where a test valve header is used, regulate the discharge by means of the hose valves and a selection of the nozzle tips.
    ii. Where a test meter is used, regulate the discharge valve to achieve various flow readings.
    iii. Important test points are at 150 percent rated capacity, rated capacity, and shutoff. Intermediate points can be taken if desired to help develop the performance curve.
f. Record the following data at each test point *[see Forms – Figure A.14.2.6.6(a)]*:
    i. Pump rpm
    ii. Suction pressure
    iii. Discharge pressure
    iv. Number and size of hose nozzles, pitot pressure for each nozzle, and total gpm (L/min); for test meter, simply a record of gpm (L/min)
    v. Amperes (each phase for electric motor–driven pump)
    vi. Volts (phase to phase for electric motor–driven pump)
    vii. Engine back pressure (for diesel engine drive pump)
    viii. Oil pressure (for diesel engine drive pump)
    ix. Cooling loop water pressure (for diesel engine drive pump)
    x. Engine temperature (for diesel engine drive pump)
g. Evaluate test results

Loads Start Test

1. The fire pump unit shall be started and brought up to rated speed without interruption under the conditions of a discharge equal to peak load.

Signs

1. Identification signs shall be provided at each valve to indicate the valve's function and the part of the system the valve controls.
2. Signs shall be permanently marked and shall be constructed of weather-resistant metal or rigid plastic materials.

Controller Acceptance Test for Electric and Diesel Driven Units.

1. Fire pump controllers shall be tested in accordance with the manufacturer's recommended test procedure.
2. As a minimum, no fewer than six automatic and six manual operations shall be performed during the acceptance test.
    a. An electric-driven fire pump shall be operated for a period of at least 5 minutes at full speed during each of the operations required in NFPA 20 14.2.7.2.

   b. An engine driver shall not be required to run for 5 minutes at full speed between successive starts until the cumulative cranking time of successive starts reaches 45 seconds.
3. The fire pump or foam concentrate pump shall be in operation for not less than 1 hour total time during all of the foregoing tests.
   a. It is not the intent to discharge water for the full 1-hour test duration, provided all flow tests can be conducted in less time and efforts are taken to prevent the pump from overheating.
4. The fire pump shall be started once from each power service and run for a minimum of 5 minutes.

   CAUTION: Manual emergency operation shall be accomplished by manual actuation of the emergency handle to the fully latched position in a continuous motion. The handle shall be latched for the duration of this test run.
5. At least half of the manual and automatic operations shall be performed with the fire pump connected to the alternate source.
6. The automatic operation sequence of the controller shall start the pump from all provided starting features.
   a. This sequence shall include pressure switches or remote starting signals.

Engine-Driven Units.

1. Tests of engine-driven controllers shall be divided between both sets of batteries.
2. The governor of such units shall be set at the time of the test to properly regulate the engine speed at rated pump speed. *[See NFPA 20 11.2.4.1. (a, b, and c below)]*
   a. Engines shall be provided with a governor capable of regulating engine speed within a range of 10 percent between shutoff and maximum load condition of the pump.
   b. The governor shall be field adjustable and set and secured to maintain rated pump speed at maximum pump load.
   c. Engines shall accelerate to rated output speed within 20 seconds.

Electric Motor–Driven Units.

1. For electric motors operating at rated voltage and frequency, the ampere demand on each phase shall not exceed the product of the full-load ampere rating times the allowable service factor as stamped on the motor nameplate.
2. Phase Reversal Test.
   a. For electric motors, a test shall be performed to ensure that there is not a phase reversal condition in either the normal power supply configuration or from the alternate power supply (where provided).
      i. A simulated test of the phase reversal device is an acceptable test method.

Alternate Power Supply.

1. On installations with an alternate source of power and an automatic transfer switch, loss of primary source shall be simulated and transfer shall occur while the pump is operating at peak load.
2. Transfer from normal to alternate source and retransfer from alternate to normal source shall not cause opening of overcurrent protection devices in either line.

Fire Pump Alarm and Signal Devices Remote from Controller

1. Pump or Motor Running.
   a. The signal shall actuate whenever the controller has operated into a motor-running condition.
2. Loss of Phase.
   a. The fire pump alarm shall actuate whenever any phase at the line terminals of the motor contactor is lost.
   b. All phases shall be monitored. Such monitoring shall detect loss of phase whether the motor is running or at rest.
3. Phase Reversal.
   a. This fire pump alarm circuit shall be energized by a separate reliable supervised power source or from the pump motor power, reduced to not more than 125 V. *[See NFPA 20 10.4.6.2.]*
   b. The fire pump alarm shall actuate whenever the three-phase power at the line terminals of the motor contactor is reversed.

Acceptance Testing Records

1. Summary of equipment installed.
2. Other documentation from A/EOR confirming that all work has been completed.
3. One set of record drawings shall be provided to the building owner.
4. One copy of the completed test report shall be provided to the building owner.
   a. Completed Contractor's Material and Test Certificate for Private Fire Service Mains Feeding Fire Pump(s) *[see Forms]*.
   b. Completed Contractor's Material and Test Certificate for Fire Pump Systems *[see Forms]*.
   c. Fire pump initial acceptance report. A sample report for centrifugal fire pumps is provided in the Forms section of this chapter. The information in the sample report will be the benchmark used to determine acceptance from different report formats.
5. Identification of the onsite location for acceptance testing records.

Operations and Maintenance Information

1. One set of instruction manuals for all major components of the fire pump system shall be supplied by the manufacturer of each major component.
   a. The manual shall contain the following:
      i. A detailed explanation of the operation of the component
      ii. Instructions for routine maintenance
      iii. Detailed instructions concerning repairs
      iv. Parts list and parts identification
      v. Schematic electrical drawings of controller, transfer switch, and fire pump control panels
      vi. List of recommended spare parts and lubricants
2. Any special tools and testing devices required for routine maintenance shall be available for inspection by the authority having jurisdiction at the time of the field acceptance test.

Routine Inspection, Testing, and Maintenance.

1. Fire pumps shall be inspected, tested, and maintained in accordance with NFPA 25
    a. See Chapter 4 of the Port Authority Manual “Inspection, Testing, and Maintenance Requirements for Fire Protection and Life Safety Systems”.
2. Confirm that records of acceptance testing will be kept on site and for the life of the building.
3. Confirm if tasks will be completed by building or facility maintenance, outside contractor, or a combination.
4. Confirm that inspection, testing, and maintenance documentation will be kept on site and available upon request.
5. Confirm that inspection, testing, and maintenance documentation is required to be retained for a minimum of 3 years.

FORMS

Contractor's Material and Test Certificate for Fire Pump Systems

PROCEDURE Upon completion of work, inspection and tests shall be made by the contractor's representative and witnessed by an owner's representative. All defects shall be corrected and system left in service before contractor's personnel finally leave the job.

A certificate shall be filled out and signed by both representatives. Copies shall be prepared for approving authorities, owners, and contractor. It is understood the owner's representative's signature in no way prejudices any claim against contractor for faulty material, poor workmanship, or failure to comply with approving authority's requirements or local ordinances.

PROPERTY NAME		DATE	
PROPERTY ADDRESS			
PLANS	ACCEPTED BY APPROVING AUTHORITIES (NAMES)		
	ADDRESS		
	INSTALLATION CONFORMS TO ACCEPTED PLANS	☐ YES	☐ NO
	ALL EQUIPMENT USED IS APPROVED FOR FIRE SYSTEM SERVICE IF NO, STATE DEVIATIONS	☐ YES	☐ NO
INSTRUCTIONS	HAS PERSON IN CHARGE OF FIRE PUMP EQUIPMENT BEEN INSTRUCTED AS TO LOCATION OF SYSTEM CONTROL VALVES AND CARE AND MAINTENANCE OF THIS NEW EQUIPMENT? IF NO, EXPLAIN	☐ YES	☐ NO
	HAVE COPIES OF APPROPRIATE INSTRUCTIONS AND CARE AND MAINTENANCE CHARTS BEEN LEFT ON PREMISES? IF NO, EXPLAIN	☐ YES	☐ NO
LOCATION	SUPPLIES BUILDING(S) (CAMPUS, WAREHOUSE, HIGH RISE) EXPLAIN		
PUMP ROOM EQUIPMENT	IS THE PUMP ROOM EQUIPMENT PER THE PLANS AND SPECS?	☐ YES	☐ NO
	IS THE FIRE PUMP PROPERLY MOUNTED AND ANCHORED TO THE FOUNDATION? IF NO, EXPLAIN	☐ YES	☐ NO
	IS THE FIRE PUMP BASE PROPERLY GROUTED? IF NO, EXPLAIN	☐ YES	☐ NO
	DOES THE PUMP ROOM HAVE THE PROPER FLOOR DRAINS? IF NO, EXPLAIN	☐ YES	☐ NO
	IS THE SUCTION AND DISCHARGE PIPING PROPERLY SUPPORTED?	☐ YES	☐ NO
	IS THE PUMP ROOM HEATED AND VENTILATED PER NFPA 20?	☐ YES	☐ NO
PIPES AND FITTINGS	PIPE TYPES AND CLASS		
	PIPE CONFORMS TO _____ STANDARD FITTINGS CONFORM TO _____ STANDARD IF NO, EXPLAIN	☐ YES ☐ YES	☐ NO ☐ NO
	SUCTION AND DISCHARGE PIPING ANCHORED OR RESTRAINED?:	☐ YES	☐ NO
PRE-PACKAGED PUMP HOUSE	IS THIS A PACKAGE OR SKID MOUNTED PUMP?	☐ YES	☐ NO
	IS THE PACKAGE/SKID PROPERLY ANCHORED TO A CONCRETE FOUNDATION? IF NO, EXPLAIN	☐ YES	☐ NO
	IS THE STRUCTURAL FOUNDATION FRAME FILLED WITH CONCRETE TO FORM A FINISHED FLOOR?	☐ YES	☐ NO
	IS THERE A FLOOR DRAIN INSTALLED?	☐ YES	☐ NO
TEST DESCRIPTION	HYDROSTATIC: Hydrostatic tests shall be made at not less than 200 psi (13.8 bar) for 2 hours or 50 psi (3.4 bar) above static pressure in excess of 200 psi (13.8 bar) for 2 hours.		
	HYDROSTATIC TEST: ALL NEW PIPING HYDROSTATICALLY TESTED AT: _____ PSI/BAR FOR _____ HOURS	NO LEAKAGE ALLOWED	
FLUSHING TESTS	FLUSHING: Flow the required rate until water is clear as indicated by no collection of foreign material in burlap bags at outlets such as hydrants and blowoffs. Flush at flows not less than 390 gpm (1476 L/min) for 4 in. pipe, 610 gpm (2309 L/min) for 5 in. pipe, 880 gpm (3331 L/min) for 6 in. pipe, 1560 gpm (5905 L/min) for 8 in. pipe, 2440 gpm (9235 L/min) for 10 in. pipe, and 3520 gpm (13,323 L/min) for 12 in. pipe. When supply cannot produce stipulated flow rates, obtain maximum available.		

 (NFPA 20, 1 of 2)

Δ **FIGURE A.14.1.3(a)** **Sample of Contractor's Material Test Certificate for Fire Pump Systems.**

FLUSHING TESTS *(continued)*	NEW PIPING FLUSHED ACCORDING TO _____ STANDARD ☐ YES ☐ NO BY (COMPANY) _____ IF NO, EXPLAIN	
	HOW FLUSHING FLOW WAS OBTAINED ☐ PUBLIC WATER ☐ TANK OR RESERVOIR ☐ OTHER (EXPLAIN)	THROUGH WHAT TYPE OPENING ☐ TEST HEADER ☐ OPEN PIPE
	LEAD-INS FLUSHED ACCORDING TO _____ STANDARD ☐ YES ☐ NO BY (COMPANY) IF NO, EXPLAIN	
	HOW FLUSHING FLOW WAS OBTAINED ☐ PUBLIC WATER ☐ TANK OR RESERVOIR ☐ OTHER (EXPLAIN)	THROUGH WHAT TYPE OPENING ☐ Y CONNECTION TO FLANGE & SPIGOT ☐ OPEN PIPE
FIELD ACCEPTANCE TEST	ALL EQUIPMENT APPROVED? ☐ YES ☐ NO	
	ALL REQUIRED REPRESENTATIVES PRESENT FOR TEST ☐ YES ☐ NO	
	AHJ AND OWNER'S REPRESENTATIVE PRESENT FOR TEST ☐ YES ☐ NO IF NO, EXPLAIN	
	ALL ELECTRICAL WIRING COMPLETE AND PER *NFPA 70* AND NFPA 20 ☐ YES ☐ NO IF NO, EXPLAIN	
	CALIBRATE TEST EQUIPMENT USED ☐ YES ☐ NO CALIBRATION DATE _____	
	FLOW TESTS PUMP DESIGN _____ GPM _____ PSI DOES THE PUMP MEET OR EXCEED THE CERTIFIED CURVE? ☐ YES ☐ NO PUMP TYPE ☐ HORIZONTAL ☐ VERTICAL TURBINE ☐ OTHER PUMP MAKE _____ MODEL # _____ SERIAL # _____ COMMENTS _____	
	ELECTRIC DRIVER OPERATIONAL TEST SATISFACTORY ☐ YES ☐ NO ELEC. DRIVER _____ MODEL # _____ SERIAL # _____ VOLTAGE _____ VAC @ _____ HP _____ RPM _____ FLA	
	ENGINE DRIVEN ☐ YES ☐ NO ENGINE MAKE _____ MODEL # _____ SERIAL # _____ _____ HP _____ RPM SPEED DIESEL DRIVER OPERATIONAL TEST SATISFACTORY? ☐ YES ☐ NO OTHER EXPLAIN	
	CONTROLLER MAKE _____ MODEL # _____ SERIAL # _____ VARIABLE SPEED PRESSURE LIMITING CONTROL ☐ YES ☐ NO TESTED AT MINIMUM, RATED, AND PEAK FLOW ☐ YES ☐ NO CONTROLLER TEST: SIX AUTO STARTS ☐ YES ☐ NO SIX MANUAL STARTS ☐ YES ☐ NO PHASE REVERSAL TEST PERFORMED (ELECTRIC ONLY) ☐ YES ☐ NO ALTERNATE POWER SOURCE TESTED (ELECTRIC ONLY) ☐ YES ☐ NO ELECTRONIC FUEL MANAGEMENT (ECM) FUNCTION TEST PERFORMED (DIESEL ONLY) ☐ YES ☐ NO	
CONTROL VALVES	SYSTEM CONTROL VALVES LEFT WIDE OPEN ☐ YES ☐ NO IF NO, STATE REASON	
	HOSE THREADS OF FIRE DEPARTMENT CONNECTIONS AND HYDRANTS ☐ YES ☐ NO INTERCHANGEABLE WITH THOSE OF FIRE DEPARTMENT ANSWERING ALARM	
REMARKS	DATE LEFT IN SERVICE _____ ADDITIONAL COMMENTS:	
SIGNATURES	NAME OF INSTALLING CONTRACTOR	
	TESTS WITNESSED BY FOR PROPERTY OWNER (SIGNED) TITLE DATE	
	FOR INSTALLING CONTRACTOR (SIGNED) TITLE DATE	
ADDITIONAL COMMENTS AND NOTES:		

 (NFPA 20, 2 of 2)

FIGURE A.14.1.3(a) *Continued*

Contractor's Material and Test Certificate for Private Fire Service Mains Feeding Fire Pump(s)

PROCEDURE Upon completion of work, inspection and tests shall be made by the contractor's representative and witnessed by an owner's representative. All defects shall be corrected and system left in service before contractor's personnel finally leave the job.

A certificate shall be filled out and signed by both representatives. Copies shall be prepared for approving authorities, owners, and contractor. It is understood the owner's representative's signature in no way prejudices any claim against contractor for faulty material, poor workmanship, or failure to comply with approving authority's requirements or local ordinances.

PROPERTY NAME		DATE
PROPERTY ADDRESS		
PLANS	ACCEPTED BY APPROVING AUTHORITIES (NAMES)	
	ADDRESS	
	INSTALLATION CONFORMS TO ACCEPTED PLANS	☐ YES ☐ NO
	EQUIPMENT USED IS APPROVED IF NO, STATE DEVIATIONS	☐ YES ☐ NO
INSTRUCTIONS	HAS PERSON IN CHARGE OF FIRE EQUIPMENT BEEN INSTRUCTED AS TO LOCATION OF CONTROL VALVES AND CARE AND MAINTENANCE OF THIS NEW EQUIPMENT? IF NO, EXPLAIN	☐ YES ☐ NO
	HAVE COPIES OF APPROPRIATE INSTRUCTIONS AND CARE AND MAINTENANCE CHARTS BEEN LEFT ON PREMISES? IF NO, EXPLAIN	☐ YES ☐ NO
LOCATION	SUPPLIES BUILDINGS	
PIPES AND JOINTS	PIPE TYPES AND CLASS	TYPE JOINT
	PIPE CONFORMS TO _____ STANDARD FITTINGS CONFORM TO _____ STANDARD IF NO, EXPLAIN	☐ YES ☐ NO ☐ YES ☐ NO
	BURIED JOINTS NEEDING ANCHORAGE CLAMPED, STRAPPED, OR BLOCKED IN ACCORDANCE WITH _____ STANDARD IF NO, EXPLAIN	☐ YES ☐ NO
TEST DESCRIPTION	FLUSHING: Flow the required rate until water is clear as indicated by no collection of foreign material in burlap bags at outlets such as hydrants and blowoffs. Flush at flow not less than 37 gpm for 1 in. pipe (140 L/min for 25 mm pipe), 85 gpm for 1½ in. pipe (330 L/min for 38 mm pipe), 150 gpm for 2 in. pipe (570 L/min for 50 mm pipe), 229 gpm for 2½ in. pipe (870 L/min for 65 mm pipe), 330 gpm for 3 in. pipe (1250 L/min for 75 mm pipe), 450 gpm for 3½ in. pipe (1710 L/min for 85 mm pipe), 590 gpm for 4 in. pipe (2240 L/min for 100 mm pipe), 920 gpm for 5 in. pipe (3490 L/min for 125 mm pipe), 1360 gpm for 6 in. pipe (5150 L/min for 150 mm pipe), 2350 gpm for 8 in. pipe (8900 L/min for 200 mm pipe), 3670 gpm for 10 in. pipe (13,900 L/min for 250 mm pipe), 5290 gpm for 12 in. pipe (20,100 L/min for 300 mm pipe), 7200 gpm for 14 in. pipe (27,300 L/min for 350 mm pipe), and 9400 gpm for 16 in. pipe (35,600 L/min for 400 mm pipe). When supply cannot produce stipulated flow rates, comply with 14.1.1.3. HYDROSTATIC: Hydrostatic tests shall be made at not less than 200 psi (13.8 bar) for 2 hours or 50 psi (3.4 bar) above static pressure in excess of 150 psi (10.3 bar) for 2 hours. LEAKAGE: New pipe laid with rubber gasketed joints shall, if the workmanship is satisfactory, have little or no leakage at the joints. The amount of leakage at the joints shall not exceed 2 qt/hr (1.89 L/hr) per 100 joints irrespective of pipe diameter. The amount of allowable leakage specified above can be increased by 1 fl oz per inch valve diameter per hour (30 mL/25 mm/hr) for each metal seated valve isolating the test section. If dry barrel hydrants are tested with the main valve open, so the hydrants are under pressure, an additional 5 oz per minute (150 mL/min) leakage is permitted for each hydrant.	

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Δ FIGURE A.14.1.3(b) Sample of Contractor's Material and Test Certificate for Private Fire Service Mains Feeding Fire Pump(s).

FLUSHING TESTS	NEW PIPING FLUSHED ACCORDING TO _____ STANDARD ☐ YES ☐ NO BY (COMPANY) IF NO, EXPLAIN	
	HOW FLUSHING FLOW WAS OBTAINED PUBLIC WATER ☐ TANK OR RESERVOIR ☐ FIRE PUMP	THROUGH WHAT TYPE OPENING ☐ HYDRANT BUTT ☐ OPEN PIPE
	LEAD-INS FLUSHED ACCORDING TO _____ STANDARD ☐ YES ☐ NO BY (COMPANY) IF NO, EXPLAIN	
	HOW FLUSHING FLOW WAS OBTAINED PUBLIC WATER ☐ TANK OR RESERVOIR ☐ FIRE PUMP	THROUGH WHAT TYPE OPENING ☐ Y CONNECTION TO FLANGE & SPIGOT ☐ OPEN PIPE
HYDROSTATIC TEST	ALL NEW PIPING HYDROSTATICALLY TESTED AT _____ PSI FOR _____ HOURS	BURIED JOINTS COVERED ☐ YES ☐ NO
LEAKAGE TEST	TOTAL AMOUNT OF LEAKAGE MEASURED _____ GALLONS _____ HOURS	NO LEAKAGE ALLOWED FOR VISIBLE JOINTS
	ALLOWABLE LEAKAGE (BURIED) _____ GALLONS _____ HOURS	NO LEAKAGE ALLOWED FOR VISIBLE JOINTS
HYDRANTS	NUMBER INSTALLED / TYPE AND MAKE	ALL OPERATE SATISFACTORILY ☐ YES ☐ NO
CONTROL VALVES	WATER CONTROL VALVES LEFT WIDE OPEN ☐ YES ☐ NO IF NO, STATE REASON	
	HOSE THREADS OF FIRE DEPARTMENT CONNECTIONS AND HYDRANTS INTERCHANGEABLE WITH THOSE OF FIRE DEPARTMENT ANSWERING ALARM ☐ YES ☐ NO	
REMARKS	DATE LEFT IN SERVICE _____ ADDITIONAL COMMENTS: _____	
SIGNATURES	NAME OF INSTALLING CONTRACTOR	
	TESTS WITNESSED BY	
	FOR PROPERTY OWNER (SIGNED) / TITLE / DATE	
	FOR INSTALLING CONTRACTOR (SIGNED) / TITLE / DATE	
ADDITIONAL EXPLANATION AND NOTES		

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△ FIGURE A.14.1.3(b) *Continued*

Sample Centrifugal Fire Pump Acceptance Test Form

Information on this form covers the minimum requirements of NFPA 20 for performing acceptance tests on centrifugal fire pumps with electric motor or diesel engine drivers. A separate form is required for each pump operating simultaneously. This form does not cover periodic inspection, testing, and maintenance required by NFPA 25.

Owner: _____
Owner's address: _____
_____
Pump location: _____
Property address: _____
_____
Date of test: _____
Maximum demand(s) of fire protection system(s) _____ gpm at _____ psi for _____ minutes at fire pump discharge.
System demand information supplied by: _____
Pump type: Horizontal ❑ Vertical ❑ Inline ❑ Other (specify) _____
Manufacturer: _____ Model or type: _____ Shop/Serial number _____
Pump rated for _____ gpm at _____ psi at _____ RPM, net discharge pressure _____ psi at 150% _____ psi at churn
Pump suction size _____ in., discharge size _____ in., suction from _____
If suction from tank, tank diameter _____ ft, height _____ ft, net capacity _____ gpm
Driver: _____ Electric motor _____ Diesel engine _____ Steam turbine
Manufacturer: _____ Shop/Serial number: _____ Model or type: _____
Rated horsepower: _____ Rated speed: _____ If electric motor, rated voltage _____ Operating voltage _____
Rated amps _____ Phase cycles _____ Service factor _____
Controller manufacturer: _____
Shop/Serial number: _____ Model or type: _____
Controller rated _____ HP _____ VAC
Does controller rated HP & VAC match motor? ..... ❑ Yes ❑ No
Transfer switch? ..... ❑ Yes ❑ No
Transfer switch rated _____ HP _____ VAC
Does controller rate HP & VAC match motor? ..... ❑ Yes ❑ No ❑ N/A
Pressure maintenance (jockey) pump on system? ❑ Yes ❑ No ❑ Manual ❑ Automatic
Manufacturer: _____ Shop/Serial number: _____
Model or type: _____ ❑ Centrifugal or ❑ Positive displacement?
Pressure relief valve provided on jockey pump discharge? ❑ Yes ❑ No ❑ N/A
Jockey pump rated for _____ gpm at _____ psi at _____ RPM _____ HP
Jockey pump suction size _____ in., discharge size _____ in.
Jockey pump controller manufacturer: _____
Shop/Serial number: _____ Model or type: _____
Jockey pump controller rated _____ HP _____ VAC
Does jockey pump controller rated HP & VAC match motor? ..... ❑ Yes ❑ No

Note: All blanks are to be filled in. All questions are to be answered Yes, No, or Not Applicable. All "No" answers are to be explained in the comments portion of this form.

I. Flush Test *(Table 14.1.1.1 — Conduct before hydrostatic test)*

A. Suction supply from ground level storage tank or reservoir ..... ❑ Yes ❑ N/A
B. Suction piping was flushed at _____ gpm? (See Table 14.1.1.1) ..... ❑ Yes ❑ No ❑ N/A
C. Was pipe from tank discharge to pump suction visually inspected? ..... ❑ Yes ❑ No ❑ N/A
D. Copy of Contractor's Material and Test Certificate for Underground Piping attached? [See Figures A.14.1.3(b) and A.14.1.3(c)] ..... ❑ Yes ❑ No ❑ N/A

II. Hydrostatic Test (14.1.2)

A. Maximum pump discharge pressure at rated speed and nonflow (churn) condition _____ psi
B. Piping tested at _____ psi for 2 hours? ..... ❑ Yes ❑ No ❑ N/A
C. Piping passed test? ..... ❑ Yes ❑ No ❑ N/A
D. Copy of Contractor's Material and Test Certificate for Fire Pump Systems attached? [See Figures A.14.1.3(a) and A.14.1.3(b)] ..... ❑ Yes ❑ No ❑ N/A

III. People Present (14.2.1)

Were the following present to witness the test:

A. Pump manufacturer/representative? ..... ❑ Yes ❑ No
B. Engine manufacturer/representative? ..... ❑ Yes ❑ No ❑ N/A
C. Controller manufacturer/representative? ..... ❑ Yes ❑ No
D. Transfer switch manufacturer/representative? ..... ❑ Yes ❑ No ❑ N/A
E. Authority having jurisdiction/representative? ..... ❑ Yes ❑ No
F. Owner or owner's representative? ..... ❑ Yes ❑ No

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Δ FIGURE A.14.2.6.6(a) Centrifugal Fire Pump Acceptance Test Form.

IV. Electric Wiring

A. Was all electric wiring including control interwiring for multiple pumps alternate power supply and the jockey pump completed and checked by the electrical contractor prior to the initial start-up and acceptance test? .....❑ Yes ❑ No ❑ N/A

V. Flow Test

A. Is a copy of the manufacturer's certified pump test curve attached? ..... ❑ Yes ❑ No
B. Test results compared to the manufacturer's certified pump test curve? .....❑ Yes ❑ No
C. Gauges and other test equipment calibrated? .....❑ Yes ❑ No
D. No vibrations that could potentially damage any fire pump component? .....❑ Yes ❑ No ❑ N/A
E. The fire pump performed at all conditions without objectionable overheating of any component? ...❑ Yes ❑ No ❑ N/A
F. For each test, record the required information for each load condition using the following formulas (or other acceptable methods) and tables:

$$P_{Net} = P_{Discharge} - P_{Suction}$$
$$Q = 29.83\ cd^2P^{0.5}$$
$$Pv = 0.43352V^2/(2g) = (Q^2)/(890.47D^4)$$

Where

P_{Net} = Net pump pressure (psi)
$P_{Discharge}$ = Total pressure at the pump discharge (psi)
$P_{Suction}$ = Total pressure at the pump suction (psi)
Q = Flow through a circular orifice (gpm)
c = Nozzle discharge coefficient
d = Nozzle orifice diameter (in.)
P = Pressure measured on gauge (pitot)
Pv = Velocity pressure (psi)
V = Velocity of liquid (ft/sec)
g = Gravitational constant (32.174 ft/sec)
D = Internal pipe diameter (in.)

Test	Pump speed (rpm)	Suction pressure (psi)	Discharge pressure (psi)	Nozzle size (in.)_____ Nozzle coef. _____ Pitot readings (psi) 1	2	3	4	5	6	Flow (gpm)	Net pressure (psi)	Rpm adjusted net pressure	Rpm adjusted flow (psi)	Suction velocity pressure (psi)[1]	Discharge velocity pressure (psi)[1]	Velocity adjusted pressure (psi)[1]	Oil pressure (psi)[2]	Exhaust back pressure (in. Hg)[2]	Diesel water temperature[2]	Cooling loop pressure (psi)[2]
0%																				
25%																				
50%																				
75%																				
100%																				
125%																				
150%																				
0%																				
100%																				
150%																				

Pump is ❑ Constant speed ❑ Variable speed

Notes:
[1]Velocity pressure adjustments provide a more accurate analysis in most cases and as a minimum should be included whenever the pump suction and discharge diameters are different and the pump fails by a narrow margin. The actual internal diameter of the pump suction and discharge should be obtained from the manufacturer.
[2]These readings are applicable to diesel engine pumps only. Recording these readings is not specifically required in Chapter 14.

For electric motor–driven pumps also record:

Test	Voltage			Amperes		
	L1-L2	L2-L3	L1-L3	L1	L2	L3
0%						
25%						
50%						
75%						
100%						
125%						
150%						
0%						
100%						
150%						

G. For electric motors operating at rated voltage and frequency, is the ampere demand less than or equal to the product of the full load ampere rating times the allowable service factor as stamped on the motor name plate? .....❑ Yes ❑ No ❑ N/A

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△ FIGURE A.14.2.6.6(a) *Continued*

H. For electric motors operating under varying voltage:
   1. Was the product of the actual voltage and current demand less than or equal to the product of the rated full load current times the rated voltage times the allowable service factor? ❑ Yes ❑ No ❑ N/A
   2. Was the voltage always less than 5% above the rated voltage during the test? ❑ Yes ❑ No ❑ N/A
   3. Was the voltage always less than 10% above the rated voltage during the test? ❑ Yes ❑ No ❑ N/A

I. Did engine-driven units operate without any signs of overload or stress? ❑ Yes ❑ No ❑ N/A
J. Was the engine overspeed emergency shutdown tested? ❑ Yes ❑ No ❑ N/A
K. Was the governor set to properly regulate the engine speed at rated pump speed? ❑ Yes ❑ No ❑ N/A
L. Did the gear drive assembly operate without excessive objectionable noise, vibration, or heating? ❑ Yes ❑ No ❑ N/A
M. Was the fire pump unit started and brought up to rated speed without interruption under the conditions of a discharge equal to peak load? ❑ Yes ❑ No ❑ N/A
N. Did the fire pump performance equal the manufacturer's factory curve within the accuracy limits of the test equipment? ❑ Yes ❑ No ❑ N/A
O. Did the electric motor pumps pass phase reversal test on normal and alternate (if provided) power? ❑ Yes ❑ No ❑ N/A

VI. Multiple Pump Operation

A. _____ fire pumps are required to operate ❑ in series ❑ in parallel ❑ N/A to meet the maximum fire protection demand.

B. Record the following information for each of the _____ pumps operating simultaneously.

Test	Pump speed (rpm)	Suction pressure (psi)	Discharge pressure (psi)	Nozzle size (in.)_____ Nozzle coef. _____ Pitot readings (psi) 1	2	3	4	5	6	7	8	9	10	11	12	Net pressure (psi)	Total flow (gpm)	Flow through this pump (gpm)	Rpm adjusted net pressure	RPM adjusted flow (psi)	Suction velocity pressure (psi)	Suction velocity pressure (psi)	Velocity adjusted net pressure (psi)
0%																							
25%																							
50%																							
75%																							
100%																							
125%																							
150%																							
0%																							
100%																							
150%																							
Pump is ❑ Constant speed ❑ Variable speed																							

C. Did the fire pump performance equal the manufacturer's factory curve within the accuracy limits of the test equipment during the multiple test? ❑ Yes ❑ No ❑ N/A

VII. Main Pressure Relief Valve

A. Is a main pressure relief valve installed on the fire pump discharge? ❑ Yes ❑ No
B. During variable speed performance testing, what was the flow rate through the main pressure relief valve at churn? ❑ No flow ❑ Weeping flow ❑ More than weeping flow ❑ Substantial flow ❑ N/A
C. During variable speed performance testing, what was the flow rate through the main pressure relief valve at rated flow? ❑ No flow ❑ Weeping flow ❑ More than weeping flow ❑ Substantial flow ❑ N/A
D. During constant speed performance testing, what was the flow rate through the main pressure relief valve at churn? ❑ No flow ❑ Weeping flow ❑ More than weeping flow ❑ Substantial flow ❑ N/A
E. During constant speed performance testing, what was the flow rate through the main pressure relief valve at rated flow? ❑ No flow ❑ Weeping flow ❑ More than weeping flow ❑ Substantial flow ❑ N/A
F. After resetting the pressure relief valve after performance testing, under variable speed operation, what was the flow rate through the main pressure relief valve at churn? ❑ No flow ❑ Weeping flow ❑ More than weeping flow ❑ Substantial flow ❑ N/A
G. After resetting the pressure relief valve after performance testing, under constant speed operation, what was the flow rate through the main pressure relief valve at churn? ❑ No flow ❑ Weeping flow ❑ More than weeping flow ❑ Substantial flow ❑ N/A
What was the fire pump discharge pressure?_____psi.
H. After resetting the pressure relief valve after performance testing, under constant speed operation, at what flow rate did the pressure relief valve substantially close?_____ gpm. What was the fire pump discharge pressure when the pressure relief valve was substantially closed? _____ psi.
I. Is the maximum discharge pressure adjusted for elevation, and with the pressure relief operational, less than the pressure rating of the system components for elevation? ❑ Yes ❑ No ❑ N/A

VIII. Controller Test

A. Did the pump start at least 6 times from automatic sources? ❑ Yes ❑ No ❑ N/A
B. Was each automatic starting feature tested at least once? ❑ Yes ❑ No ❑ N/A
C. Did the pump start at least 6 times manually? ❑ Yes ❑ No ❑ N/A
D. Was the pump run for at least 5 minutes during each of the operations in Parts A, B, and C above? ❑ Yes ❑ No ❑ N/A
(Note: An engine driver is not required to run for 5 minutes at full speed between successive starts until the cumulative cranking time of successive starts reaches 45 seconds.)
E. Were the starting operations divided between both sets of batteries for engine-driven controllers? ❑ Yes ❑ No ❑ N/A

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△ **FIGURE A.14.2.6.6(a)** *Continued*

F. Were both ECMs tested if supported? ..... ❑ Yes ❑ No ❑ N/A
G. Was the engine tested and rpm set on both ECMs at rated flow and full load? ..... ❑ Yes ❑ No ❑ N/A
H. Were all alarm functions including ECM alarms for fuel injection failure, low fuel pressure, and any primary sensor failure tested at the engine? ..... ❑ Yes ❑ No ❑ N/A
I. Electric Driven Pump Controllers
1. Were all overcurrent protective devices (including the controller circuit breaker) selected, sized, and set in accordance with NFPA 20?..... ❑ Yes ❑ No ❑ N/A
2. Was the fire pump started at least once from each power service and run for at least 5 minutes? ..... ❑ Yes ❑ No ❑ N/A
3. Upon simulation of a power failure, while the pump is operating at peak load, did the transfer switch transfer from the normal to the emergency source without opening overcurrent protection devices on either line? ..... ❑ Yes ❑ No ❑ N/A
4. When normal power was restored, did retransfer from emergency to normal power occur without overcurrent protection devices opening on either line? ..... ❑ Yes ❑ No ❑ N/A
5. Were at least half of the automatic and manual starts required by Parts A and C performed with the pump connected to the alternate source? ..... ❑ Yes ❑ No ❑ N/A
J. Were all signal conditions simulated demonstrating satisfactory operation? ..... ❑ Yes ❑ No ❑ N/A
K. Did the pump run for at least 1 hour during the tests? ..... ❑ Yes ❑ No ❑ N/A
NOTE: Run time includes all time the driver was turning the impeller — i.e., no-flow and flow conditions.

IX. Water Storage Tank ❑ Yes ❑ No

A. Tank capacity_____ gallons, height _____ ft, diameter _____ ft
B. Break tank ❑ Yes ❑ No ❑ N/A Required break tank fill rate _____ gpm ❑ N/A
C. Did refill rate maintain tank level when flowing 150% of rated capacity? ❑ Yes ❑ No ❑ N/A
D. A water refill rate of ____ gpm was: ❑ field verified by flowing ____ gpm through the fire pump with a starting water level of ____ ft ____ in. and an ending water level of ____ ft ____ in. after flowing for ____ minutes, ❑ field verified by raising the water level from ____ ft ____ in. to ____ ft ____ in. in ____ minutes, ❑ field verified by other means (specify) _____
E. Was the automatic refill assembly operated a minimum of 5 times? ..... ❑ Yes ❑ No ❑ N/A

X. Test Evaluation

A. Did the pump performance equal that indicated on the manufacturer's certified shop test under all load conditions? ..... ❑ Yes ❑ No
B. Did the pump discharge equal or exceed the maximum fire protection system demand? ..... ❑ Yes ❑ No
C. Did the pump installation and performance meet the requirements of NFPA 20?..... ❑ Yes ❑ No

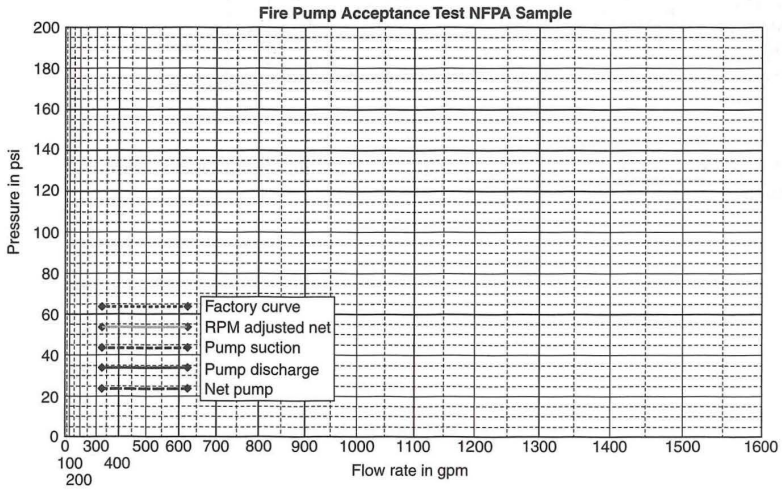
XI. Tester Information

Tester: _____
Company: _____
Company address: _____

I state that the information on this form is correct at the time and place of my test, and that all equipment tested was left in operational condition upon completion of this test except as noted in the comments section below.
Signature of tester: _____ Date: _____ License or certification number if applicable: _____

XII. Comments *(Any "No" answers, test failures, or other problems must be explained — use additional sheets if necessary.)*

_____
_____
_____



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△ **FIGURE A.14.2.6.6(a)** *Continued*

CHAPTER 5
WATER STORAGE TANKS

Contents

Approved plans.

1. New installation or modification.
2. No outstanding rider comments from QAD Design Standards.
3. Confirmation that installation has been completed as per approved drawings.
4. Plans (shop drawings) are on site and available to inspection staff.

Identify Type of Water Storage Tank

1. Coated Steel Tank
2. Welded Steel Tank
3. Bolted Steel Tank
4. Pressure Tank
5. Concrete Tank
6. Wood Tank
7. Fiberglass-Reinforced Plastic Tank

Visual Inspection

1. Conduct a walk around inspection of the installation to confirm:
   a. Condition of tank exterior
   b. Clear access to control valves.
   c. All control valves are in their normal position.
   d. Verify volume of water in tank.

Control Valves

1. Identify the number of control valves.
2. Identify the make and model of each control valve.
3. Identify how each control valve is supervised.
4. Operate each control valve through its full range and return to normal position.
5. Test the operation of each electronic valve supervision device.

Underground Pipe Flushing

1. Confirm that all underground piping is flushed.
   a. Flushing shall be in accordance with NFPA 24.
   b. Confirm that the installing contractor completes and signs the contractor's material and test certificate(s).

Hydrostatic Testing

1. Define the standard for testing and success criteria.
2. Test new piping prior to connecting to existing piping or water tank.
3. Obtain documentation for successful hydrostatic testing including confirmation that all piping was included.

Signs

1. All control, drain, and test connection valves shall be provided with signs indicating their purpose.
2. Signs shall be permanently marked and shall be constructed of weather-resistant metal or rigid plastic materials.

Coated Steel Tanks

1. All coated steel tanks shall be tested for holidays and coating thickness.

Welded Steel Tanks

1. Flat Bottoms. Upon completion of the welding of the tank bottom, it shall be tested by one of the following methods and shall be made entirely tight:
   a. Air pressure or vacuum applied to the joints, using soapsuds, linseed oil, or other suitable material for the detection of leaks
   b. Joints tested by the magnetic particle method
2. Upon completion of the tank construction, it shall be filled with water furnished at the tank site by the owner's representative using the pressure necessary to fill the tank to the maximum working water level.
3. The tank shall be tested as watertight to the satisfaction of the authority having jurisdiction and/or the owner's representative.

Bolted Steel Tanks

1. The completed tank shall be tested by filling it with water, and any detected leaks shall be repaired in accordance with AWWA D103.

Pressure Tanks

1. Each pressure tank shall be tested in accordance with the ASME Boiler and Pressure Vessel Code, "Rules for the Construction of Unfired Pressure Vessels," before painting.
   a. The hydrostatic test pressure shall be a minimum of 150 lb/in.^{2} (10.3 bar).
2. In addition to the ASME tests, each pressure tank shall be filled to two-thirds of its capacity and tested at the normal working pressure with all valves closed and shall not lose more than ½ psi (0.03 bar) pressure in 24 hours.
3. A certificate signed by the manufacturer that certifies that the foregoing tests have been made shall be filed with the authority having jurisdiction.
4. A repetition of the tests specified in NFPA 22 17.5.1 through 17.5.3 *[shown above as 1 through 3]* shall be required after the tank has been set in place and connected. Where conditions do not allow shipping the tank after it is assembled, these tests shall be conducted following its assembly in the presence of a representative of the authority having jurisdiction.

Concrete Tanks

1. Leakage Testing.
   a. On completion of the tank and prior to any specified backfill placement at the footing or wall, the test specified in NFPA 22 17.7.2 through 17.7.4 *[shown as 2 through 4 below]* shall be applied to ensure watertightness.
2. Preparation.
   a. The tank shall be filled with water to the maximum level and left to stand for at least 24 hours.
3. Measurement.
   a. The drop in liquid level shall be measured over the next 72-hour period to determine the liquid volume loss. Evaporative losses shall be measured or calculated and shall be deducted from the measured loss to determine whether there is net leakage.
4. There shall be no measurable leakage after the tank is placed in service.

Wood Tanks

1. Wood tanks shall be filled and tested for liquid tightness for 48 hours.
2. Testing shall be done under the supervision of a qualified wood tank specialist.
3. Tests shall be in accordance with the National Wood Tank Institute Bulletin S82.

Fiberglass-Reinforced Plastic Tanks

1. Hydrostatic Test.
   a. After the excavation hole is backfilled to the bottom of the influent and effluent piping, influent and effluent piping shall be sealed off with watertight caps or plugs.
   b. The tank shall be filled with water up to 3 in. (76 mm) into the access openings.
   c. The water shall be allowed to stand in the tank for a minimum of 2 hours.
   d. The tank shall be examined for leakage or drop in water elevation.
   e. If the water level drops, plugs or caps sealing off piping shall be checked to see that they are tight.
   f. If tightening is required, more water shall be added to fill air voids back to the standard testing level.
   g. The tank shall show no visible signs of leakage, and the water level shall stabilize within a 2-hour test period.

Anti-Vortex Plate Inspection

1. After completion of the tank construction, and before filling the tank with water, the anti-vortex plate shall be inspected.
2. The inspection shall verify that the horizontal steel plate and long radius elbow meet the requirements of NFPA 22 14.2.13.2 *[see Reference A]* and are installed in accordance with 14.2.13.3 *[see Reference A]*.

Disposal of Test Water

1. The owner's representative shall provide a means for disposing of test water up to the tank inlet or drain pipe.

Acceptance Testing Records

1. Written reports of completed equipment inspections shall be made in triplicate, and a copy that has been signed by the contractors and the owners shall be sent to the authority having jurisdiction.
   a. Complete Water Storage Tank Inspection Checklist *[see Forms]*
2. Summary of all fire protection and life safety system equipment installed
3. Other documentation from the A/EOR confirming and documenting that all required testing has been successfully completed.
4. As built drawings.
5. Identification of the onsite location for acceptance testing records.

Routine Inspection, Testing, and Maintenance.

1. Tanks shall be periodically inspected, tested, and maintained in accordance with NFPA 25.
   a. See Chapter 5 in the Port Authority Manual “Inspection, Testing, and Maintenance Requirements for Fire Protection and Life Safety Systems”.
2. Confirm that records of acceptance testing will be kept on site and for the life of the building.
3. Confirm if tasks will be completed by building or facility maintenance, outside contractor, or a combination.
4. Confirm that inspection, testing, and maintenance documentation will be kept on site and available upon request.
5. Confirm that inspection, testing, and maintenance documentation is required to be retained for a minimum of 3 years.

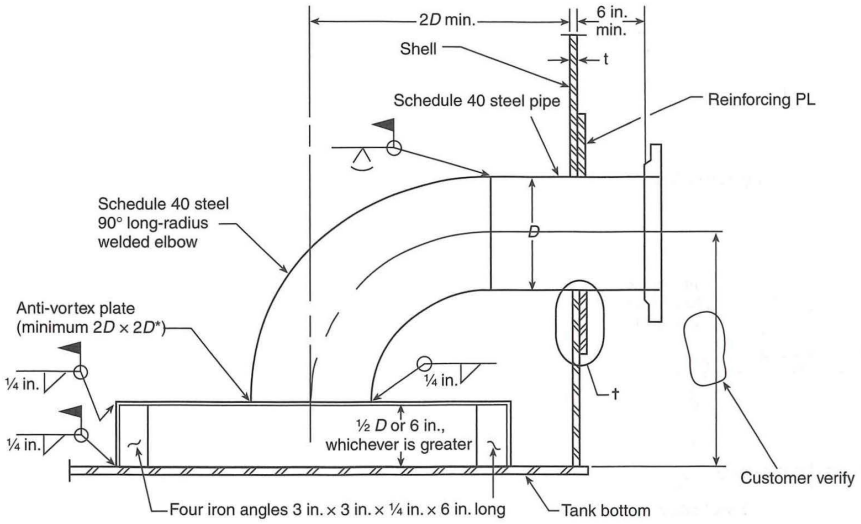
REFERENCES

A.

NFPA 22 2018

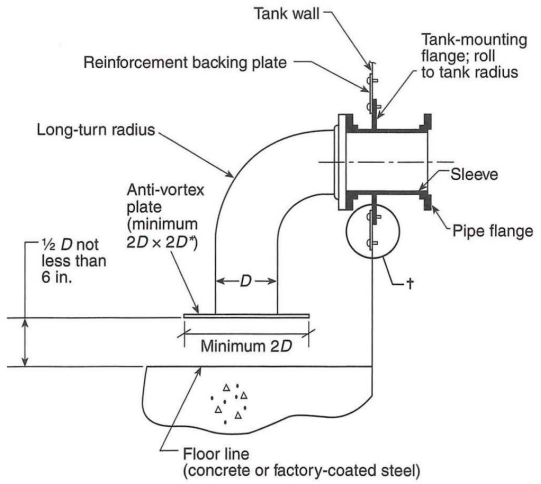
14.2.13* Anti-Vortex Plate Assembly.

A.14.2.13 See Figure B.1(o), Figure B.1(p), and Figure B.1(q).



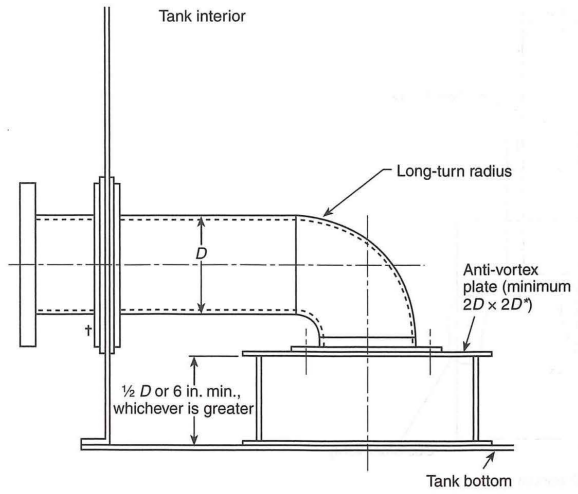
For SI units, 1 in. = 25.4 mm.
*Frequently, a 48 in. × 48 in. size is used as a standard size that will work for any situation.
†For weld size and configuration and reinforcement requirements, see AWWA D100.

Δ FIGURE B.1(o) Suction Nozzle with Anti-Vortex Plate for Welded Suction Tanks. *(See A.14.2.13.2.)*



For SI units, 1 in. = 25.4 mm.
*Frequently, a 48 in. × 48 in. size is used as a standard size that will work for any situation.
†For reinforcement requirements, see AWWA D103.

Δ FIGURE B.1(p) Typical Suction Nozzle with Anti-Vortex Plate for Lap-Jointed Bolted Tanks. *(See A.14.2.13.2.)*



For SI units, 1 in. = 25.4 mm.
*Frequently, a 48 in. × 48 in. size is used as a standard size that will work for any situation.
†For reinforcement requirements, see AWWA D103.

FIGURE B.1(q) Typical Suction Nozzle with Anti-Vortex Plate for Flange-Jointed Bolted Steel Tanks. *(See A.14.2.13.2.)*

14.2.13.1 The discharge outlet for every suction tank shall be equipped with an anti-vortex plate assembly.

14.2.13.2* The assembly shall consist of a horizontal steel plate that is at least twice the diameter of the outlet on a long radius elbow fitting, where required, mounted at the outlet a distance above the bottom of the tank equal to one-half the diameter of the discharge pipe.

A.14.2.13.2 Large, standard size anti-vortex plates [48 in. × 48 in. (1219 mm × 1219 mm)] are desirable, as they are adequate for all sizes of pump suction pipes normally used. Smaller plates may be used; however, they should comply with 14.2.13.

14.2.13.3 The minimum distance above the bottom of the tank shall be 6 in. (152 mm).

FORMS

WATER STORAGE TANKS FOR FIRE PROTECTION INSPECTION CHECKLIST

Date of inspection: _____ Capacity: _____

Inspector name: _____ Diameter: _____

Inspector phone #: _____ Height: _____

Property name: _____ Year built: _____

Property address: _____

Inspections		Comments
Joint inspection of completed equipment by a representative of the tank contractor and a representative of the owner.	❑ Yes ❑ No	
Anti-vortex plate: size and dimensions correct	❑ Yes ❑ No	

Tests		Comments
Welded Steel Tanks:		
Has flat bottom?	❑ Yes ❑ No	
Has no leaks in the shell, bottom, or roof	❑ Yes ❑ No	
Bolted Steel Tanks:		
Has no leaks	❑ Yes ❑ No	
Pressure Tanks:		
Follows ASME *Boiler and Pressure Vessel Code*?	❑ Yes ❑ No	
Hydrostatic test pressure at least 150 psi?	❑ Yes ❑ No	
Pressure does not drop more than 0.5 psi in 24 hours after being filled at working pressure and ⅔ its capacity?	❑ Yes ❑ No	
Embankment-Supported Coated Fabric Tanks:		
Has no leaks prior to shipment or after installation?	❑ Yes ❑ No	
Concrete Tanks:		
Fill tank, let it sit for 24 hours and measure liquid volume loss over next 72 hours. Has measurable leakage?	❑ Yes ❑ No	
Wood Tanks:		
Check liquid tightness for 48 hours with the help of qualified wood tank specialist?	❑ Yes ❑ No	
In accordance with National Wood Tank Institute Bulletin S82?	❑ Yes ❑ No	
Fiberglass-Reinforced Plastic Tanks:		
Hydrostatic test performed?	❑ Yes ❑ No	
All Tanks:		
Disposal of test water?	❑ Yes ❑ No	

 NFPA 22

Δ FIGURE A.17.1.2 Water Storage Tank Inspection Checklist.

CHAPTER 6
FOAM WATER SPRINKLER/SPRAY SYSTEMS

Contents

Approved Plans

1. New installation or modification?
2. No outstanding rider comments from QAD Design Standards.
3. Confirmation that installation has been completed as per approved drawings.
4. Plans (shop drawings) are on site and available to inspection staff.
    a. Sequence of operations is on the approved drawings.

Piping and Fittings

1. Confirm the type of piping and fittings used.

Sprinkler Heads / Spray Nozzles

1. Document the following information for all sprinklers/spray nozzles installed:
    a. Make
    b. Model
    c. Year of Manufacture
    d. Orifice Size
    e. Quantity
    f. Temperature Rating

Sprinkler System Alarm Valve

1. Document sprinkler valve information
    a. Location
    b. Type
    c. Make
    d. Model

System Equipment

1. Identify the system equipment including but not limited to:
    a. Fire pump
        i. Power supply and controller
    b. Foam concentrate
    c. Foam Concentrate Proportioning Means.
        i. Foam Concentrate Pumps
            (1) Power Supply and Controller

d. Foam Concentrate Storage Tank(s)
e. Automatic detection system
f. Air maintenance device
g. Test Connections
h. Fire department connection(s).
i. Pressure regulating device(s).
j. Backflow preventer device(s).

Visual inspection

1. Conduct a walkthrough of the installation to confirm:
   a. Clear access to control valves.
   b. All control valves are in their normal position.
   c. Satisfactory coverage of the protected area / equipment.
   d. Test connection is in the correct location.
   e. Foam concentrate tank is full.

Control Valves

1. Identify the number of control valves installed.
2. Identify the make and model of each control valve.
3. Identify how each control valve is supervised.
4. Confirm that all control, drain, venting, and test connection valves are provided with permanently marked metal or rigid plastic identification signs.
   a. Confirm that each valve has the correct signage including but not limited to:
      i. General Information Sign *[See Forms]*
      ii. Hydraulic Design Information Sign *[See Forms]*
      iii. Antifreeze Information Sign
      iv. Auxiliary Drain Sign
5. Operate each control valve through its full range and return to normal position.
6. Test the operation of each electronic valve supervision device.

Underground Piping

1. Confirm that all underground piping is flushed.
   a. Flushing shall be in accordance with NFPA 24.
2. Confirm that the installing contractor completes and signs the contractor's material and test certificate(s).

Painting of Dedicated Sprinkler Piping and Valve Handles

NYC only

1. Dedicated sprinkler piping shall be painted and such painting certified in accordance with NYCBC Sections 903.6.1 through 903.6.5 *[shown as items 2 through 6 below]*. In addition to painting, sprinkler piping may also be identified by lettered legend in accordance with ANSI A13.1. Where the piping is required to be listed and labeled such painting shall not obscure such labeling.

Exception:

(1) Attachments, gauges, valves and operable parts of sprinkler systems other than valve handles.
(2) Horizontal branch lines.
(3) Where different color coding may be required by Section 3406 of the New York City Fire Code for facilities storing, handling, and using flammable and combustible liquids in connection with special operations.

2. New Buildings
   a. Cross connections and risers in new buildings, including buildings constructed pursuant to Section 28-101.4.2 of the NYC Administrative Code, shall be painted red and the handles of valves serving dedicated sprinklers shall be painted green prior to the hydrostatic pressure test regardless of whether they will be enclosed at a later point in time.

      Exception:

      Where a standpipe system is used as a combination standpipe and sprinkler system, the sprinkler risers and cross connections that are also used for the standpipe system shall be painted red and the handles of valves serving such combination system shall be painted yellow.

3. Alterations
   a. Cross connections and risers for independent (stand-alone) existing sprinkler systems that are exposed during alterations, including alterations pursuant to Section 28-101.4.2 of the NYC Administrative Code, shall be painted red and the handles of valves serving such existing sprinkler systems shall be painted green. Where the alteration requires a hydrostatic pressure test such painting shall be completed prior to such test.

      Exception:

      Where a standpipe system is used as a combination standpipe and sprinkler system, the sprinkler risers and cross connections that are also used for the standpipe system shall be painted red and the handles of valves serving such combination system shall be painted yellow.

4. Retroactive Requirement for Completed Buildings
   a. Notwithstanding any other provision of law, all exposed risers and cross connections of completed buildings in existence on March 2, 2010 shall be painted red and all handles of valves serving such sprinkler system shall be painted green.

      Exception:

      Where a standpipe system is used as a combination standpipe and sprinkler system, the sprinkler risers and cross connections that are also used for the standpipe system shall be painted red and the handles of valves serving such combination system shall be painted yellow.

5. Buildings Under Construction on March 2, 2010
   a. Notwithstanding any other provision of law, where construction documents were approved and permits issued for the construction of a new building or alteration of an existing building prior to March 2, 2010 and the work is not signed off by the department prior to such date, all exposed cross connections and risers in any such building shall be painted red prior to the hydrostatic pressure test, including cross connections and risers that will be enclosed at a later point in time, and handles of valves serving such sprinkler system shall be painted green.

Exception:
(1) Where a standpipe system is used as a combination standpipe and sprinkler system, the sprinkler risers and cross connections that are also used for the standpipe system shall be painted red and the handles of valves serving such combination system shall be painted yellow.
(2) Cross connections and risers enclosed prior to March 2, 2010 need not be painted.

6. Certification of Completion of System Painting
   a. For all buildings where sprinkler and combination sprinkler and standpipe systems are not subject to a special inspection pursuant to NYCBC Section 1705.29 of this code, a licensed master plumber, licensed master fire suppression piping contractor, registered design professional or an individual holding an appropriate certificate of fitness from the Fire Department for the operation and/or maintenance of such system shall certify on forms provided by the department that all required painting has been completed in accordance with NYCBC Section 903.6. Such certification shall be maintained on the premises and made available for inspection by the department and the Fire Department.

Hydrostatic Testing

1. In NJ and NYS.
   a. All piping, including foam concentrate lines and the system piping, shall be hydrostatically tested at 200 psi (13.8 bar) or at 50 psi (3.4 bar) in excess of the maximum static pressure where the maximum static pressure exceeds 150 psi (10.3 bar).
   b. The pressure shall be maintained without loss for 2 hours.
   c. Piping between the exterior fire department connection and the check valve in the fire department inlet pipe shall be hydrostatically tested in the same manner as the balance of the system. After repair or replacement work affecting the fire department connection, the piping between the exterior and the check valve in the fire department inlet pipe shall be isolated and hydrostatically tested at 150 psi (10.3 bar).
2. In NYC.
   a. All new systems, including yard piping and fire department connections, shall be tested hydrostatically at not less than 20.7 bar (300 psi) of pressure for 1 hours, or at 3.5 bar (50 psi) in excess of the maximum pressure where the maximum pressure is in excess of 17.3 bar (250 psi).
   b. Piping between the exterior fire department connection and the check valve in the fire department inlet pipe shall be hydrostatically tested in the same manner as the balance of the system. After repair or replacement work affecting the fire department connection, the piping between the exterior and the check valve in the fire department inlet pipe shall be isolated and hydrostatically tested at 200 psi (13.8 bar).
3. Test new piping prior to connection with existing piping.
4. Bladder tanks shall not be included in pressure tests.
5. Underground water piping shall be tested in accordance with NFPA 24.

Fire department connections

1. When a fire department connection is required, it shall be installed on the supply side of the proportioner.
2. The fire department connection shall be located not less than 18 in. (450 mm) and not more than 4 ft (1.2 m) above the level of the adjacent grade or access level.
3. There shall be no shutoff valve in the fire department connection piping.
4. The piping between the check valve and the outside hose coupling shall be equipped with an approved automatic drain valve in areas subject to freezing.
5. A sign that states the following shall be placed at the fire department connection:

FIRE DEPARTMENT CONNECTION

THIS CONNECTION FEEDS A FOAM-WATER
SPRINKLER SYSTEM.

DO NOT PUMP AT PRESSURES
EXCEEDING *[insert design pressure]* UNTIL FOAM
LIQUID SUPPLY IS EXHAUSTED.

IF INCIDENT IS CONTROLLED BY FOAM
BLANKET, DO NOT DESTROY FOAM BLANKET BY
EXCESSIVE APPLICATION OF WATER.

Dry Pipe and Preaction Sprinkler Systems with Supervisory Air Pressure

1. In addition to the standard hydrostatic test, an air pressure leakage test at 40 psi (2.7 bar) shall be conducted for 24 hours.
   a. Any leakage that results in a loss of pressure in excess of 1 ½ psi (0.1 bar) for the 24 hours shall be corrected.
   b. Retest the piping after corrective work has been completed.

Pressure Regulating Devices

1. Record static inlet and outlet pressures.
2. Record residual inlet and outlet pressures while demonstrating satisfactory minimum and maximum flow rates.
3. Where pressure-reducing valves are arranged in series, the downstream pressure-reducing valve shall be tested at both the discharge pressure from the upstream pressure-reducing valve and with the upstream pressure-reducing valve bypass open.

Backflow Prevention Devices

1. The backflow prevention assembly shall be forward flow tested to ensure proper operation.
2. The minimum flow rate shall be the system demand.

Main Drain Flow Test

1. The main drain valve shall be opened and shall remain open until the system pressure stabilizes.
2. The static and residual pressure shall be recorded on the contractor's test certificate.
3. Main drain flow tests are not required for manual systems that do not have a permanently attached water supply.

Waterflow Alarm Device

1. Document the type of waterflow alarm device including make and model.
2. Confirm that the water alarm device is satisfactorily installed and pretested.
3. Confirm that waterflow alarm initiates all functions as per the approved sequence of operations.

Air Maintenance Device

1. Identify the air maintenance device including:
   a. Air compressor
   b. Air receiver
   c. Relief valve
2. Confirm that the air maintenance device is dedicated to the system.
3. Witness restoration of the system to normal air pressure confirming maximum time of 30 minutes.
4. Identify and confirm satisfactory operation of the air pressure relief valve.

Tests Discharging Foam from Foam-Water Deluge and Spray Systems

1. All tests should be made by the contractor in the presence of the inspector for the authority having jurisdiction.
2. Before asking for final approval of the protective equipment by the authority having jurisdiction, installation companies should furnish a written statement to the effect that the work covered by its contract has been completed and all specified flushing of underground, lead-in, and system piping has been successfully completed, together with specified hydrostatic pressure tests and system foam discharge tests.
3. Acceptance tests shall be conducted to ensure that the hazard is fully protected in accordance with NFPA 16 Chapter 4 and to determine the flow pressures, actual discharge capacity, consumption rate of foam-producing materials, staffing needs, and other operating characteristics.
4. The tests shall include the following:
   a. Foam discharge from a single system
   b. Simultaneous foam discharge of the maximum number of systems expected to operate on a single hazard.
   c. The discharge shall be continued for the time required to obtain stabilized discharge.

Wet Sprinkler Systems

1. Test the waterflow alarm device.
   a. Confirm transmission of all alarm, trouble, and supervisory signals to the approved monitoring station.

Dry Pipe Sprinkler Systems

1. If installed, document the make, model, and serial number of the quick opening device.
2. Inspect the test connection and verify:
   a. The correct orifice size.
   b. Most distant location on the upper most story.
   c. Connection has a shutoff valve and plug.
3. Conduct the acceptance trip test with the control valve fully open documenting the following:
   a. Record the time for the valve to trip when operated through the test connection.
   b. Record the water pressure at the dry pipe valve prior to test
   c. Record the air pressure in the system prior to the test
   d. Record the air pressure when the dry pipe valve trips
   e. Record the time for the water to reach the test connection (full flow).
   f. Confirm that the air pressure supervisory signal(s) and waterflow alarm operate as designed.
   g. Confirm transmission of all alarm, trouble, and supervisory signals to the approved monitoring station.

Deluge Sprinkler Systems

1. Identify how the deluge valve operates:
   a. Hydraulically
   b. Pneumatically
   c. Electrically
2. Identify and document the detection system.
   a. Test each circuit to confirm operation of the supervision loss alarm.
   b. Test each detection circuit to confirm operation of the valve release.
   c. Test each initiation device to confirm satisfactory operation.
3. Test the operation of the valve from all manual, remote, and control stations.
4. Test and document the time for detection system to operate the valve release.
5. Demonstrate satisfactory operation of the water spray system(s).
   a. Confirm that the water discharge pattern is satisfactory.
   b. Record the time required to deliver water to the most remote nozzle.
6. Confirm that all required systems operate simultaneously.
7. Record pressure readings:
   a. At the most hydraulically most remote nozzle.
   b. At the actuation valve.
   c. Obtain a copy of the documentation from the A/EOR confirming that the system is operating as satisfactorily based on the pressure readings measured when compared to design criteria.
8. Confirm transmission of all alarm, trouble, and supervisory signals to the approved monitoring station.

Preaction Sprinkler Systems

1. Document if the preaction system is:
   a. Non-interlock
   b. Single Interlock
   c. Double Interlock
2. Document if the piping is supervised

3. Document the detection system and its components
   a. Test each circuit to confirm operation of the supervision loss alarm.
   b. Test each detection circuit to confirm operation of the valve release.
   c. Test each initiation device to confirm satisfactory operation.
4. Test the operation of the valve from all manual, remote, and control stations.
5. Trip test the system
6. Confirm transmission of all alarm, trouble, and supervisory signals to the approved monitoring station.

Proportioning System Testing

1. Operation of the proportioning equipment shall be verified by flow tests.
2. For closed (wet pipe, preaction, or dry pipe) systems, the concentration shall be verified by flow tests at the actual calculated discharge demand for the least hydraulically demanding condition and at the minimum design flow rate of the system. For open deluge systems, the concentration shall be verified by flow tests at the midrange design flow rate of the system.
   a. Foam flow tests shall include a minimum flow test for wet pipe, dry pipe, and preaction systems equal to the flow of the most remote (4) sprinklers.
3. For open deluge systems, the concentration shall be verified by flow tests at the actual calculated discharge demand.
4. During the tests the pressure at the proportioning devices shall be at the design operating pressure of the system or systems tested.
5. For balanced pressure and positive pressure proportioning systems, flow tests shall be permitted to be conducted through the test connections required in NFPA 16 Section 5.14.
6. For positive-pressure proportioning with pumps or pressure-controlled bladder tanks the percentage at minimum listed flow shall be at the maximum percentage of manufacturer's requirement plus 30 percent, or 1 percentage point, whichever is less.

Acceptance Testing Records

1. Summary of all fire protection and life safety system equipment installed including fans, dampers, and control equipment for the suppression system.
2. Applicable NFPA Contractor Material and Test Certificates *[see Forms]*
3. Other documentation from the A/EOR confirming and documenting that all required testing has been successfully completed.
4. As built drawings including sequence of operations.
5. Identification of the onsite location for acceptance testing records.

Operations and Maintenance Information

1. System component instructions
2. System care and maintenance instructions
3. Copy of NFPA 25
4. Acceptance testing report

Routine Inspection, Testing, and Maintenance

1. Foam-water sprinkler systems shall be tested and inspected in accordance with NFPA 25.
   a. See Chapter 6 in the Port Authority Manual “Inspection, Testing, and Maintenance Requirements for Fire Protection and Life Safety Systems”.
2. Confirm that records of acceptance testing will be kept on site and for the life of the system.
3. Confirm if tasks will be completed by building or facility maintenance, outside contractor, or a combination.
4. Confirm that routine inspection, testing, and maintenance documentation will be kept on site and available upon request.
5. Confirm that routine inspection, testing, and maintenance documentation is required to be retained for a minimum of 3 years.

FORMS

Sample Foam Water Sprinkler System General Information Sign

Foam-Water Sprinkler System — General Information
for
_____
_____
_____

System type _____
Proportioning method _____
_____
Foam concentrate type: _____
_____
Percent concentration _____

High-piled storage ❑ Yes ❑ No
Rack storage: ❑ Yes ❑ No
Commodity class: _____
Max. storage height _____ ft m
Aisle width (min.) _____ ft m
Encapsulation ❑ Yes ❑ No
Solid shelving: ❑ Yes ❑ No
Flammable/
combustible liquids: ❑ Yes ❑ No
Other storage: ❑ Yes ❑ No
_____

Hazardous materials: ❑ Yes ❑ No
Location: _____

Date: _____
Flow test data:
Static: _____ psi bar
Residual: _____ psi bar
Flow: _____ gpm L/min
Pitot: _____ psi bar
Date: _____
Location: _____
_____
Location of auxiliary/low point drains:
_____
_____
_____
Dry pipe/double interlock preaction valve test results _____
Original main drain test results:
Static: _____ psi bar
Residual: _____ psi bar
Venting valve location: _____

Where injection systems are used to treat MIC or corrosion:
Type of chemical: _____ Concentration: _____ For proper disposal, see:
_____
Name of contractor or designer: _____
Address: _____
Phone: _____

FIGURE A.8.7 Foam-Water Sprinkler System — General Information.

Sample Hydraulic Design Information Sign

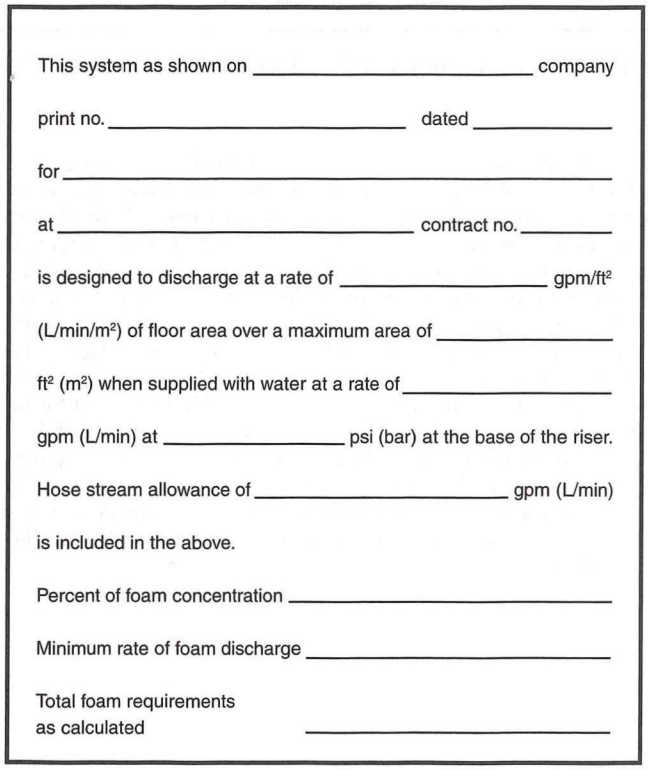


FIGURE A.8.6 Sample Hydraulic Design Information Sign.

Test Certificate for Low-Expansion Foam

Contractor's Material and Test Certificate for Low-Expansion Foam

PROCEDURE

Upon completion of work, inspection and tests shall be made by the contractor's representative and witnessed by an owner's representative. All defects shall be corrected and system left in service before contractor's personnel finally leave the job.

A certificate shall be filled out and signed by both representatives. Copies shall be prepared for approving authorities, owners, and contractor. It is understood the owner's representative's signature in no way prejudices any claim against contractor for faulty material, poor workmanship, or failure to comply with approving authority's requirements or local ordinances.

Property name | Date

Property address

Plans

Accepted by approving authorities (names)
1 _____
2 _____
3 _____

Address
1 _____
2 _____
3 _____

Installation conforms to accepted plans ❑ Yes ❑ No

Equipment used is approved ❑ Yes ❑ No
If no, explain deviations

Instructions

Has person in charge of fire equipment been instructed as to location of control valves and care and maintenance of this new equipment? ❑ Yes ❑ No
If no, explain

Have copies of the following been left on premises?
1. System components instructions ❑ Yes ❑ No
2. Care and maintenance instructions ❑ Yes ❑ No
3. NFPA 25 ❑ Yes ❑ No
4. With whom have the copies been left? _____

Location of system

Supplies buildings	Square footage
	Total square footage

Discharge devices

Make	Model	Year of manufacture	Orifice size	Quantity	Other

Pipe and fittings

Type of pipe _____
Type of fittings _____

Alarm valve or flow indicator

Alarm device				Maximum time to operate through test connection	
Type	Make	Size	Model	Min.	Sec.

Dry pipe operating test

Dry valve				Q. O. D.				
Make	Size	Model	Serial no.	Type	Make	Size	Model	Serial no.
				❑ Accelerator ❑ Exhauster				

	Time to trip thru test connection		Water pressure	Air pressure	Trip point air pressure	Time water reached test outlet[1]		Alarm operated properly	
	Min.	Sec.	PSI	PSI	PSI	Min.	Sec.	Yes	No
Without Q. O. D.									
With Q. O. D.									

If no, explain

[1]Measured from time inspector's test connection is opened.

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FIGURE A.11.7(3) Sample Material and Test Certificate.

Deluge & preaction valves

Operation ❑ Pneumatic ❑ Electric ❑ Hydraulic

Piping supervised? ❑ Yes ❑ No Detecting media supervised? ❑ Yes ❑ No

Does valve operate from the manual trip, remote, or both control stations? ❑ Yes ❑ No

Is there an accessible facility in each circuit for testing? If no, explain

❑ Yes ❑ No

Make	Model	Does each circuit operate supervision loss alarm?		Does each circuit operate valve release?		Maximum time to operate release	
		Yes	No	Yes	No	Min.	Sec.

Backflow preventers

Make	Model	Size

Foam

High flow rate _____ gpm @ _____ psi
Results fall within –0% to +30% for balanced pressure system: ❑ Yes ❑ No
Low flow rate _____ gpm @ _____ psi
Results fall within –0% to +30% for balanced pressure system: ❑ Yes ❑ No
For positive pressure systems with pump or pressure controlled bladder tank and in-line balanced pressure type proportioning systems: –0% to +30% or greater: ❑ Yes ❑ No
Foam concentrate induction rate –0% to +30% of manufacturers listed induction rate or 1 percentage point, whichever is less at listed flow rates: ❑ Yes ❑ No
Balanced pressure proportioning systems produce the minimum percentage of manufacturers requirements –0% at minimum listed flow rate: ❑ Yes ❑ No
Positive pressure proportioning with pumps or pressure-controlled bladder tanks produce the maximum percentage of manufacturers requirement +30% or 1 percentage point, whichever is less at the minimum listed flow rate: ❑ Yes ❑ No
Variable pressure orifice type proportioners produce the percentage –0% to +30% or 1 percentage point, whichever is less: ❑ Yes ❑ No
Foam discharge was collected and disposed of properly: ❑ Yes ❑ No
Approved simulated foam concentrates were used for this test: ❑ Yes ❑ No
Type _____
All foam residue was removed from the piping system by flushing with clean water ❑ Yes ❑ No

Test description

Hydrostatic: Hydrostatic tests shall be made at not less than 200 psi (13.6 bar) for 2 hours or 50 psi (3.4 bar) above static pressure in excess of 150 psi (10.2 bar) for 2 hours. Differential dry-pipe valve clappers shall be left open during the test to prevent damage. All aboveground piping leakage shall be stopped. Maximum static pressure: _____

Pneumatic: Establish 40 psi (2.7 bar) air pressure and measure drop, which shall not exceed 1½ psi (0.1 bar) in 24 hours. Test pressure tanks at normal water level and air pressure and measure air pressure drop, which shall not exceed 1½ psi (0.1 bar) in 24 hours.

Tests

All piping hydrostatically tested at ____ psi (____ bar) for ____ hrs. ❑ Yes ❑ No
Dry piping pneumatically tested ❑ Yes ❑ No
Equipment operates properly ❑ Yes ❑ No
If no, state reason

Do you as the sprinkler contractor certify that additives and corrosive chemicals, sodium silicate or derivatives of sodium silicate, brine, or other corrosive chemicals were not used for testing systems or stopping leaks? ❑ Yes ❑ No

Drain test: Reading of gauge located near water supply test connection: _____ psi (____ bar)
Residual pressure with valve in test pipe open wide _____ psi (____ bar)

Underground mains and lead-in connections to system risers flushed before connection made to sprinkler piping.
Verified by copy of the U Form No. 85B ❑ Yes ❑ No
Flushed by installer of underground sprinkler piping ❑ Yes ❑ No
Other Explain

If powder-driven fasteners are used in concrete, has representative sample testing been satisfactorily completed? ❑ Yes ❑ No
If no, explain

Blank testing gaskets

Number used	Locations	Number removed

Welded piping ❑ Yes ❑ No

If yes . . . .

Do you certify as the sprinkler contractor that welding procedures comply with the requirements of at least AWS B2.1? ❑ Yes ❑ No

Do you certify that the welding was performed by welders qualified in compliance with the requirements of at least AWS B2.1? ❑ Yes ❑ No

Do you certify that welding was carried out in compliance with a documented quality control procedure to ensure that all discs are retrieved, that openings in piping are smooth, that slag and other welding residue are removed, and that the internal diameters of piping are not penetrated? ❑ Yes ❑ No

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FIGURE A.11.7(3) *Continued*

Cutouts (discs)	Do you certify that you have a control feature to ensure that all cutouts (discs) are retrieved? ❑ Yes ❑ No
Hydraulic data nameplate	Nameplate provided ❑ Yes ❑ No If no, explain
Remarks	Date left in service with all control valves open:
Signatures	Name of sprinkler contractor Address Phone Fax
	Tests witnessed by
	For property owner (signed) Title Date
	For sprinkler contractor (signed) Title Date
Additional explanation and notes	

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FIGURE A.11.7(3) *Continued*

Test Certificate for Foam-Water Sprinkler/Spray System

Sample Contractor's Material and Test Certificate for Foam-Water Sprinkler/Spray System

PROCEDURE

Upon completion of work, inspection and tests shall be made by the contractor's representative and witnessed by the property owner or their authorized agent. All defects shall be corrected and system left in service before contractor's personnel finally leave the job.

A certificate shall be filled out and signed by both representatives. Copies shall be prepared for approving authorities, owners, and contractor. It is understood the owner's representative's signature in no way prejudices any claim against contractor for faulty material, poor workmanship, or failure to comply with approving authority's requirements or local ordinances.

Property name		Date	
Property address			
Plans	Accepted by approving authorities (names)		
	Address		
	Installation conforms to accepted plans	❑ Yes	❑ No
	Equipment used is approved If no, explain deviations	❑ Yes	❑ No
Instructions	Has person in charge of fire equipment been instructed as to location of control valves and care and maintenance of this new equipment? If no, explain	❑ Yes	❑ No
	Have copies of the following been left on the premises?	❑ Yes	❑ No
	1. System components instructions	❑ Yes	❑ No
	2. Care and maintenance instructions	❑ Yes	❑ No
	3. NFPA 25	❑ Yes	❑ No
Location of system	Supplies buildings		

Sprinklers or Nozzles	Make	Model	Year of manufacture	Orifice size	Quantity	Temperature rating

Pipe and fittings: Type of pipe _____ Type of fittings _____

General

Building type: ❑ New ❑ Existing ❑ Renovation Area: _____

Contruction type: ❑ Fire resistive ❑ Noncombustible ❑ Ordinary ❑ Heavy timber ❑ Wood frame ❑ Mixed

Occupancy classification: _____

Foam-water system type

❑ Wet ❑ Dry ❑ Preaction ❑ Deluge ❑ Spray ❑ Preprimed

Sprinkler omitted in any areas?	❑ Yes	❑ No
Spare sprinkler provided?	❑ Yes	❑ No
Sprinkler wrench provided?	❑ Yes	❑ No

Area of coverage: ❑ Total ❑ Partial ❑ Special hazard ❑ Other

Fire Pump

Fire pump provided? ❑ Yes ❑ No

If yes, rated capacity: _____ gpm@ _____ psi

Type of pump: ❑ Electric ❑ Diesel ❑ Steam

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▲ FIGURE 8.3.1.1 Contractor's Material and Test Certificate for Foam-Water Sprinkler/Spray System.

Hydrostatic test

All piping tested at _____ psi for _____ hours

Dry piping pneumatically tested? ❑ Yes ❑ No

Equipment operates properly? ❑ Yes ❑ No

Do you certify as the installing contractor that additives and corrosive chemicals, sodium silicate, brine, or other corrosive chemicals were not used for testing systems or stopping leaks? ❑ Yes ❑ No

Main drain test

Static pressure _____ psi Residual pressure _____ psi

Backflow device forward flow test	Indicate means used for forward flow test of backflow device: _____
	When means to test device was opened, was system flow demand created? ❑ Yes ❑ No ❑ N/A

Alarm valve or flow indicator

Alarm device			Minimum time to operate through test connection	
Type	Make	Model	Minutes	Seconds

Dry pipe operating test

Dry valve			Q.O.D.		
Make	Model	Serial no.	Make	Model	Serial no.

	Time to trip through test connection		Water pressure	Air pressure	Trip point air pressure	Time water reached test outlet		Alarm operated properly	
	Minutes	Seconds	psi	psi	psi	Minutes	Seconds	Yes	No
Without Q.O.D.									
With Q.O.D.									

Deluge and preaction valves

Operation ❑ Pneumatic ❑ Electric ❑ Hydraulic

Piping supervised? ❑ Yes ❑ No Detecting media supervised? ❑ Yes ❑ No

Does valve operate from the manual trip, remote, or both control actions? ❑ Yes ❑ No

Is there an accessible facility in each circuit for testing? ❑ Yes ❑ No If no, explain.

Make	Model	Does each circuit operate supervision loss alarm?		Does each circuit operate valve release?		Maximum time to operate release?	
		Yes	No	Yes	No	Minutes	Seconds

Foam system concentrate tests

High flow rate _____ gpm@ _____ psi
Results fall within –0% to +30% for balanced pressure system: ❑ Yes ❑ No

Low flow rate _____ gpm@ _____ psi
Results fall within –0% to +30% for balanced pressure system: ❑ Yes ❑ No

For positive pressure systems with pump or pressure controlled bladder tank and inline balanced pressure type proportioning systems: –0% to +30% or greater: ❑ Yes ❑ No

Foam concentrate induction rate –0% to +30% of manufacturer's listed induction rate or 1 percentage point, whichever is less, at listed flow rates: ❑ Yes ❑ No

Balanced pressure proportioning systems produce the minimum percentage of manufacturer's requirements –0% at minimum listed flow rate: ❑ Yes ❑ No

Positive pressure proportioning with pumps or pressure-controlled bladder tanks produce the maximum percentage of manufacturer's requirement +30% or 1 percentage point, whichever is less, at the minimum listed flow rate: ❑ Yes ❑ No

Variable pressure orifice type proportioners produce the percentage –0% to +30% or 1 percentage point, whichever is less: ❑ Yes ❑ No

Foam discharge was collected and disposed of properly: ❑ Yes ❑ No

Approved simulated foam concentrates were used for this test: ❑ Yes ❑ No

Type _____

All foam residue was removed from the piping system by flushing with clean water: ❑ Yes ❑ No

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△ FIGURE 8.3.1.1 *Continued*

Hydraulic data nameplate	Nameplate provided ❑ Yes ❑ No	If no, explain
Date left in service with all control valves open:		
Tests witnessed by		
Owner / Authorized Agent	Title	Date
Contractor	Title	Date
Additional explanations and notes		

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Δ FIGURE 8.3.1.1 *Continued*

CHAPTER 7
DRY CHEMICAL FIRE EXTINGUISHING SYSTEMS

Contents

Approved Plans.

1. New installation or modification.
2. No outstanding rider comments from QAD Design Standards.
3. Confirmation that installation has been completed as per approved drawings.
4. Plans (shop drawings) are on site and available to inspection staff.
   a. The specification shall indicate that only equipment that is specifically listed and compatible for use with the extinguishing system shall be used.
   b. The specification shall indicate special auxiliary devices acceptable to the system manufacturer and the authority having jurisdiction.
   c. The specifications shall include system acceptance tests.
   d. The specifications shall indicate the hazard to be protected and shall include such information as physical dimensions, combustibles, air-handling equipment, heat sources, and so on.
   e. The details on the system shall include sufficient information and calculations on the following:
      (1) The amount of dry chemical
      (2) The size, length, and arrangement of connected piping or of piping and hose
      (3) The description and location of nozzles so that the adequacy of the system can be determined

f. Flow rates of nozzles used shall be provided for engineered systems.
g. Information shall be submitted pertaining to the location and function of detection devices, operating devices, auxiliary equipment, and electrical circuitry, if used.

5. Where field conditions necessitate any substantial change from the approved plan, the corrected as-installed plans shall be submitted to the authority having jurisdiction for approval.

Components

1. Detectors
   a. Automatic detection equipment shall be capable of detecting and indicating heat, flame, smoke, combustible vapors, or an abnormal condition in the hazard that is likely to produce fire.
   b. Automatic detection equipment utilized in engineered systems shall be listed devices.
   c. Automatic detection equipment utilized in a preengineered system shall be included within the listing of the pre-engineered system.
2. Discharge Nozzles
   a. Discharge nozzles shall be listed for their intended use.
   b. Discharge nozzles shall be of brass, stainless steel, or other corrosion-resistant materials or shall be protected inside and out against corrosion.
   c. Protective Devices for Discharge Nozzles
      (1) Discharge nozzles shall be provided with blowoff caps or other suitable devices or materials to prevent the entrance of moisture, environmental contaminants, or other foreign materials into the piping.
      (2) The protective device shall blow off, blow open, or blow out upon agent discharge.
3. Manual Actuators
   a. Manual actuators shall not require a force of more than 40 lbf (178 N) to initiate operation.
   b. Manual actuators shall not require movement of more than 14 in. (356 mm) to secure operation.
   c. All readily accessible manual operating devices on systems with fixed nozzles shall identify the hazards they protect.
   d. The operating instructions shall be permitted to include the use of pictographs and shall have lettering at least ¼ in. (6.35 mm) in height. *[See NFPA 17 5.7.1.7.]*
   e. All remote manual operating devices shall be identified as to the hazard they protect.
4. Shutoff Devices
   a. Shutoff devices shall require manual resetting prior to fuel or power being restored.
5. Dry Chemical
   a. The type of dry chemical used in the system shall not be changed unless listed for that system.
   b. Different types of dry chemical shall not be mixed.
6. Assembly
   a. During assembly, the piping system shall be examined internally to detect and remove contaminants or other foreign materials.
   b. All extinguishing agent storage containers shall be examined to ensure that they are fastened securely to their mounting brackets.

Methods of Actuation

1. Systems shall be provided with both automatic and manual means of operation.
2. The automatic and manual means of mechanical system actuation, external to the control head or releasing device, shall be separate and independent of each other so that failure of one will not impair the operation of the other.
3. Operation of any automatic or manual actuator shall be all that is required to bring about the full operation of the system.
4. At least one manual actuator shall be provided for each system.
5. A readily accessible means for manual actuation shall be located in a path of exit or egress.
6. Where manual actuation is used for protection of hazards other than mobile equipment, the manual actuation device shall be installed no more than 48 in. (1200 mm) and no less than 42 in. (1067 mm) above the floor.
7. Where automatic systems protect only common exhaust ducts, a remote manual actuator shall not be required.
8. All remote manual actuators shall be identified as to the hazard they protect.

Supervision

1. Supervision of electrically or pneumatically operated automatic systems shall be provided unless specifically waived by the authority having jurisdiction.
2. Pneumatic actuation piping, hose, and tubing that is not normally pressurized shall not require supervision.
3. Notification
   a. An audible or visual indicator shall be provided to show that the system has operated, that personnel response might be needed, and that the system is in need of recharge.
4. Connection to the Alarm System
   a. The extinguishing system shall be connected to the fire alarm system, if provided, in accordance with the requirements of NFPA 72, so that the actuation of the dry chemical system will sound the fire alarm as well as provide the function of the extinguishing system.

Pre-Engineered Systems

1. Pre-engineered systems shall be installed to protect hazards within the limitations of the listing.
2. Pre-engineered systems shall comply with ANSI/UL 1254, Pre-Engineered Dry Chemical Extinguishing System Units, or equivalent listing standard.
3. Only system components referenced in the manufacturer's design, installation, and maintenance manual or alternative suppliers' components that are listed for use with the specific extinguishing system shall be used.
4. Used components shall not be permitted to be installed in new systems unless approved by the authority having jurisdiction.
5. Manual Actuation Requirements
   a. Such mechanical means shall not rely on any of the hardware components that would be common to the automatic function of the fixed fire-extinguishing equipment.
   b. The means for manual actuation shall be mechanical and shall not rely on electrical power for actuation.
   c. Electrical power shall be permitted to be used for manual actuation if a reserve power supply is provided in accordance with NFPA 17 9.6.1.

   d. The manual actuation means of an automatic extinguishing system shall be totally independent of the automatic means.
   e. A failure of a system component shall not impair both the automatic and the manual means of actuation.
6. System Annunciation Requirements
   a. Upon actuation of a fixed automatic fire-extinguishing system, an audible alarm or visual indicator shall be provided to show that the system has been actuated.
   b. Where a fire alarm signaling system is serving the occupancy where the extinguishing system is located, the actuation of the fixed automatic fire-extinguishing system shall actuate the fire alarm signaling system.
7. System Supervision
   a. Where electrical power is required to operate the fixed automatic fire-extinguishing system, the system shall be monitored by a supervisory alarm and provided with a reserve power supply.
   b. Where fixed automatic fire-extinguishing systems include automatic mechanical detection and actuation as a backup detection system, electrical power required for automatic operation shall not require monitoring or a reserve power supply.
8. Review and Certification
   a. Design and installation of systems shall be performed only by persons properly trained and qualified to design and/or install the specific system being provided.
   b. The installer shall provide certification to the authority having jurisdiction that the installation is in complete agreement with the terms of the listing and the manufacturer's instructions and/or approved design.
9. Vehicle Fueling Service Station Systems
   a. Each hazard protected by two or more systems shall have these systems connected for simultaneous operation.
   b. The protected area of each hazard shall include the area within the arc scribed by the nozzle end of the hose on each vehicle fuel dispenser.
   c. Equipment shall be provided to shut down all vehicle fuel dispensers simultaneously upon system actuation.
   d. Automatic detection and actuation of the extinguishing system shall be provided.
   e. A remote manual actuator or operating device shall be provided in a conspicuous and accessible location away from the vehicle fuel dispensers and protected area. *[See NFPA 17 Section 4.4.]*
   f. All discharge nozzles shall be located so as to minimize the likelihood of damage or misalignment and within the limitations and constraints of the manufacturer's design, installation, and maintenance manual.

Approval of Installations

1. The completed system shall be tested by a service technician as outlined.
   a. A service technician who performs maintenance on an extinguishing system shall be trained and shall have passed a written or online test that is acceptable to the authority having jurisdiction.
2. The installer shall certify that the installation has been made in accordance with the approved plans, where required, and the manufacturer's design, installation, and maintenance manual.

3. Verification shall be required that nozzles and pipe sizes are in accordance with approved plans, where required, and the manufacturer's design, installation, and maintenance manual.
4. Prior to the pressurization test below, piping shall be physically checked for tightness.
5. A test using nitrogen or dry air shall be performed on the piping network at a pressure not to exceed the normal operating pressure of the extinguishing system and to verify that nitrogen or dry air has discharged out of each nozzle in the system.
    a. The test is intended to verify that flow is continuous and that the piping and nozzles are reasonably unobstructed. The nitrogen or dry air should be introduced into the piping network at the extinguishing agent container connection using a test cylinder or other suitable source. The quantity of nitrogen or dry air used for this test should be sufficient to verify that each nozzle is unobstructed. Nozzle flow should be verified at each discharge nozzle.
6. Piping shall not be hydrostatically tested.
7. Where the system is connected to a building alarm system, verification that alarm-sounding or notification devices and remote annunciation devices are functional shall be required.
8. Verification that all manual release devices (manual pull stations) are readily accessible and accurately identified shall be required.
9. Where a releasing control panel is provided, verification that it is readily accessible and restricted from unauthorized personnel shall be required.

System Operational Tests

1. System operational tests shall be performed in accordance with the manufacturer's design, installation, and maintenance manual and shall include functional tests of the automatic detection system, the manual release devices, and shutdown devices, where provided.

Return the System to Operational Condition

1. Verification shall be required that each extinguishing agent storage container is reconnected and the system has been returned to its fully operational condition.
2. The installing contractor shall complete and sign an acceptance test report acceptable to the authority having jurisdiction.
    a. NFPA 17 Figure A.10.4.6 is an example of an acceptance test report *[see Forms]*.

Acceptance Testing Records

1. Summary of all fire protection and life safety system equipment installed including fans, dampers, and control equipment for the suppression system.
2. Accepting testing report for each system installed.
3. Other documentation from A/EOR confirming that all work has been completed.
4. As built drawings including sequence of operations.
5. Identification of the onsite location for acceptance testing records

Operations and Maintenance Information

1. System component instructions
2. System care and maintenance instructions
    a. The owner shall be provided with a copy of the manufacturer’s design, installation, and maintenance manual or the owner’s manual.

This summary is provided as a general guideline for acceptance testing and does not ensure coverage for all systems and equipment. This summary is intended to provide support for inspection staffs but the information included should not be construed as the only requirements for the systems and equipment. Codes and standards should be reviewed to confirm that all requirements are completed.

Routine Inspection, Testing, and Maintenance.

1. The responsibility for inspection, testing, maintenance, and recharge of the fire protection system shall ultimately be that of the owner of the system, provided that this responsibility has not been transferred in written form to a management company, tenant, or other party.
    a. See Chapter 9 in the Port Authority Manual “Inspection, Testing, and Maintenance Requirements for Fire Protection and Life Safety Systems”.
2. Confirm that records of acceptance testing will be kept on site and for the life of the building.
3. Confirm if tasks will be completed by building or facility maintenance, outside contractor, or a combination.
4. Confirm that inspection, testing, and maintenance documentation will be kept on site and available upon request.
5. Confirm that inspection, testing, and maintenance documentation is required to be retained for 3 years.

FORMS

Dry Chemical System Acceptance Test Report

DRY CHEMICAL SYSTEM ACCEPTANCE TEST REPORT

Property Information

Building name: _____

Address: _____

Building owner: _____

Address: _____

Phone/Fax/E-mail: _____

Designer/Installer Information

Company name: _____

Address: _____

Contact person: _____

Phone/Fax/E-mail: _____

Description of hazard protected: _____

_____

System manufacturer/model: _____

System Check or Test	Results
Installation in accordance with approved plans, where required, and manufacturer's installation manual	
Piping test (10.4.3.1)	
Proper labeling (10.4.3.4)	
Proper alarm operation (10.4.3.5)	
Manual release accessibility (10.4.3.6)	
Releasing control panel (10.4.3.7)	
Automatic detection & manual release (10.4.4)	
System properly charged and left in normal "set" condition (10.4.5)	
Manual left with owner (10.5)	
Date system left in service:	

Test Witnessed By:

Owner/Authorized agent	Title	Date
Installing contractor	Title	Date

Additional comments:

_____

_____

_____

 NFPA 17

FIGURE A.10.4.6 Sample Acceptance Test Report.

This summary is provided as a general guideline for acceptance testing and does not ensure coverage for all systems and equipment. This summary is intended to provide support for inspection staffs but the information included should not be construed as the only requirements for the systems and equipment. Codes and standards should be reviewed to confirm that all requirements are completed.

CHAPTER 8
COMMERCIAL KITCHEN HOOD, DUCT, AND COOKING APPLIANCE FIRE EXTINGUISHING SYSTEMS

Contents

Pre-Engineered Wet Chemical Fire-Extinguishing Systems

Approved plans.

1. New installation or modification.
2. No outstanding rider comments from QAD Design Standards.
3. Confirmation that installation has been completed as per approved drawings.
4. Specifications
   a. The following items shall be included:
      i. Indication that only equipment referenced in the manufacturer's design, installation, and maintenance manual or alternative suppliers' components that are listed for use with the specific extinguishing system shall be used
      ii. Identification of special auxiliary equipment
      iii. List of the specific tests, if any, that are required
      iv. Identification of the hazard to be protected, including such information as physical dimensions, cooking appliances, energy sources for each appliance, and airhandling equipment
5. Plans (shop drawings) are on site and available to inspection staff.
   a. The plans shall contain sufficient detail to enable the authority having jurisdiction to evaluate the protection of the hazard(s).

b. The details on the system shall include the following:
    i. Size, length, and arrangement of connected piping
    ii. Description and location of nozzles
c. Information shall be submitted pertaining to the following:
    i. The location and function of detection devices
    ii. Operating devices
    iii. Auxiliary equipment
    iv. Electrical circuitry

System Requirements

1. General
    a. Wet chemical fire-extinguishing systems for the protection of cooking operations shall be listed and shall meet or exceed the requirements of ANSI/UL 300, Fire Testing of Fire Extinguishing Systems for Protection of Commercial Cooking Equipment.
2. Use
    a. Hazards and equipment that can be protected using wet chemical extinguishing systems shall include the following:
        i. Restaurant, commercial, and institutional hoods
        ii. Plenums, ducts, and filters with their associated cooking appliances
        iii. Special grease removal devices
        iv. Odor control devices
        v. Energy recovery devices installed in the exhaust system
3. Applications
    a. NFPA 96 and the manufacturer's design, installation, and maintenance manual shall be consulted for system limitations and applications for which wet chemical extinguishing systems for commercial cooking operations are considered satisfactory protection.
        i. Pre-engineered systems protect hazards posed by the duct, plenum, and cooking surfaces of appliances and are defined by the manufacturer’s design, installation, and maintenance manual. Fires that start outside the protected area might not be extinguished by the pre-engineered system.
    b. Each protected cooking appliance, individual hood, and branch exhaust duct directly connected to the hood shall be protected by a system or systems designed and installed for simultaneous operation.
    c. Where two or more hazards can be simultaneously involved in fire by reason of their proximity, the hazards shall be protected by either of the following:
        i. Individual systems installed on each hazard to operate simultaneously
        ii. A single system designed and installed to protect all hazards that can be simultaneously involved
    d. Any hazard that will allow fire propagation from one area to another shall constitute a single fire hazard.
4. System Actuation
    a. All systems shall have both automatic and manual methods of actuation.
        i. The automatic and manual means of system actuation, external to the control head or releasing device, shall be separate and independent of each other so that a failure of one will not impair the operation of the other.
        ii. The manual means of system activation shall be permitted to be common with the automatic means if the manual activation device is located between the control head or releasing device and the first fusible link.

iii. Automatic detection and system actuation shall be in compliance with this standard and the manufacturer's design, installation, and maintenance manual.
iv. All devices necessary for proper operation of the system shall function simultaneously with the system operation.
v. Operation of any manual actuator shall be all that is required to bring about the full operation of the system.
vi. At least one manual actuator shall be provided for each system.
vii. All operating devices shall be designed, located, installed, or protected so that they are not subject to mechanical, environmental, or other conditions that could render them inoperative or cause inadvertent operation of the system.
viii. An audible or visual indicator shall be provided to show that the system has operated, that personnel response is needed, and that the system is in need of recharge.
ix. The extinguishing system shall be connected to the fire alarm system, if provided, in accordance with the requirements of NFPA 72 so that the actuation of the extinguishing system will sound the fire alarm.
x. At least one manual actuation device shall be located in a means of egress or at a location acceptable to the authority having jurisdiction.
xi. Mounting location is recommended to be a minimum of 10 ft (3 m) and a maximum of 20 ft (6 m) from the protected hood.
xii. Each manual actuation device shall be installed no more than 48 in. (1200 mm) and no less than 42 in. (1067 mm) above the floor.
xiii. The manual actuation device shall clearly identify the hazard protected and provide instructions for its use.
xiv. At least one manual actuation device shall be located in accordance with NFPA 96 or as directed by the authority having jurisdiction, within the limitations of the manufacturer's design, installation, and maintenance manual.
xv. Automatic systems protecting only common exhaust ducts shall not require a manual actuator.
xvi. The means for manual actuation shall be mechanical and shall not rely on electrical power for actuation.
xvii. Electrical power shall be permitted to be used for manual actuation if electrical supervision and a reserve power supply are provided in accordance with NFPA 17A 5.3.1 *[see Supervision below]*.

5. Supervision
   a. Where electrical power is required to operate the fixed automatic fire-extinguishing system, the system shall be monitored by a supervisory alarm with a reserve power supply provided.
   b. Where supervision of any or all of the following is provided, it shall be designed and installed to give an indication of trouble in the following:
      i. Automatic detection system
      ii. Electrical actuation circuit
      iii. Electrical power supply
   c. Signals indicating the failure of supervised devices or equipment shall give prompt and positive indication of any failure and shall be distinct from signals indicating operation or hazardous conditions.
6. Special Requirements
   a. The building owner(s) or the owner's agent shall be responsible for the protection of any common exhaust ducts used by more than one tenant.

b. The tenant shall be responsible for the protection of common exhaust duct(s) serving hoods located within the tenant's space and up to the point of connection to the building owner's common exhaust duct.
c. The tenant's common duct shall be considered a branch duct to the building owner's common duct.
d. At least one fusible link or heat detector shall be installed within each exhaust duct opening in accordance with the manufacturer's listing.
e. Other than appliances that utilize a downdraft ventilation system, a fusible link or heat detector shall be provided above each protected appliance or in accordance with the extinguishing system manufacturer's design, installation, and maintenance manual.
f. Appliances that utilize a downdraft ventilation system shall be provided with a fusible link or heat detector for each protected cooking appliance located in the plenum area or in accordance with the extinguishing system manufacturer's design, installation, and maintenance manual.
g. Fusible links or heat detectors located at or within 12 in. (305 mm) into the exhaust duct opening and above the protected appliance shall be permitted to meet the requirements of NFPA 17A 5.6.1.5.
h. The maximum distance between detection devices shall not exceed 36 in. (914 mm) unless permitted by the manufacturer's design, installation, and maintenance manual.

7. Protection of Common Exhaust Duct

a. Common exhaust ducts shall be protected by one of the following methods:

(1) *Simultaneous operation of all independent hood, duct, and appliance protection systems

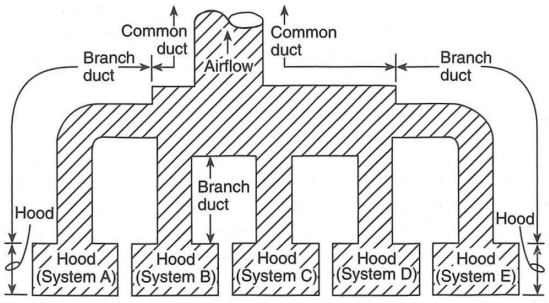

FIGURE A.5.6.2.1(1) Simultaneous Operation of All Systems.

(2) *Simultaneous operation of any hood, duct, and appliance protection system and the system(s) protecting the entire common exhaust duct

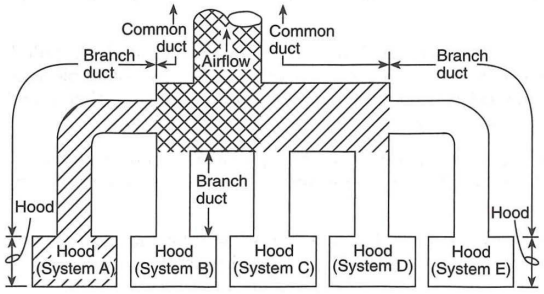

FIGURE A.5.6.2.1(2)(a) Simultaneous Operation of a Single Cooking Appliance, Hood, or Branch Duct System and the System Protecting the Entire Common Exhaust Duct.

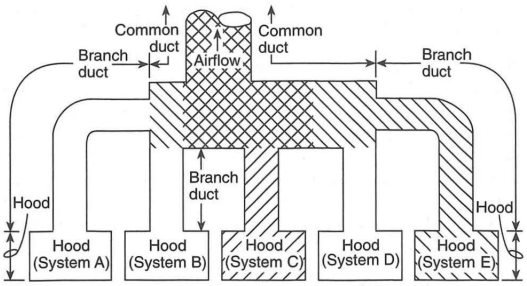

FIGURE A.5.6.2.1(2)(b) Simultaneous Operation of Two Systems in Which One Also Provides Common Duct Protection.

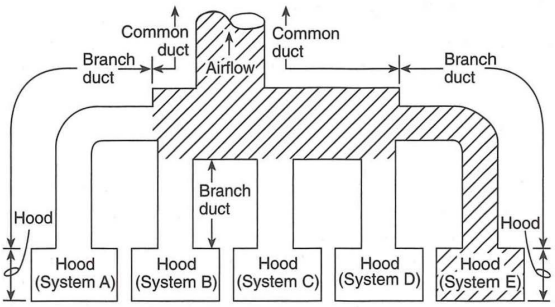

FIGURE A.5.6.2.1(2)(c) Independent Operation of a System That Protects a Hood and the Common Duct.

(1) A fusible link or other mechanically operated heat detection device from the common duct fire-extinguishing system shall be located at each branch duct–to–common duct connection where electrical operation of the common duct fire-extinguishing system does not meet the requirements of NFPA 17A 5.3.1.
    i. All sources of fuel or heat to appliances served by the common exhaust duct shall be shut down upon actuation of any protection system in accordance with NFPA 17A 4.4.4.

8. Ignition sources contained within any exhaust system shall be protected and have a separate detection system that is in accordance with the manufacturer's specifications and that is approved by the authority having jurisdiction.
    a. Examples of ignition sources include, but are not limited to, in-duct electrostatic precipitators and in-line fans, but not external spark arresters or terminal exhaust fans.
9. Any equipment installed in the path of exhaust products that provides secondary filtration or air pollution control shall be provided with an approved automatic fire-extinguishing system, installed in accordance with the fire-extinguishing system manufacturer's instructions.
10. Movable cooking equipment shall be provided with a means to ensure that it is correctly positioned in relation to the appliance discharge nozzle during cooking operations.

Components

1. Discharge Nozzles
    a. Discharge nozzles shall be listed for their intended use.
    b. Discharge nozzles shall be provided with an internal strainer or a separate listed strainer located immediately upstream of the nozzle.
    c. Discharge nozzles shall be permanently marked for identification.
2. Protective Covers for Discharge Nozzles
    a. All discharge nozzles shall be provided with caps or other suitable devices to prevent the entrance of grease vapors, moisture, environmental contaminants, or other foreign materials into the piping.
    b. The protection device shall blow off, blow open, or blow out upon agent discharge.
3. Manual Actuators
    a. Manual actuators shall not require a force of more than 40 lbf (178 N) to initiate operation.
    b. Manual actuators shall not require a movement of more than 14 in. (356 mm) to initiate operation.

   c. All manual actuators shall be provided with operating instructions.
      i. These instructions shall be permitted to include the use of pictographs and shall have lettering at least ¼ in. (6.35 mm) in height.
   d. All readily accessible manual operating devices shall identify the hazards they protect.
   e. A placard shall be conspicuously placed near each Class K extinguisher that states that the fire protection system shall be activated prior to using the fire extinguisher.
4. Shutoff Devices
   a. On actuation of any cooking equipment fire extinguishing system, all sources of fuel and electric power that produce heat to all equipment protected by the system shall be shut down.
   b. Gas appliances not requiring protection but located under the same ventilation equipment shall also be shut off.
   c. Solid fuel cooking operations shall not be required to be shut down.
   d. Shutoff devices shall require manual resetting prior to fuel or power being restored.
   e. A hood exhaust fan(s) shall continue to operate after the extinguishing system has been activated unless fan shutdown is required by a listed component of the ventilation system or by the design of the extinguishing system.
   f. When the fire-extinguishing system activates, makeup air supplied internally to a hood shall be shut off.

Assembly

1. During assembly, the piping system shall be examined internally to detect and remove contaminants or other foreign materials.

Approval of Installations

1. General
   a. It shall be verified that the appliances, hoods, and ducts are properly protected with nozzles and positioned in accordance with the manufacturer's design, installation, and maintenance manual.
2. Mechanical Components
   a. It shall be verified that pipe sizes and nozzles are in accordance with the manufacturer's design, installation, and maintenance manual.
   b. It shall be verified that piping supports are securely fastened.
3. Appliances
   a. It shall be verified that the installed appliances are the same and in the same locations as the approved system design.
4. Piping Integrity Test
   a. Prior to the test required by NFPA 17A 6.4.4.2 *[see b. below]*, piping shall be physically checked for tightness.
   b. A test using nitrogen or dry air shall be performed on the piping network at a pressure not to exceed the normal operating pressure of the extinguishing system.
      i. The test is intended to verify that flow is continuous and that the piping and nozzles are reasonably unobstructed. The nitrogen or dry air should be introduced into the piping network at the extinguishing agent container connection using a test cylinder or other suitable source. The quantity of nitrogen or dry air used for this test should be sufficient to verify that each nozzle is unobstructed. Nozzle flow should be verified at each discharge nozzle.

   c. The test shall verify that nitrogen or dry air has discharged out of each nozzle in the system.
   d. The method of verification shall be acceptable to the authority having jurisdiction.
   e. The piping shall not be hydrostatically tested.
5. Building Alarm System
   a. Where the system is connected to a building alarm system, verification that alarm-sounding or notification devices and remote annunciation devices are functional shall be required.
6. Review of Manual Release Devices.
   a. Verification that all manual devices (manual pull stations) are readily accessible and accurately identified shall be required.
7. Releasing Control Panel
   a. Where a releasing control panel is provided, verification that it is connected to a dedicated circuit and labeled properly shall be required.
   b. Where a releasing control panel is provided, verification that it is readily accessible and restricted from unauthorized personnel shall be required.

System Operational Tests

1. System operational tests shall be performed in accordance with the manufacturer's design, installation, and maintenance manual and include functional tests of the automatic detection system, the manual release devices, the gas shutoff, the shutoff of makeup air supplied internally to a hood, and the electrical power shutdown.

Return of System to Operational Condition.

1. Verification that each extinguishing agent storage container is reconnected and the system has been returned to its fully operational condition shall be required.
2. The installing contractor shall complete and sign an acceptance test report acceptable to the authority having jurisdiction.
   a. NFPA 17A Figure A.6.4.10.3 is an example of an acceptance test report *[see Forms]*.

Acceptance Testing Records

1. Summary of all fire protection and life safety system equipment installed including fans, dampers, and control equipment for the suppression system.
2. Accepting testing report for each system installed.
3. Other documentation from A/EOR confirming that all work has been completed.
4. As built drawings including sequence of operations.
5. Identification of the onsite location for acceptance testing records.

Operation and Maintenance Information

1. System component instructions
2. System care and maintenance instructions
   a. The owner shall be provided with a copy of the manufacturer's design, installation, and maintenance manual or the owner's manual.

Routine Inspection, Testing, and Maintenance.

1. The responsibility for inspection, testing, maintenance, and recharge of the fire protection system shall ultimately be that of the owner of the system, provided that this responsibility has not been transferred in written form to a management company, tenant, or other party.
    a. See Chapter 9 in the Port Authority Manual “Inspection, Testing, and Maintenance Requirements for Fire Protection and Life Safety Systems”.
2. Confirm that records of acceptance testing will be kept on site and for the life of the building.
3. Confirm if tasks will be completed by building or facility maintenance, outside contractor, or a combination.
4. Confirm that inspection, testing, and maintenance documentation will be kept on site and available upon request.
5. Confirm that inspection, testing, and maintenance documentation is required to be retained for a minimum of 3 years.

Dry Chemical Fire-Extinguishing Systems

This section has been retained in the event that a new dry chemical system is compliant with the listing standard.

1. Dry chemical fire-extinguishing systems for commercial kitchen hood, duct, and cooking appliances shall comply with ANSI/UL 300, Fire Testing of Fire Extinguishing Systems for Protection of Commercial Cooking Equipment, or equivalent listing standard.
    a. Fixed automatic dry chemical extinguishing systems shall be installed in accordance with the terms of the listing, the manufacturer’s design, installation, and maintenance manual, and this standard.
2. Each protected cooking appliance(s), individual hood(s), and branch exhaust duct(s) directly connected to the hood shall be protected by a system or systems designed and installed for simultaneous operation.
    a. At least one fusible link or heat detector shall be installed within each exhaust duct opening in accordance with the manufacturer’s listing.
    b. A fusible link or heat detector shall be provided above each protected cooking appliance and in accordance with the extinguishing system manufacturer’s listing.
    c. Systems protecting two or more hoods, plenums, or both that meet the requirements of NFPA 17 Section 5.2 shall be installed to ensure the simultaneous operation of all systems protecting the hoods, plenums, or both and associated cooking appliances located below the hoods.

3. Protection of Common Exhaust Duct
   a. Common exhaust ducts shall be protected by one of the following methods:

      (1) *Simultaneous operation of all independent hood, duct, and appliance protection systems

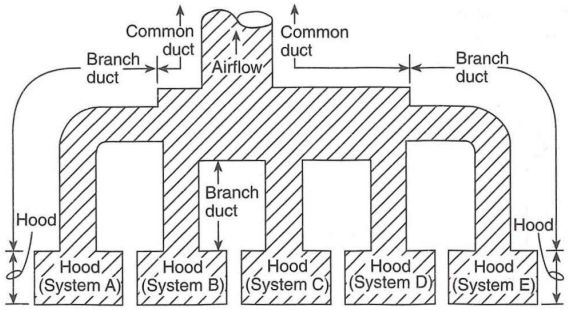

FIGURE A.9.3.4.1(1) Simultaneous Operation of All Systems.

      (2) *Simultaneous operation of any hood, duct, and appliance protection system and the system(s) protecting the entire common exhaust duct

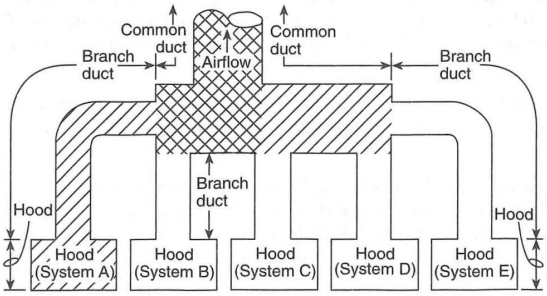

FIGURE A.9.3.4.1(2)(a) Simultaneous Operation of a Single Cooking Appliance, Hood, or Branch Duct System and the System Protecting the Common Duct.

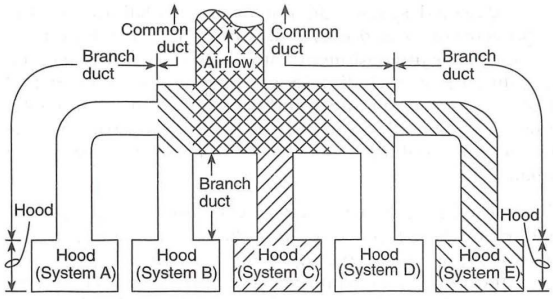

FIGURE A.9.3.4.1(2)(b) Simultaneous Operation of Two Systems in Which One Also Provides Common Duct Protection.

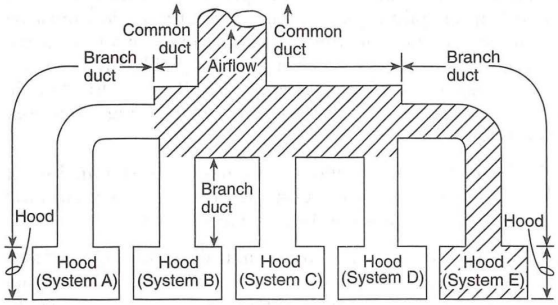

FIGURE A.9.3.4.1(2)(c) Independent Operation of a System That Protects a Hood and the Common Duct.

   b. A fusible link or other mechanically operated heat detection device from the common duct fire-extinguishing system shall be located at each branch duct–to–common duct connection where electrical operation of the common duct fire-extinguishing system does not meet the requirements of NFPA 17 9.6.1.
   c. Where a fusible link or mechanically operated heat detector is located at a branch duct–to–common duct connection, an access panel shall be installed in accordance with NFPA 96 to enable servicing of the detector when the detector is not accessible from the branch duct connection to the exhaust hood.

4. All sources of fuel or heat to appliances served by the common exhaust duct shall be shut down upon actuation of any protection system in accordance with NFPA 17 9.3.5.
5. The building owner(s) or the owner's agent shall be responsible for the protection of a common exhaust duct(s) used by more than one tenant.
    a. The tenant shall be responsible for the protection of a common exhaust duct(s) serving hoods located within the tenant's space and up to the point of connection to the building owner's common exhaust duct.
    b. The tenant's common duct shall be considered a branch duct to the building owner's common duct.
6. Shutoff Devices
    a. Upon actuation of any cooking equipment fire-extinguishing system, all sources of fuel and electric power that produce heat to all equipment protected by the system shall be shut down.
        i. Exhaust fans do not need to be shut down or to have dampers closed upon system actuation, since the systems have been tested under both zero and high-velocity flow conditions.
        ii. Exhaust fans and dampers shall not be required to be shut down upon system actuation.
        iii. Any gas appliance not requiring protection but located under the same ventilating equipment shall be automatically shut off upon actuation of any extinguishing system.
        iv. Shutoff devices shall require manual resetting prior to fuel or power being restored.
        v. Where fixed automatic fire-extinguishing systems are interconnected or interlocked with the cooking equipment power sources so that if the fire-extinguishing system becomes inoperable due to power failure, all sources of fuel and heat to all cooking equipment serviced by that hood shall automatically shut off, and electrical power monitoring shall not be required.

FORMS

WET CHEMICAL SYSTEM ACCEPTANCE TEST REPORT

Property Information

Building name: _____

Address: _____

Building owner: _____

Address: _____

Phone/Fax/E-mail: _____

Designer/Installer Information

Company name: _____

Address: _____

Contact person: _____

Phone/Fax/E-mail: _____

Description of hazard protected: _____

_____

System manufacturer/model: _____

System Check or Test	Results
Installation in accordance with approved plans, where required, and manufacturer's design, installation, and maintenance manual	
Piping test (6.4.4.2)	
Proper labeling (6.4.5)	
Proper alarm operation (6.4.6)	
Manual release accessibility (6.4.7)	
Releasing control panel (6.4.9)	
Automatic detection & manual release (6.4.8)	
System properly charged and left in normal "set" condition (6.4.10)	
Manual left with owner (6.4.10.4)	
Date system left in service:	

Test Witnessed By:

_____ _____ _____
Owner/Authorized agent Title Date

_____ _____ _____
Installing contractor Title Date

Additional comments:

_____

_____

_____

 NFPA 17A

FIGURE A.6.4.10.3 Sample Wet Chemical System Acceptance Test Report.

This summary is provided as a general guideline for acceptance testing and does not ensure coverage for all systems and equipment. This summary is intended to provide support for inspection staffs but the information included should not be construed as the only requirements for the systems and equipment. Codes and standards should be reviewed to confirm that all requirements are completed.

CHAPTER 9
CLEAN AGENT SYSTEMS

Contents

Approved plans.

1. New installation or modification.
2. No outstanding rider comments from QAD Design Standards.
3. Confirmation that installation has been completed as per approved drawings.
4. Plans (shop drawings) are on site and available to inspection staff.

System Acceptance Testing

1. The system shall be tested in accordance with the requirements of this standard and the manufacturer's design, installation, and maintenance manual.
2. Equipment shall be inspected to verify that it is installed in accordance with the manufacturer's instructions and the system design documents.
3. The actual hazard dimensions shall be checked against those indicated on the system drawings to verify the quantity of agent.
4. The weight of agent in the containers shall be verified by weighing or other approved methods.
5. When applicable for system operation, fan coastdown and damper closure time shall be verified that they are in accordance with the system design criteria.
6. When required by project specifications, integrated fire protection and life safety system testing shall be in accordance with NFPA 4.

Review of Mechanical Components.

1. The piping distribution system shall be inspected to determine that it is in compliance with the design and installation documents.
2. Nozzles and pipe size shall be in accordance with system drawings.
3. Piping joints, discharge nozzles, and piping supports shall be securely fastened to prevent unwanted vertical or lateral movement during discharge.
4. Discharge nozzles shall be installed in such a manner that piping cannot become detached during discharge.
5. During assembly, the piping distribution system shall be inspected internally to detect the possibility of any oil or particulate matter soiling the hazard area or affecting the agent distribution due to a reduction in the effective nozzle orifice area.
6. The discharge nozzle shall be oriented in accordance with the nozzle listing.
7. If nozzle deflectors are installed, they shall be positioned per the equipment listing.
8. The discharge nozzles, piping, and mounting brackets shall be installed in such a manner that they will not potentially cause injury to personnel.
9. Agent shall not directly impinge on areas where personnel could be found in the normal work area.
10. Agent shall not directly impinge on any loose objects or shelves, cabinet tops, or similar surfaces where loose objects could be present and become projectiles.
11. The pipe system shall be pressure-tested in a closed circuit using nitrogen or other dry gas.
    a. The pipe shall be pressurized to at least 40 psi (276 kPa).
    b. After removing the source of pressurizing gas, the pressure in the pipe shall not be less than 80 percent of the test pressure after 10 minutes.
12. A flow test using nitrogen or an inert gas shall be performed on the piping network to verify that flow is continuous.
    a. The purpose is to conduct a flow test of short duration (also known as a "puff test") through the piping network to determine that the flow is continuous and to check that valves are oriented in accordance with the system documentation.
    b. The flow test should be performed using gaseous nitrogen or an inert gas at a pressure not to exceed the normal operating pressure of the clean agent system.
    c. The nitrogen or an inert gas pressure should be introduced into the piping network at the clean agent container connection.
    d. Visual indicators should be used to verify that nitrogen or an inert gas has discharged out of each and every nozzle in the system.

Review of Electrical Components.

1. All wiring systems shall be installed in compliance with local codes and the system drawings.
2. All field circuits shall be free of ground faults and short circuits.
3. Power shall be supplied to the control unit from a separate dedicated source that will not be shut down upon system operation.
4. Adequate and reliable primary and 24-hour minimum standby sources of energy shall be used to provide for operation of the detection, signaling, control, and actuation requirements of the system.
5. All auxiliary functions such as alarm-sounding or displaying devices, remote annunciators, air-handling shutdown, and power shutdown shall be checked for operation in accordance with system requirements and design specifications.
6. The detection devices shall be checked for type and location as specified on the system drawings.
7. Detectors shall not be located near obstructions or air ventilation and cooling equipment that would affect their response characteristics.

Review of Enclosure Integrity.

1. It shall be determined that the protected enclosure is in general conformance with the construction documents.
2. All total flooding systems shall have the enclosure examined and tested to locate and then effectively seal any significant air leaks that could result in a failure of the enclosure to hold the specified agent concentration level for the specified holding period.
3. Quantitative results shall be obtained and recorded to indicate that the specified agent concentration for the specified duration of protection is in compliance with NFPA 2001 Section 5.6, using an approved blower fan unit or other means as approved by the authority having jurisdiction. (For guidance, see NFPA 2001 Annex C.)
    a. The leakage and predicted retention time of an enclosure can be determined using the procedure in NFPA 2001 Annex C, Enclosure Integrity Procedure, or by an alternative method that can be used to obtain an equivalent quantitative result. The currently preferred method is using a blower door fan unit and smoke pencil.

Manual Pull Stations.

1. Manual pull stations shall be securely mounted.
2. The operable part of a manual pull station shall be not less than 42 in. (1.07 m) and not more than 48 in. (1.22 m) from the finished floor.
3. Manual pull stations shall be installed so that they are conspicuous, unobstructed, and accessible.
4. All manual pull stations shall be identified as to the hazard they protect, the function they perform, and their method of operation.
    a. Particular care should be taken where manual release devices for more than one system are in close proximity and could be confused or the wrong system actuated. Manual stations in this instance should be clearly identified as to which zone or extinguishing area they affect.
5. All manual stations used to release agents shall require two separate and distinct actions for operation.

Systems with Main/Reserve Capability.

1. For systems with a main/reserve capability, the main/reserve switch shall be installed in accordance with the system manufacturer's design, installation, and maintenance manual and the system drawings.
2. If installed, the main/reserve switch shall be identified.

Systems Using Abort Switches.

1. Abort switches shall be of the deadman type requiring constant manual pressure.
2. Switches that remain in the abort position when released shall not be used for this purpose.
3. Abort switches shall be installed so that they are readily accessible within the hazard.
4. Abort switches shall be securely mounted.
5. Abort stations shall be installed so they are conspicuous, unobstructed, and accessible.
6. The operable part of an abort switch shall be not less than 42 in. (1.07 m) and not more than 48 in. (1.22 m) from the finished floor.
7. Manual pull stations shall always override abort switches.
8. The releasing control unit shall be installed in accordance with the system documentation and readily accessible.

Preliminary Functional Tests.

1. Each agent storage container release mechanism shall be disabled or replaced with a functional device so that activation of the release circuit will not release agent.
2. Each detector shall be tested for operation.
3. All polarized alarm devices and auxiliary relays shall be checked for polarity in accordance with the manufacturer's instructions.
4. Initiating and notification circuits shall be checked for end-of-line devices, if required.
5. All supervised circuits shall be tested for trouble response.

System Functional Operational Test.

1. Each detection initiating circuit shall be operated to verify that all alarm functions occur according to design specifications.
2. Each manual release shall be operated to verify that manual release functions occur according to design specifications.
3. Each abort switch circuit shall be operated to verify that abort functions occur according to design specifications and that visual and audible supervisory signals are annunciated at the control panel.
4. All automatic valves shall be tested to verify operation unless testing the valve will release agent or damage the valve (destructive testing).
5. Pneumatic equipment, where installed, shall be tested for integrity to ensure operation.

Remote Monitoring Operations.

1. Each type of initiating device shall be operated while on standby power to verify that an alarm signal is received at the remote panel after the device is operated.
2. A fault condition shall be applied to each initiating or notification circuit to verify receipt of a trouble condition at the remote station.
3. Each supervised device shall be operated to verify receipt of a supervisory condition at the remote station.

Control Panel Primary Power Source

1. A primary power failure shall be initiated in accordance with the manufacturer's specification to verify that the system operates on standby power.

Return of System to Operational Condition

1. When functional testing is completed, the system shall be returned to its fully operational condition.
2. The alarm-receiving office and all concerned personnel at the end user's facility shall be notified that the fire system test is complete and that the system has been returned to full service condition.

Acceptance Test Report

1. The acceptance testing required shall be documented in a test report.
   a. A sample test report is available *[see Forms]*. An alternative form that ensures that all the applicable design, operational, and safety requirements of this standard are documented to the satisfaction of the authority having jurisdiction can be used.
   b. Upon completion of a door fan test, a written test report should be prepared for the authority having jurisdiction and made part of the permanent record. The test report should include the following:
      i. Date, time, and location of the test
      ii. Names of witnesses to the test
      iii. Room dimensions and volume
      iv. All data generated during the test, including computer printouts
      v. Descriptions of any special techniques utilized by the testing technician (e.g., use of optional ceiling neutralization and temporary sealing of suspended ceiling)
      vi. In case of technical judgment, a full explanation and documentation of the judgment
      vii. Test equipment make, model, and serial number
      viii. Copy of current calibration certificate of test equipment
      ix. Name and affiliation of the testing technician and signature
2. The acceptance test report shall be maintained by the system owner for the life of the system.

Training.

1. All persons who could be expected to operate fire extinguishing systems shall be trained and kept trained in the functions they are expected to perform.
2. Personnel working in an enclosure protected by a clean agent shall receive training regarding agent safety issues.

Acceptance Testing Records

1. Summary of all fire protection and life safety system equipment installed including fans, dampers, and control equipment for the clean agent system.
2. Accepting testing report for each system installed.
3. Other documentation from A/EOR confirming that all work has been completed.
4. As built drawings including sequence of operations.
5. Identify the onsite location for acceptance testing records.

This summary is provided as a general guideline for acceptance testing and does not ensure coverage for all systems and equipment. This summary is intended to provide support for inspection staffs but the information included should not be construed as the only requirements for the systems and equipment. Codes and standards should be reviewed to confirm that all requirements are completed.

Operations and Maintenance Information

1. System component instructions
2. System care and maintenance instructions
3. Paper or electronic copies of all test reports and related documentation shall be provided to the system owner.
   a. Acceptance testing report
   b. The system owner shall maintain these reports for the life of the system.

Routine Inspection, Testing, and Maintenance

1. The responsibility for inspection, testing, maintenance, and recharging of the fire protection system shall ultimately be that of the owner(s) of the system, provided that this responsibility has not been transferred in written form to a management company, tenant, or other party.
   a. See Chapter 10 in the Port Authority Manual “Inspection, Testing, and Maintenance Requirements for Fire Protection and Life Safety Systems”.
2. Confirm that records of acceptance testing will be kept on site and for the life of the building.
3. Confirm if tasks will be completed by building or facility maintenance, outside contractor, or a combination.
4. Confirm that inspection, testing, and maintenance documentation will be kept on site and available upon request.
5. Confirm that inspection, testing, and maintenance documentation is required to be retained for a minimum of 3 years.

FORMS

Clean Agent System Acceptance Test Report

PROCEDURE
Upon completion of work, an inspection and test shall be made by the contractor's representative and witnessed by an owner's representative. All defects shall be corrected and the system left in service before the contractor's personnel leave the job. A certificate shall be filled out and signed by both representatives. Copies shall be prepared for approving authorities, owners, and contractor. It is understood the owner's representative's signature in no way prejudices any claim against the contractor for faulty material, poor workmanship, or failure to comply with approving authority's requirements or local ordinances.

Property name		Date	
Property address			
Plans	Accepted by approving authorities (names)		
	Address		
	Installation conforms to accepted plans	❑ Yes	❑ No
	Equipment used is approved If no, state deviations	❑ Yes	❑ No
Instructions	Person in charge of fire equipment has been instructed as to location of control valves and care and maintenance of this new equipment If no, explain	❑ Yes	❑ No
	Copies of appropriate instructions and care and maintenance charts have been left on premises If no, explain	❑ Yes	❑ No
Enclosure	Enclosure in conformance with construction documents If no, explain	❑ Yes	❑ No
	Enclosure integrity report received and approved	❑ Yes	❑ No
Mechanical equipment	System type	❑ Total flooding	❑ Local app.
	Agent storage containers properly located (in accordance with approved system drawings)	❑ Yes	❑ No
	Storage containers and mounting brackets fastened securely	❑ Yes	❑ No
	Piping, equipment, and discharge nozzles proper size and location	❑ Yes	❑ No
	Pipe size reduction and tee fitting position in conformance with design drawings	❑ Yes	❑ No
	Piping joints, discharge nozzles, and pipe supports securely fastened	❑ Yes	❑ No
	Discharge nozzle orientation in conformance with approved design drawings	❑ Yes	❑ No
	Nozzle deflectors (if installed) orientation in conformance with approved design drawings	❑ Yes	❑ No
	Location of alarms and manual emergency releases acceptable	❑ Yes	❑ No
	Current hazard configuration comparable to original configuration	❑ Yes	❑ No
	Enclosure test report received	❑ Yes	❑ No
	All installed equipment listed for use	❑ Yes	❑ No
Electrical equipment	Proper operation verified for all auxiliary functions including alarm-sounding or displaying devices, remote annunciators, air-handling shutdown, and power shutdown	❑ Yes	❑ No
	Main/reserve transfer switch installed properly, readily accessible, and clearly identified	❑ Yes	❑ No
	Type and location of all detection devices verified	❑ Yes	❑ No
	Manual pull stations installed properly, readily accessible, accurately identified, and protected to prevent damage	❑ Yes	❑ No
Pipe and fittings	Piping pneumatically tested to 40 psi (276 kPa) for 10 minutes	❑ Yes	❑ No
	Pipe conforms to Standard	❑ Yes	❑ No
	Fittings conform to Standard	❑ Yes	❑ No
	If no, explain		
Pre-functional tests	Each detector checked for proper response	❑ Yes	❑ No
	Polarity verified for all polarized alarm devices and auxiliary relays	❑ Yes	❑ No
	EOL resistors installed across all alarm and detection circuits (where required)	❑ Yes	❑ No
	Proper trouble response verified for all supervised circuits	❑ Yes	❑ No

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Δ FIGURE A.7.3.1 Sample Acceptance Test Report.

Clean Agent System Acceptance Test Report (Continued)

Operational test	Puff test completed and continuous flow and unobstructed piping and nozzles verified	❑ Yes	❑ No
	Alarm functions verified following detection initiation	❑ Yes	❑ No
	Manual release functions according to design specifications	❑ Yes	❑ No
	Abort switch functions according to design specifications	❑ Yes	❑ No
	Automatic valves tested and operation verified	❑ Yes	❑ No
	All pneumatic equipment tested and verified	❑ Yes	❑ No
	Full operational test for single or multiple hazards	❑ Yes	❑ No
	Weight before and after discharge	_____ lb	_____ kg
	For inert gas systems — pressure before and after discharge	_____ psi	_____ kPa
	Remote Monitoring	❑ Yes	❑ No
	Alarm signal from each input device on stand-by owner verified	❑ Yes	❑ No
	Trouble signal verified for each alarm condition on each signal circuit	❑ Yes	❑ No
	Control panel primary power source	❑ Yes	❑ No
	Control panel connected to a dedicated circuit	❑ Yes	❑ No
	Control panel labeled properly	❑ Yes	❑ No
	Control panel readily accessible	❑ Yes	❑ No
	Control panel secured from unauthorized access	❑ Yes	❑ No
	System returned to fully operational design condition	❑ Yes	❑ No
Signatures	Name of installing contractor: _____		
	Tests witnessed by:		
	For property owner: Title: _____ Date: _____		
	For contractor: Title: _____ Date: _____		
Notes:			

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▲ FIGURE A.7.3.1 *Continued*

CHAPTER 10
FIRE DOORS, SMOKE DOORS, AND OTHER OPENING PROTECTIVES

Contents

Approved plans

1. No outstanding rider comments from QAD Design Standards.
2. Confirmation that installation has been completed as per approved drawings.
3. Plans (shop drawings) are on site and available to inspection staff.

Identification

1. Prior to scheduling acceptance inspection, installing contractor(s) are required to provide list of all:
   a. Fire rated doors
   b. Smoke doors
   c. Fire shutters
   d. Fire dampers
   e. Smoke dampers
   f. Combination fire/smoke dampers
   g. Fire windows
   h. Fire curtains
2. Prior to scheduling acceptance inspection, the A/EOR is required to provide:
   a. Report identifying that all fire doors, smoke doors, and other opening protectives have been inspected and operationally tested as required.

Installation

1. Upon completion of the installation, door, shutters, and window assemblies shall be inspected and tested.
2. A record of all inspections and testing shall be signed by the inspector and kept for inspection by the AHJ.
3. Records of acceptance tests shall be retained for the life of the assembly.
4. The records shall be on a medium that will survive the retention period. Paper or electronic media shall be permitted.
5. A record of all inspections and testing shall be provided that includes, but is not limited to, the following information:
   a. Date of inspection
   b. Name of facility
   c. Address of facility
   d. Name of person(s) performing inspections and testing
   e. Company name and address of inspecting company
   f. Signature of inspector of record
   g. Individual record of each inspected and tested fire door assembly
   h. *Opening identifier and location of each inspected and tested fire door assembly
   i. *Type and description of each inspected and tested fire door assembly
   j. *Verification of visual inspection and functional operation
   k. Listing of deficiencies in accordance with NFPA 80 5.2.3 *[included within this chapter]*, NFPA 80 Section 5.3, and NFPA 80 Section 5.4

Acceptance Testing – General

1. Acceptance testing of fire door and window assemblies shall be performed by a qualified person with knowledge and understanding of the operating components of the type of assembly being subject to testing.

This summary is provided as a general guideline for acceptance testing and does not ensure coverage for all systems and equipment. This summary is intended to provide support for inspection staffs but the information included should not be construed as the only requirements for the systems and equipment. Codes and standards should be reviewed to confirm that all requirements are completed.

2. Before testing, a visual inspection shall be performed to identify any damaged or missing parts that can create a hazard during testing or affect operation or resetting.
3. Acceptance testing shall include the closing of the door by all means of activation.
4. A record of these inspections and testing shall be made in accordance with NFPA 80 5.2.2.

Closing Devices – General

1. All fire doors, fire shutters, and fire window assemblies shall be inspected and tested to check for proper operation and full closure.
2. Resetting of the automatic-closing device shall be done in accordance with the manufacturer's instructions.

Classifications and Types of Doors

1. Only labeled fire doors shall be used.
   a. Doors are of several classifications, types, and methods of operation. Fire door assemblies consist of individually labeled components that are essential to the satisfactory performance of the complete assembly. Some labels cover one or more components in addition to the door. *[For specific information, see NFPA 80 4.3.2 and Annex D.]*
2. Swinging fire doors shall be permitted to be furnished separately from labeled door frames and builders hardware if the complete fire door assembly, including the door, frame, and builders hardware, comprises a labeled fire door assembly.
3. Fire doors furnished with or prepared for fire exit hardware shall bear a label stating "Fire Door to Be Equipped with Fire Exit Hardware."
4. The label described in NFPA 80 4.3.3 *[#3 above]* shall address the reinforcements necessary for the fire exit hardware, and the complete fire door assembly shall have been tested for egress panic load requirements.
5. Rolling steel fire doors shall be labeled and shall be furnished as a complete assembly that includes curtain, bottom bar, barrel, guides, brackets, hood, automatic closing device, vision lights, and any other components required by their listing for a complete assembly.
6. Elevator doors shall be in accordance with NFPA 80 Section 14.2.
7. Access-type door assemblies shall consist of single swinging steel doors with frames, self-latching devices, and closing mechanisms.
8. Service counter doors shall be of the single- or two-speed counterbalanced types of flush design or the rolling steel type of formed steel and shall include wall guides, frame, sill, latching, and counterbalancing mechanism.

Classification of Hardware for Fire Doors

1. Hardware required for the installation of all types of fire doors shall be as specified in those sections covering installation.
2. Hardware for fire doors shall be referred to as builders hardware or fire door hardware.
   a. Fire exit hardware shall be within the category of builders hardware.
3. In this standard, builders hardware shall be applied only to swinging doors.
   a. Builders hardware shall include hinges (full mortise, half mortise, half surface, full surface, olive knuckle, paumelle, or spring), single-, two-, or three-point locks and latches, top and bottom bolts (flush, surface, or concealed), and door closers.
   b. See NFPA 80 Figure A.4.6.3.1(a) through Figure A.4.6.3.1(h). *[see Reference A]*
4. Builders hardware shall not be required to be shipped from the factory with the fire doors.

5. Fire exit hardware shall consist of exit devices that have been labeled for both fire and panic protection.
   a. See NFPA 80 Figure A.4.6.3.1(c) and Figure A.4.6.3.1(d). *[see Reference A]*
6. Fire door hardware shall be applied to both swinging and sliding doors.
   a. See NFPA 80 Figure A.4.6.4(a) through Figure A.4.6.4(h). *[see Reference B]*
7. Fire door hardware that is applied to swinging doors shall consist of surface-mounted strap hinges, surface-applied latches, and closing devices.
8. In this standard, all hardware for sliding doors shall be fire door hardware.
9. Fire door hardware shall be shipped from the factory with the fire door.

Swinging Doors with Builders Hardware or Fire Door Hardware – General

1. Fire door assemblies shall be visually inspected from both sides to assess the overall condition of door assembly.
2. As a minimum, the following items shall be verified:
   a. Labels are clearly visible and legible.
   b. No open holes or breaks exist in surfaces of either the door or frame.
   c. Glazing, vision light frames, and glazing beads are intact and securely fastened in place, if so equipped.
   d. The door, frame, hinges, hardware, and noncombustible threshold are secured, aligned, and in working order with no visible signs of damage.
   e. No parts are missing or broken.
   f. Door clearances do not exceed clearances listed in NFPA 80 4.8.4 and 6.3.1.7 *[see Reference C]*.
   g. The self-closing device is operational; that is, the active door completely closes when operated from the full open position.
   h. If a coordinator is installed, the inactive leaf closes before the active leaf.
   i. Latching hardware operates and secures the door when it is in the closed position.
   j. Auxiliary hardware items that interfere or prohibit operation are not installed on the door or frame.
   k. No field modifications to the door assembly have been performed that void the label.
   l. Meeting edge protection, gasketing and edge seals, where required, are inspected to verify their presence and integrity.
   m. Signage affixed to a door meets the requirements listed in NFPA 80 4.1.4.

Swinging Doors with Builders Hardware

1. Mounting of Doors.
   a. Swinging composite, hollow metal, flush sheet metal, metal-clad (kalamein), and wood core doors with builders hardware shall be flush mounted in labeled door frames.
2. Operation of Doors.
   a. All swinging doors shall be closed and latched at the time of fire.
3. The operation of doors shall be divided into the following categories:
4. Self-closing doors
5. Automatic-closing doors
6. Power-operated fire doors
7. Self-Closing Doors.
   a. Self-closing doors shall swing easily and freely and shall be equipped with a closing device to cause the door to close and latch each time it is opened.
   b. The closing mechanism shall not have a hold-open feature.

8. Automatic-Closing Doors.
    a. Automatic-closing doors shall be permitted to close automatically by means of the installation of a closing device and one of the following:
9. A separate, labeled, fail-safe door holder/release device or a hold-open mechanism that shall be permitted to be an integral part of the basic closing device
10. An integral closing device that allows the door to swing freely and that automatically closes the door during an alarm condition, provided the hold-open mechanisms are released by one or a combination of automatic fire detectors acceptable to the AHJ
    a. The fire door shall latch upon closure.
11. Power-Operated Fire Doors.
    a. Power-operated fire doors shall be equipped with a releasing device that shall automatically disconnect the power operator at the time of fire, allowing a self-closing or automatic device to close and latch the door regardless of power failure or manual operation.
12. Door Frames.
    a. Only labeled door frames shall be used.
    b. Door frames intended for drywall installation shall be of the flush butt–mounted or wrap-around type, and anchors shall be secured in accordance with the manufacturer's instructions.
    c. Door frames provided with expansion bolt–type anchors shall be installed in masonry walls only.
    d. Steel-faced composite, hollow metal, metal-clad (kalamein), and flush sheet metal doors shall be installed in pressed steel or steel channel frames.
13. Closing Devices.
    a. Unless otherwise permitted by the AHJ, a closing device shall be installed on every fire door.
    b. All components of closing devices used shall be attached securely to doors and frames by steel screws or through-bolts.
    c. All closing mechanisms shall be adjusted to overcome the resistance of the latch mechanism so that positive latching is achieved on each door operation.
        i. Adequate spring power is essential for hydraulic door closers to close a fire door with sufficient force to overcome the resistance of the latching mechanism. However, too much spring power causes opening resistance and makes it difficult for the handicapped, the infirm, and young children to open doors.
        ii. Spring hinges shall be adjusted to achieve positive latching when the door is allowed to close freely from an open position of no more than 30 degrees.
14. Coordinating Device.
    a. Where there is an astragal or projecting latch bolt that prevents the inactive door from closing and latching before the active door closes and latches, a coordinating device shall be used.
    b. A coordinating device shall not be required where each door closes and latches independently of the other.
15. Door Holder/Release Devices.
    a. Door holder/release devices shall be installed in accordance with the manufacturer's instructions and only in conformance with the individual manufacturer's published listings.
        i. Labeled door holder/release devices for swinging doors should, wherever possible, be installed at the top of the door as close as possible to the lock edge and should be located to avoid interference with any other hardware. If

necessary, the holder/release can be permitted to be located at the bottom of the door as close as possible to the lock edge, with the device installed on the wall or floor.

b. Where door holder/release devices are used, they shall be labeled.

16. Locks or Latches
    a. Only labeled locks and latches or labeled fire exit hardware (panic devices) meeting both life safety requirements and fire protection requirements shall be used.
    b. Fire exit hardware shall be installed only on fire doors bearing a label stating “Fire Door to Be Equipped with Fire Exit Hardware.”
    c. Fire exit hardware shall be labeled for both fire and panic.
    d. Fire exit hardware shall have a permanently attached label that bears the serial number and shows the manufacturer's name and type of approval.
    e. The label shall differentiate between panic hardware, which is not acceptable for use on fire doors, and fire exit hardware.
    f. Where both leaves are required for exit purposes, they shall be provided with labeled fire exit hardware.

Swinging Doors with Fire Door Hardware

1. The doors shall swing easily and freely on their hinges.
2. The latches shall operate freely.
3. Door Frames
    a. Frames for Lap-Mounted Doors.
        i. Frames shall not be required for lap-mounted doors.
    b. Frames for Flush-Mounted Doors.
        i. Only labeled frames of the structural steel type shall be used for flush-mounted doors.
        ii. The frames shall be erected before the wall is built.
4. Fire Door Hardware.
    a. Only labeled fire door hardware shall be used.
    b. Components. Fire door hardware shall include hinge brackets, hinges, latches, latch keepers, and operating handle mechanisms, and hardware for an inactive door or pairs of doors shall include top and bottom bolts and keepers.

Horizontally Sliding, Vertically Sliding, and Rolling Doors – General

1. Fire door assemblies shall be visually inspected from both sides to assess the overall condition of door assembly.
2. At a minimum, the following items shall be verified:
    a. Labels are clearly visible and legible.
    b. No open holes or breaks exist in surfaces of either the door or the frame.
    c. Slats, endlocks, bottom bar, guide assembly, curtain entry, hood, and flame baffle are correctly installed and intact for rolling steel fire doors.
    d. Glazing, vision light frames, and glazing beads are intact and securely fastened in place, if so equipped.
    e. Curtain, barrel, and guides are aligned, level, plumb, and true for rolling steel fire doors.
    f. Expansion clearance is maintained in accordance with the manufacturer’s listing.
    g. Drop release arms and weights are not blocked or wedged.
    h. Mounting and assembly bolts are intact and secured.

i. Attachments to jambs are with bolts, expansion anchors, or as otherwise required by the listing.
j. Smoke detectors, if equipped, are installed and operational.
k. No parts are missing or broken.
l. *Fusible links, if equipped, are in the correct location; chain/cable, s-hooks, eyes, and so forth, are in good condition; the cable or chain is not kinked, pinched, twisted, or inflexible; and links are not painted or coated with dust or grease.
m. Auxiliary hardware items that interfere or prohibit operation are not installed on the door or frame.
n. No field modifications to the door assembly have been performed that void the label.
o. Doors have an average closing speed of not less than 6 in./sec (152 mm/sec) or more than 24 in./sec (610 mm/sec).

3. Fusible links should not be coated with any materials such as fireproofing, drywall compound, or spray texturing.
   a. Some older sliding doors were installed with rope in lieu of cable. If the rope needs to be replaced, it should be replaced with a rope of the same size and type.

Horizontally Sliding Doors

1. Door Panels
   a. Door panels shall be permitted to be a single section or multiple sections.
   b. Tin-clad and metal-clad (kalamein) doors shall not be furnished in more than two sections.
   c. Personnel swinging-type pass doors shall be permitted to be used if tested with the sliding door and listed in the manufacturer's individual published listing.
   d. Pass doors shall be provided with hinges, latchset, spring hinges, or closer.
2. Mounting of Doors
   a. Horizontally sliding doors shall be wall mounted in a track attached to a wall or bottom roller mounted with a top guide in accordance with the manufacturer's instructions and individual published listing.
3. Lap.
   a. Unless tested otherwise, doors shall lap openings at least 4 in. (102 mm) at the sides and top.
   b. Biparting doors shall have an astragal securely attached in place so as to project a minimum of ¾ in. (19.05 mm) unless otherwise required or permitted in the individual manufacturer's published listing.
4. Closing Devices
   a. Doors shall be equipped with self-closing or automatic-closing devices to ensure that they shall close or be closed at the time of a fire.
   b. Closing devices shall be a system of weights or a listed closing device.
5. Closing Speed
   a. The average closing speed shall be not less than 6 in./sec (152 mm/sec), not including any initial delay time.
   b. In buildings where access by the general public is not restricted, the average closing speed for doors used shall be not more than 24 in./sec (610 mm/sec).
6. Releasing Devices
   a. Power-operated doors not equipped with standby or emergency power shall be equipped with an integral or a separate listed releasing device that shall automatically disconnect the door from the control of the power operator at the time of a fire.

b. The releasing device shall be activated at the time of the fire by detectors or fusible links installed on both sides of the wall and interconnected so that the operation of the single detector or fusible link shall allow the door to be disconnected and closed.
c. If closing is achieved by power operation, standby or emergency power shall be provided.
d. The standby or emergency power source shall have capacity to operate a minimum of 50 closing cycles of the door.
e. If door opening also is achieved by power operation, the standby or emergency power source shall have capacity to operate a minimum of 50 opening and closing cycles of the door.
f. Power operation shall not allow opening if temperatures on either side of the door reach 500°F (260°C).

Special-Purpose Horizontally Sliding Accordion or Folding Doors

1. Doors
   a. Horizontally sliding accordion or folding doors shall be ceiling or wall mounted in track or tracks attached to a lintel or wall in accordance with the manufacturer's instructions and individual published listings.
   b. Doors shall lap the opening if mounted completely on the surface of the wall or shall extend across the opening if ceiling mounted or surface mounted.
   c. Doors shall completely close the opening.
2. Closing Devices
   a. Doors shall be self-closing or automatic-closing and shall not have a delay in the initiation of closing or reclosing of more than 10 seconds.
   b. The average closing speed shall be not less than 6 in./sec (152 mm/sec) or more than 24 in./sec (610 mm/sec).
3. Power Operators
   a. Where used in a means of egress, only labeled power operators listed in a category intended to facilitate safe egress of persons in case of emergency shall be used.
   b. The power operator shall be rated for continuous use with unlimited duty cycle.
   c. If closing is achieved by power operation, standby or emergency power shall be provided.
   d. The standby or emergency power source shall have capacity to operate a minimum of 50 closing cycles of the door.
   e. If door opening also is achieved by power operation, the standby or emergency power source shall have capacity to operate a minimum of 50 opening and closing cycles of the door.

Vertically Sliding Fire Doors

1. Closing Devices
   a. Vertically sliding sectional doors shall close automatically upon operation of a fusible link or detector that releases the overhead sectional door, and the governor shall control the rate of descent.
   b. Vertically sliding doors shall have an average closing speed of not less than 6 in./sec (152 mm/sec) or more than 24 in./sec (610 mm/sec).
2. Automatic Closers
   a. Automatic-closing, vertically sliding doors shall be suspended by a system of weights and ropes, wire cables, or chains over pulleys.

b. All weights shall be enclosed in a substantial metal enclosure for the entire length of travel.
c. Pulleys over which the weight cable or chain passes shall be shielded to prevent the cable or chain from jumping off the pulley.

Rolling Steel Fire Doors

1. Rolling steel fire doors shall be drop-tested twice.
   a. The first test shall be to check for proper operation and full closure.
   b. A second test shall be done to verify that the automatic-closing device has been reset correctly.
   c. Fusible links, release devices, and any other moveable parts shall not be painted or coated with other materials that could interfere with the operation of the assembly.
      i. Movable parts of the door assembly can include, but are not limited to, stay rollers, gears, and closing mechanisms.
2. Openings
   a. Fire door frames shall not be required for rolling steel fire door installations.
   b. Access to, and clearances between, surrounding construction and a rolling steel fire door shall allow for required testing and maintenance.
3. Closing Devices
   a. An automatic-closing device shall be installed on every rolling steel door.
   b. Rolling steel doors shall close automatically upon activation or release of a fusible link or detector.
   c. After automatic closing, the bottom bar shall come to rest in the closed position.
   d. A governor, where provided, shall control the rate of descent of the door curtain during automatic closing.
   e. Rolling steel fire doors shall have an average closing speed of not less than 6 in./sec (152 mm/sec) or more than 24 in./sec (610 mm/sec).
4. Power-Operated Rolling Steel Fire Doors
   a. Power-operated fire doors shall be permitted to be furnished with a sensor that causes the door closer to stop or reverse upon contact with an obstruction under normal conditions.
   b. Power-operated rolling steel fire doors shall be equipped with an automatic-closing device that, upon activation, will cause the door to close.
   c. After automatic closing is activated, the door shall remain in the closed position until the automatic-closing device has been reset.
   d. When automatic closing is accomplished by means of a power operator, the door shall remain in the closed position or shall be permitted to automatically open and then reclose if a sensing edge has been provided and an obstruction is encountered during automatic closure.
   e. The door shall remain in the closed position until the automatic closing device has been reset.
   f. When an automatic closing device is designed to open and reclose when encountering an obstruction, the unit shall be designed such that it can reopen a maximum of three times.
   g. After encountering an obstruction for the third time, the bottom bar shall come to rest on the obstruction.
5. Guides
   a. Guides for rolling steel fire doors shall be mounted either on the face of the wall or between the jambs, or a combination thereof.

6. Hoods
   a. A hood shall be provided.
   b. Where a flame baffle is provided, a fusible link connection to the flame baffle shall be permitted to be independent of the detectors or fusible link connections that activate the door's automatic-closing device.
7. Weather Protection.
   a. Where rolling steel fire doors are installed on the exterior of a building, the doors shall be protected against the weather to ensure operation.

Fire Shutters

1. Types. Fire shutters shall be of the following three general types:
   a. Swinging door
   b. Horizontally or vertically sliding door
   c. Rolling steel door
2. Weather Protection
   a. Where rolling steel horizontally or vertically sliding fire shutters are installed on the exterior of a building, they shall be protected against the weather to ensure operation.
3. Shutters can be permitted to be installed on the inside or outside of an opening or between jambs but preferably on the inside or between jambs for ease of maintenance and protection from adverse weather conditions.

Service Counter Fire Doors

1. Types. Service counter fire doors shall be of the following three general types:
   a. Swinging door panels of a single or multiple section vertical type, integrally mounted in a four-sided frame to form a labeled door and frame assembly
   b. Horizontally or vertically sliding door
   c. Rolling steel fire door
2. Automatic Closing
   a. All service counter fire doors shall be equipped to close automatically in the event of fire.
   b. A service counter fire door of the rolling type shall be automatic closing so that, upon activation or release of a fusible link or detector, the door shall close.
   c. A service counter fire door of the swinging or sliding type shall be made automatic closing by a system of weights suspended by ropes, cables, or chains over pulleys that, when activated by release of an automatic fire detector, shall cause the door to close.
   d. A governor, where employed on a service counter fire door, shall work in coordination with the closing device and shall control the closing speed of the door.
   e. A service counter fire door of the rolling type shall have an average closing speed of not less than 6 in./sec (152 mm/sec) or more than 24 in./sec (610 mm/sec).

Hoistway Doors for Elevators and Dumbwaiters

1. Labeled Swing Hoistway Doors for Elevators and Dumbwaiters — Fire-Rated Entrance
   a. Each entrance shall be labeled.
   b. Each label shall bear the name of the manufacturer.
   c. Elevator Entrances *[see Reference D – Figure A.14.2.1.3]*
      i. One label shall be provided for the door panels and shall be located so that it is visible after installation.

ii. One label shall be provided for the frame and shall be located so that it is visible after installation.

2. Labeled Horizontally Sliding Hoistway Doors for Elevators and Dumbwaiters — Fire-Rated Entrance
   a. Each entrance shall be labeled.
   b. Each label shall bear the name of the manufacturer.
   c. Elevator Entrances *[see Reference E – Figure A.14.2.2.3(a) and Figure A.14.2.2.3(b)]*
      i. One label shall be provided for the door panels and shall be located so that it is visible after installation.
      ii. One label shall be provided for the frame and shall be located so that it is visible after installation.
      iii. A master label indicating the name of the manufacturer shall be provided for the door panel and located so that it is visible for review by the AHJ after installation.
3. Labeled Vertically Sliding Hoistway Doors for Elevators and Dumbwaiters — Fire-Rated Entrance *[see Reference F – Figure A.14.2.3(a) through Figure A.14.2.3(c)]*
   a. Each entrance shall be labeled or listed.
   b. Each label shall bear the name of the manufacturer.
   c. Where all entrance hardware components have not been tested in a complete assembly, individually labeled hardware components that are designed to be compatible with the entrance assembly shall be provided as follows:
      i. One label shall be permitted to be provided for the entrance hardware where the entrance hardware components are equivalent to those tested in a complete assembly.
      ii. One label shall be permitted to be provided for the complete entrance assembly where the components are the same as those tested in a complete assembly.
   d. A master label indicating the name of the manufacturer shall be provided for the door panel where installed in drywall and shall be located so that it is visible for review by the AHJ after installation.
4. Hoistway Door Vision Panels.
   a. Where required or used, vision panels shall conform to ASME A17.1/CSA B44, Safety Code for Elevators and Escalators, and to the requirements of NFPA 80 14.3.1 through 14.4.4.

Chute Doors

1. Chute Discharge Doors.
   a. Operation.
      i. Openings in the fire resistance–rated enclosure shall have a fire protection rating as follows:
         (1) 1 ½ hour fire protection rating for 2-hour fire resistance–rated enclosures
         (2) 1-hour fire protection rating for 1-hour fire resistance–rated enclosures
2. Chute Intake Doors.
   a. General Access Gravity Waste Chutes.
      i. All chute intake doors into a waste chute shall be provided with a self-closing, positive latching and gasketed fire door assembly in accordance with NFPA 80 15.1.2.
      ii. The area of each chute intake door shall be limited to one-third of the cross-sectional area of a square chute and 44 percent of the area of a round chute.

3. Limited-Access Gravity Chutes.
   a. All chute intake doors into a linen or waste chute shall be provided with a self-closing, positive-latching and gasketed fire door assembly in accordance with NFPA 80 15.1.2.
   b. A lock shall be provided for the chute intake door.
   c. The area of each waste chute intake door shall be limited to two-thirds of the cross-sectional area of the chute.

Access Doors

1. This covers the installation of both horizontal and vertical access doors in fire-rated walls, floors, and floor–ceiling or roof–ceiling assemblies.
2. Doors.
   a. Access doors shall be self-closing.
   b. Access doors shall be self-latching.
   c. Self-closing access doors that are intended to be used to allow a person to completely enter the concealed space behind the door shall be operable from the inside without the use of a key or tool.
3. Horizontal Access Doors.
   a. Door assemblies used in fire resistance–rated floor-ceiling or roof-ceiling assemblies shall be tested in the horizontal position in accordance with the procedures described in ASTM E119, Standard Test Methods for Fire Tests of Building Construction and Materials, or ANSI/UL 263, Standard for Fire Tests of Building Construction and Materials, and shall be labeled as horizontal access doors.
   b. A horizontal access door shall bear a label that includes the additional wording “For Horizontal Installation.”
4. Vertical Access Doors.
   a. Vertical access doors shall be used only in walls.
   b. A vertical access door shall bear a label that includes the additional wording “For Vertical Installation.”
5. Floor Fire Door Assemblies.
   a. Floor fire door assemblies shall be tested in accordance with the procedures described in NFPA 288.

Fire Windows

1. Fire windows shall be tested in accordance with NFPA 257 or ANSI/UL 9, Standard for Fire Tests of Window Assemblies, for the required fire protection rating of the window opening.
2. Fire windows shall be labeled.
3. Fire Window Frames.
   a. Fire window frame assemblies shall be permanently labeled for such use.
      i. The labeled assembly includes the frame and can include a ventilator, glazing material, retaining members, mullions, and hardware, if applicable. The label reading “Fire Window Frame” includes the design and construction of the frame, ventilator, glazing material retaining members, and hardware.
4. Glazing Material.
   a. Labeled.
      i. Fire protection glazing or fire resistance glazing in fire windows shall be labeled. (See also NFPA 80 17.2.3.)

5. Size
   a. Glazing material installed in fire windows shall be limited to the maximum size openings indicated in their individual listings.
   b. Individual glazing material exposed area shall not exceed 1296 in.2 (0.84 m2), with no dimension exceeding 54 in. (1.37 m) unless otherwise tested.
6. Identification.
   a. Each individual glazing unit shall be identified with a label or other identification.
   b. The label or other identification shall be permanently applied and shall be visible after installation.
7. Safety.
   a. Fire protection glazing and fire resistance glazing installed in fire windows that are subject to human impact shall meet applicable impact safety standards.
8. Types of Windows
   a. Hollow Metal–Framed Windows.
   b. Hot-Rolled or Extruded Steel Section Windows.
   c. Hollow Metal Plate Steel (Combination) Windows
9. Closing Devices.
   a. All fire windows shall be of a fixed type or shall be automatic closing.
   b. The automatic-closing device shall be permitted to be an integral part of the assembly or a separate system, such as weights suspended by ropes, wire cables, or chains over pulleys, arranged so that operation of the automatic fire detector shall cause the ventilator to close.

Fire Dampers

- Definitions.
  - Breakaway Connection. A joint connecting a fire damper sleeve and attached ductwork that will allow collapse of the ductwork during a fire without disturbing the integrity of the fire damper.
  - Ceiling Radiation Damper. A listed device installed in a ceiling membrane of a fire resistance–rated floor-ceiling or roof-ceiling assembly to automatically limit the radiative heat transfer through an air inlet/outlet opening.
  - Combination Fire/Smoke Damper. A device that meets both the fire damper and smoke damper requirements.
  - Dynamic System. An HVAC system designed to maintain the movement of air within the system at the indication of a fire.
  - Fire Damper. A device installed in an air distribution system, designed to close automatically upon detection of heat, to interrupt migratory airflow and to restrict the passage of flame. Fire dampers are classified for use in either static systems or for dynamic systems, where the dampers are rated for closure under airflow.
  - Fire-Rated Damper Mullion. A mullion used to separate multiple listed dampers in large openings.
  - Retaining Angle. The metal angle used to retain the fire damper in the opening.
  - Smoke Damper. A device within an operating (dynamic) air distribution system to control the movement of smoke.
  - Static System. An HVAC system designed to stop the movement of air within the system at the indication of a fire.
  - Volume Control Damper. A fire damper, smoke damper, or combination fire/smoke damper that is also used to control the volume of air in an HVAC system.

1. For new damper installations, the damper manufacturer's installation and maintenance instructions shall be maintained on site.
   a. In order to verify a damper has been properly installed in accordance with the manufacturers' listing, such as a damper with a retaining angle on one side only, it is necessary to have this information on site.
2. Operational Test.
   a. Fire Dampers.
      i. After the installation of a damper is completed, an operational test shall be conducted.
      ii. The damper shall fully close from the open position.
      iii. When equipped with smoke detection activation, testing shall be performed in accordance with NFPA 4.
      iv. For dynamic dampers, it shall be verified that the system airflow where the damper is installed is within the velocity rating of the damper listing.
      v. The operational test shall verify that there are no obstructions to the operation of the damper.
      vi. The operational test shall verify that there is full and unobstructed access to the fire damper and all listed components.
      vii. All indicating devices shall be verified to work and report to the intended location.
   b. Combination Fire/Smoke Dampers.
      i. After the installation of a dynamic combination fire/smoke damper is complete, an operational test shall be conducted.
      ii. The test shall determine that the system has been installed and functions as intended.
      iii. The operational test shall be conducted under nonfire HVAC airflow conditions as well as static flow conditions.
      iv. The operational test shall verify that there are no obstructions to the operation of the dynamic combination fire/smoke damper.
      v. The operational test shall verify that there is full and unobstructed access to the dynamic combination fire/smoke damper and all listed components.
   c. Inspection
      i. Following completion of the test, a visual inspection shall be made of the assembly to ensure no obstructions have been introduced.
   d. Documentation.
      i. All inspections and testing shall be documented, indicating the location of the fire damper, date(s) of inspection, name of inspector, and deficiencies discovered. The documentation shall have a space to indicate when and how the deficiencies were corrected.
3. Acceptance Testing.
   a. Acceptance testing of fire dampers shall be performed by a qualified person with knowledge and understanding of the operating components of the type of assembly being subject to testing and the system in which it is installed.
   b. Before testing, a visual inspection shall be performed to identify any damaged or missing parts that can create a hazard during testing or affect operation or resetting.
   c. Actuated Damper.
      i. Acceptance testing of dampers designed to close via an electric or pneumatic actuator shall be conducted by removing electrical power or air pressure from the actuator and ensuring that the damper closes properly.

ii. Electrical power or air pressure shall then be reapplied to the damper to confirm that it returns to its full-open position.

d. Nonactuated Damper.
   i. It is not required to activate the fusible link by heat to test a damper that is equipped with a link. Visual inspection shall be made after the fusible link has been reinstalled to ensure it would not impede closing of the damper.
   ii. Acceptance testing of dampers designed to close via a spring(s) or by gravity shall be conducted by removing the fusible link and confirming that the damper closes properly.
   iii. The damper shall then be manually reset to its full-open position and the fusible link shall be reinstalled.
   iv. If the damper is equipped with a variable air volume system, acceptance testing shall be conducted after the building mechanical ventilation system has been balanced and in operation under maximum air flow.

e. A record of these inspections and testing shall be made in accordance with NFPA 80 19.5.3.

4. Documentation
   a. All inspections and testing shall be documented, indicating the location of the damper, date of inspection, name of inspector, and deficiencies discovered. The documentation shall have a space to indicate when and how the deficiencies were corrected.
   b. All documentation shall be maintained for at least three test cycles and made available for review by the AHJ.

Smoke Doors

1. Air Leakage Test
   a. Smoke door assemblies shall have an air leakage rating not greater than 3 $ft^3/min/ft^2$ (0.9 $m^3/min/m^2$) of door opening when tested in accordance with ANSI/UL 1784, Air Leakage Tests of Door Assemblies.
2. Smoke doors shall be self-closing or automatic closing in accordance with NFPA 80.
3. Automatic closing smoke door assemblies shall be activated by smoke detection installed in accordance with NFPA 72.
4. Devices for the release of smoke doors shall be permitted to be part of an overall system, such as a fire alarm or an automatic extinguishing system, that shall release the door and shall be installed and tested in accordance with NFPA 72
5. Louvers shall not be installed in smoke door assemblies unless otherwise tested and listed.
6. Operability.
   a. Smoke doors shall be operable at all times.
   b. Smoke doors shall be kept closed or arranged for automatic closing, unless otherwise permitted.
7. Inspections and Testing
   a. Upon installation, smoke door assemblies shall be inspected and tested in accordance with the following:
      i. Fire-rated smoke door assemblies shall be inspected and tested in accordance with this standard and also in accordance with Chapter 5 of NFPA 80.
      ii. Door assemblies without fire ratings shall be inspected in accordance with the requirements of this standard.
      iii. Inspections of smoke door assemblies without fire ratings shall be permitted to be performed at the same time as inspections for door assemblies subject to inspection under NFPA 80.

iv. All functional tests shall be conducted after the building's mechanical ventilation system has been balanced and is operating.
v. All functional tests shall be conducted after the closing mechanism has been adjusted for the applicable maximum allowable opening force.

b. A record of all inspections and testing shall be signed by the inspector and kept for inspection by the AHJ.
c. Records of the acceptance tests shall be retained for the life of the assembly.
d. Unless a longer period is required by NFPA 80, records shall be retained for a period of at least 3 years.
e. The records shall be on a medium that will survive the retention period. Paper or electronic media shall be permitted.
f. A record of all inspections and testing shall be provided that includes, but is not limited to, the following information:
i. Date of inspection
ii. Name of facility
iii. Address of facility
iv. Name of person(s) performing inspections and testing
v. Company name and address of inspecting company
vi. Signature of inspector of record
vii. Individual record of each inspected and tested [smoke] door assembly
viii. *Opening identifier and location of each inspected and tested [smoke] door assembly
ix. *Type and description of each inspected and tested [smoke] door assembly
x. *Verification of visual inspection and functional operation
xi. Listing of deficiencies in accordance with NFPA 105 5.2.4
g. Acceptance Testing.
i. Acceptance testing of smoke door assemblies shall be performed by a qualified person with knowledge and understanding of the operating components of the type of assembly subject to testing.
ii. Before testing, a visual inspection shall be performed to identify any damaged or missing parts that can create a hazard during testing or affect operation or resetting.
iii. Acceptance testing shall include the closing of the door by all means.
iv. Acceptance testing shall be conducted after the building's mechanical ventilation system has been balanced, in accordance with NFPA 105 5.2.1.
v. Acceptance testing shall be conducted after the closing mechanism has been adjusted for the applicable maximum allowable opening force.
vi. A record of these inspections and testing shall be made in accordance with NFPA 105 5.2.2.

8. Swinging Smoke Door Assemblies
a. Smoke door assemblies shall be visually inspected from both sides to assess the overall condition of the assembly.
b. As a minimum, the following items shall be verified:
i. Labels on fire-rated smoke door assemblies are clearly visible and legible and bear the "S" label marking.
ii. Door leaves without fire protection ratings comply with NFPA 105 6.3.1.
iii. Door frames comply with NFPA 105 6.3.2.

iv. Gasketing along the vertical edges of the door and across the top of the door and, where required, at meeting edges of pairs of doors forms a continuous seal that is not cut, notched, or otherwise modified to accommodate other hardware items.
v. Gasketing materials, where required, are intact and close the gaps between the door and frame to seal the door opening against the passage of smoke.
vi. Doors installed in pressurized applications have a bottom seal, where required.
vii. Doors equipped with bottom seals that automatically project to fully seal the gap under the door in the closed position do not interfere with the swinging of the door when retracted or the closing of the door when projected.
viii. No open holes or breaks exist in the surfaces of either the door or the frame.
ix. Glazing, vision light frames, and glazing beads are intact and securely fastened in place, if so equipped.
x. Glazing materials and vision light kits comply with NFPA 105 Sections 6.5 and 6.6.
xi. Glazing materials, vision light kits, and glazing beads are continuously sealed.
xii. The door, frame, hinges, and other hardware are secured, aligned, and in working order with no visible signs of damage.
xiii. No parts are missing or broken.
xiv. Door clearances do not exceed dimensions listed in NFPA 105 6.3.3 when measured on the pull side of the door(s).
xv. The self-closing device is operational; that is, the active door completely closes when operated from the full open position.
xvi. If a coordinator is installed, the inactive leaf closes before the active leaf.
xvii. Where positive latching is required, latching hardware operates and secures the door when the door is in the closed position.
xviii. Where door leaves, other than doors arranged for automatic closing, are permitted to be held open with friction door holder devices, the door holder devices comply with NFPA 105 6.3.6.6.

9. Horizontally Sliding, Vertically Sliding, and Rolling Doors
   a. Smoke door assemblies shall be visually inspected from both sides to assess the overall condition of the door assembly.
   b. The following items shall be verified:
      i. Labels are clearly visible and legible.
      ii. No open holes or breaks exist in surfaces of either the door or the frame.
      iii. Slats, endlocks, bottom bar, guide assembly, curtain entry, hood, and flame baffle are correctly installed and intact for rolling steel fire doors.
      iv. Gasketing along the perimeter of the door forms a continuous seal that is not cut, notched, or otherwise modified.
      v. Glazing, vision light frames, and glazing beads are intact and securely fastened in place, if so equipped.
      vi. Curtain, barrel, and guides are aligned, level, plumb, and true for rolling steel fire doors.
      vii. Expansion clearance is maintained in accordance with manufacturer's listing.
      viii. Drop release arms and weights are not blocked or wedged.
      ix. Mounting and assembly bolts are intact and secured.
      x. Attachments to jambs are with bolts, expansion anchors, or as otherwise required by the listing.
      xi. Smoke detectors, if equipped, are installed and operational.

xii. No parts are missing or broken.
xiii. Fusible links, if so equipped, are in the location; chain/ cable, s-hooks, eyes, and so forth, are in good condition; the cable or chain is not kinked, pinched, twisted, or inflexible; and links are not painted or coated with dust or grease.
xiv. Auxiliary hardware items that interfere or prohibit operation are not installed on the door or frame.
xv. No field modifications to the door assembly that void the label have been performed.
xvi. Doors have an average closing speed of not less than 6 in./sec (152 mm/sec) or more than 24 in./sec (610 mm/sec).

10. Swinging Doors
    a. This covers the installation of sidehinged and side-pivoted swinging smoke door assemblies.
    b. Swinging Doors with Fire Protection Ratings.
        i. Fire door assemblies that are intended for use as smoke door assemblies shall also comply with NFPA 80.
    c. Swinging Doors Without Fire Protection Ratings.
        i. Doors without fire protection ratings shall be permitted to be used as smoke door assemblies in door openings not required to be protected by fire doors.
            (1) Non-fire-rated doors used as smoke doors in door openings that are not required to be protected by fire doors might be constructed of aluminum, fiberglass, hollow metal, steel, wood, or other suitable materials. Generally, non-fire-rated smoke door assemblies are required to be self-closing or automatic closing and swing easily and freely, which requires ball bearing or anti-friction bearing hinges or pivots. Smoke door assemblies are required to have positive latching hardware, unless otherwise specifically exempted by the applicable building, fire, or life safety code.
        ii. Doors.
            (1) Non-fire-rated door leaves shall be of a design that resists the passage of smoke.
        iii. Louvers and transfer grilles shall not be permitted in doors.
        iv. Clearances.
            (1) Doors in smoke partitions shall have clearances in accordance with NFPA 80.
            (2) Doors in smoke barriers shall close the opening, leaving only the minimum clearance necessary for proper operation. The clearance under the bottom of a new door shall be a maximum of ¾ in. (19 mm).
            (3) The maximum clearance between the bottom of sidehinged or -pivoted swinging smoke doors and the finished floor shall be not greater than ¾ in. (19 mm), unless otherwise permitted.
        v. Operation of Doors.
            (1) Doors shall be arranged to be either self-closing or automatic closing, where required, unless otherwise exempted.
        vi. Self-Closing.
            (1) Self-closing doors shall swing easily and freely and shall be equipped with a closing device that closes, the door, causing it to latch, each time the door closes.
            (2) The closing mechanism shall not have a hold-open feature.

vii. Automatic Closing.
(1) Automatic-closing doors shall be permitted to close automatically by means of the installation of a closing device and the following:
(a) Upon release of the hold-open mechanism, the leaf becomes self-closing.
(b) The release device is designed so that the leaf instantly releases manually and, upon release, becomes selfclosing, or the leaf can be readily closed.
(c) The automatic releasing mechanism or medium is activated by the operation of approved smoke detectors installed in accordance with the requirements for smoke detectors for door leaf release service in NFPA 72.
(d) Upon loss of power to the hold-open device, the hold-open mechanism is released and the door leaf becomes self-closing.
(e) The release by means of smoke detection of one door leaf in a smokeproof enclosure or a stair enclosure results in closing all door leaves serving the enclosure.
(f) Where required, doors properly latch upon closing.

viii. Power-Operated Doors.
(1) Power-operated doors shall be equipped with a releasing device that automatically disconnects the power operator at the time of fire, allowing a selfclosing or automatic device to close the door regardless of power failure or manual operation, provided all the following criteria are met:
(a) The door is equipped with a means for keeping the door closed that is acceptable to the AHJ.
(b) The device used is capable of keeping the door fully closed if a force of 5 lbf (22 N) is applied to the latch edge of swinging doors, whether or not power is applied.

ix. Locks and Latches.
(1) Locking and latching shall comply with NFPA 80.
(2) Where panic hardware is utilized, the latching device shall not be permitted to be mechanically held in the retracted position.

x. Door-Closing Devices.
(1) Door-closing devices, other than spring hinges, shall meet the requirements of ANSI/ BHMA A156.4, Door Controls — Closers, Grade 1.
(2) Doors arranged for automatic closing shall have a closing device that meets the requirements of NFPA 80 6.3.5.3.

xi. Door Holder/Release Devices.
(1) Door holder/release devices for automatic-closing doors shall be installed in accordance with the manufacturer's instructions and in conformance with the individual manufacturer's published listings.

d. Gasketing and Astragals
i. Gasketing.
(1) Where required by the door listing, the gaps between the top and vertical edges of the door and frame and between the meeting edges of pairs of doors shall be closed with labeled gasketing material in accordance with the gasketing manufacturer's published listings.
(2) Gasketing material shall form a continuous seal along the top and vertical edges of the doors and at meeting edges of pairs of doors.

Smoke Dampers

1. Dampers
   a. Smoke dampers shall be installed within 24 in. (610 mm) of the partition and before any branch line or opening other than access panel and shall be installed in accordance with the manufacturer's installation instructions and the listing.
   b. For new damper installations, the damper manufacturer's installation and maintenance instructions shall be maintained on-site.
   c. Damper actuator and linkage to operate the smoke damper shall be supplied and installed at the factory.
   d. Dampers equipped with fusible links and/or internal operators shall be provided with an access door that is not less than 12 in.^{2} (7742 mm^2) or provided with a removable duct section.
   e. A smoke damper access panel shall be labeled with the words "Smoke Damper" in letters not less than 1/2 in. (13 mm) in height. External insulation shall not conceal any access panel unless there is a label attached to the insulation clearly indicating the exact location of the access panel and the insulation is installed for ease of removal or ease of removal with the access panel.
2. Operational Test
   a. Smoke and Combination Fire/Smoke Dampers.
      i. An operational test shall be conducted after the building's HVAC system has been balanced.
      ii. The test shall be adequate to determine that the damper has been installed and functions as intended.
      iii. The operational test shall be conducted under normal HVAC airflow and nonairflow conditions. The damper shall fully close under both test conditions.
      iv. The operational test shall verify that there are no obstructions to the operation of the dynamic combination damper.
      v. The operational test shall verify that there is full and unobstructed access to the dynamic combination damper and all appurtenances.
      vi. All indicating devices shall be verified to work properly and report to the intended location.
      vii. Combination fire/smoke dampers shall also meet the testing requirements contained in NFPA 80, Section 19.3.
3. Acceptance Testing
   a. Acceptance testing of smoke dampers shall be performed by a qualified person with knowledge and understanding of the operating components of the type of assembly to be tested.
   b. Before testing, a visual inspection shall be performed to identify any damaged or missing parts that could create a hazard during testing, or affect operation or resetting.
   c. Acceptance testing shall be conducted after the building mechanical ventilation system has been balanced, and in operation under maximum airflow, if equipped with a variable air volume system.
   d. Acceptance testing shall be conducted by removing electrical power or air pressure from the actuator and ensuring that the damper fully closes.
   e. Electrical power or air pressure shall then be reapplied to the damper to confirm that it returns to its full-open position.

Acceptance Testing Records

1. Summary of fire door and other opening protective systems installed.
2. Accepting testing report for each system installed.
3. Other documentation from A/EOR confirming that all work has been completed.
4. As built drawings including sequence of operations.
5. Location for acceptance testing records

Operation and Maintenance Information

1. List of all fire door and other opening protective systems.
2. System component instructions
3. Care and maintenance instructions

Routine Inspection, Testing, and Maintenance

1. The responsibility for inspection, testing, and maintenance shall ultimately be that of the owner of the system, provided that this responsibility has not been transferred in written form to a management company, tenant, or other party.
    a. See Chapter 14 in the Port Authority Manual “Inspection, Testing, and Maintenance Requirements for Fire Protection and Life Safety Systems”.
2. Confirm that records of acceptance testing will be kept on site and for the life of the building.
3. Confirm if routine tasks will be completed by building or facility maintenance, outside contractor, or a combination.
4. Confirm that inspection, testing, and maintenance documentation will be kept on site and available upon request.
5. Confirm that inspection, testing, and maintenance documentation is required to be retained for a minimum of 3 years.

REFERENCES

A.

NFPA 80 Figure A.4.6.3.1(a) through Figure A.4.6.3.1(h)

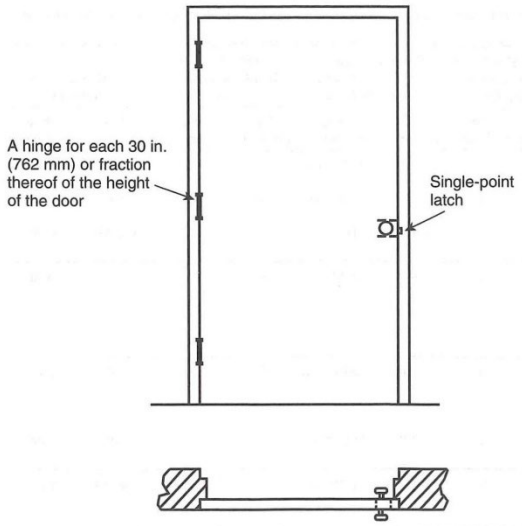
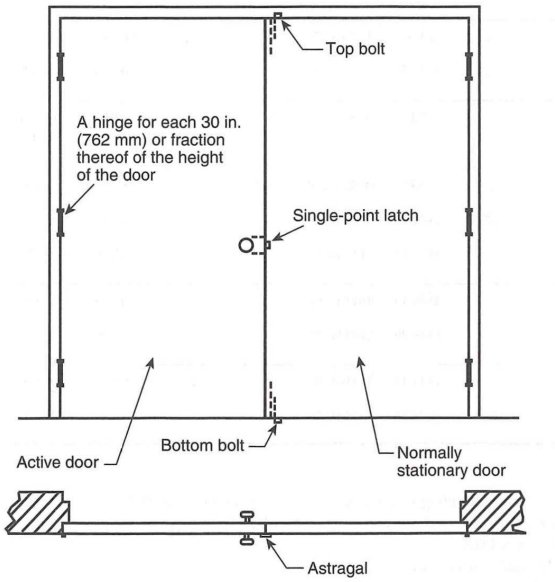


FIGURE A.4.6.3.1(a) Builders Hardware for Single Swinging Door with Single-Point Latch — Flush Mounted.



Note: The astragal can be permitted to be attached to the inside of the inactive leaf or the outside of the active leaf.

FIGURE A.4.6.3.1(b) Builders Hardware for Doors Swinging in Pairs with Single-Point Latch — Flush Mounted.

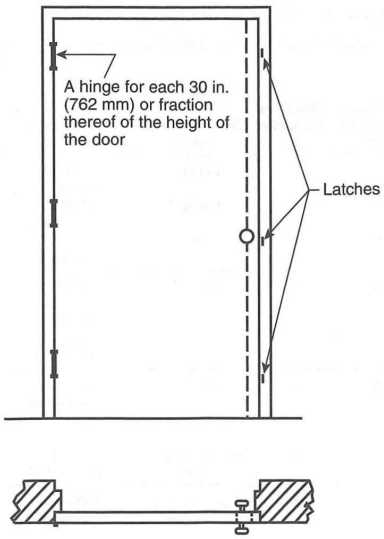


FIGURE A.4.6.3.1(c) Builders Hardware for Single Swinging Door with Concealed Three-Point Latch — Flush Mounted.

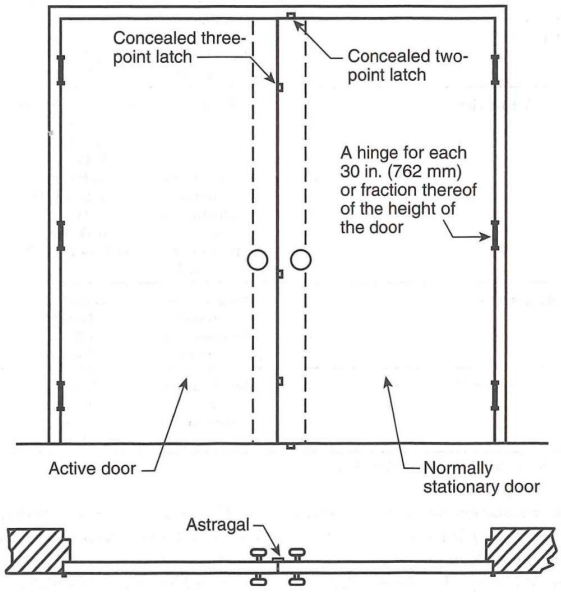


FIGURE A.4.6.3.1(d) Builders Hardware for Doors Swingin in Pairs with Concealed Two- and Three-Point Latches — Flusl Mounted.

This summary is provided as a general guideline for acceptance testing and does not ensure coverage for all systems and equipment. This summary is intended to provide support for inspection staffs but the information included should not be construed as the only requirements for the systems and equipment. Codes and standards should be reviewed to confirm that all requirements are completed.

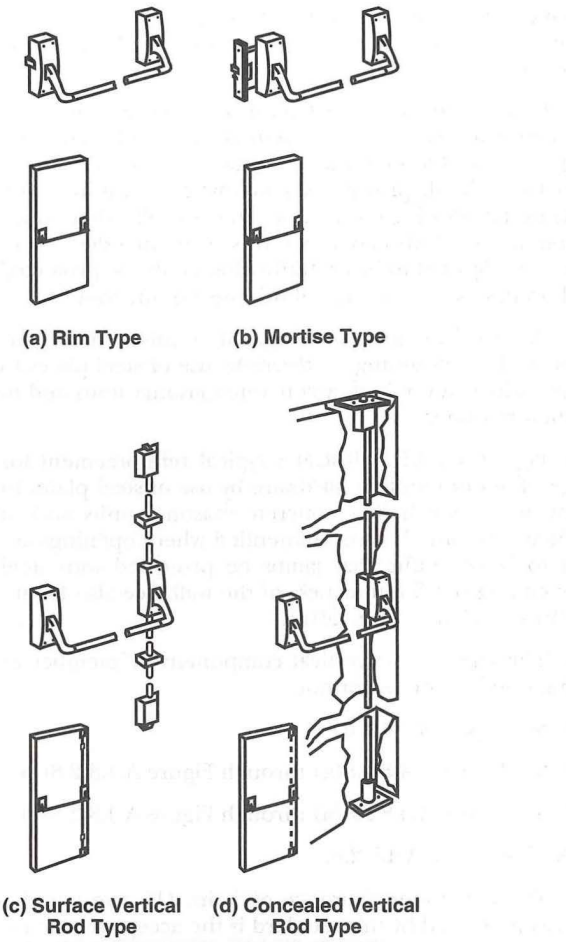


FIGURE A.4.6.3.1(e) Types of Fire Exit Hardware.

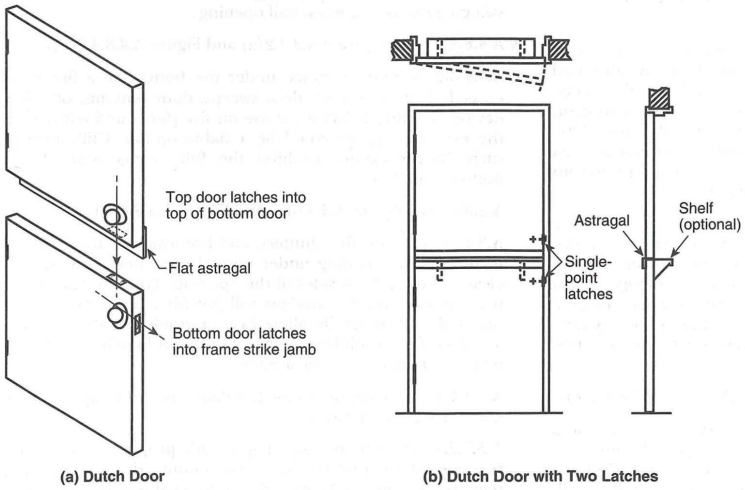


FIGURE A.4.6.3.1(f) Dutch Door and Dutch Door with Two Latches.

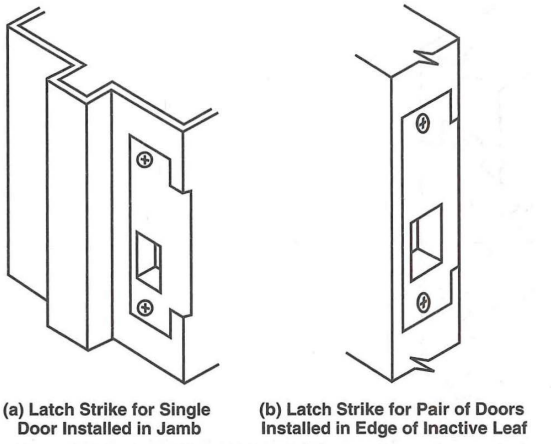


FIGURE A.4.6.3.1(g) Typical Latch Strike for Single Door and for Pair of Doors.

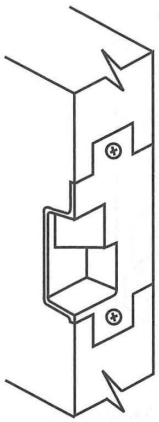


FIGURE A.4.6.3.1(h) Typical "Open-Back" Latch Strike for Pair of Doors Installed in Edge of Inactive Leaf Where Permitted by Individual Published Listings.

B.

NFPA 80 Figure A.4.6.4(a) through Figure A.4.6.4(h).

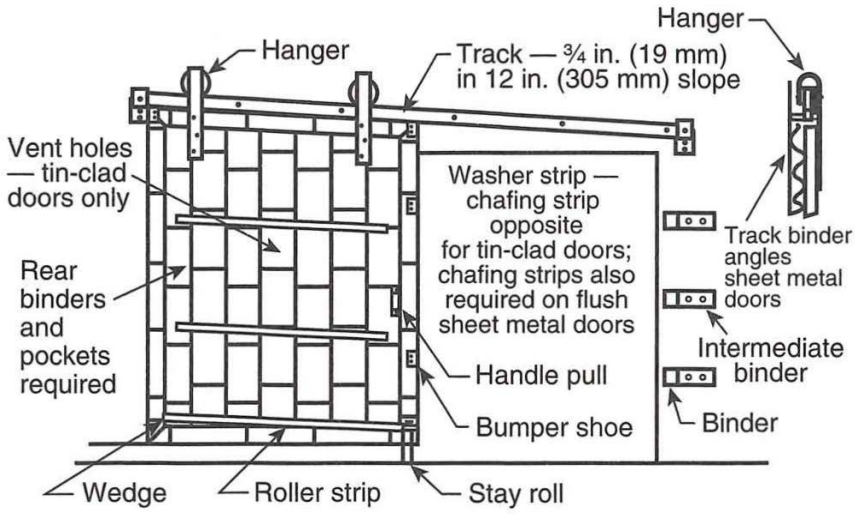
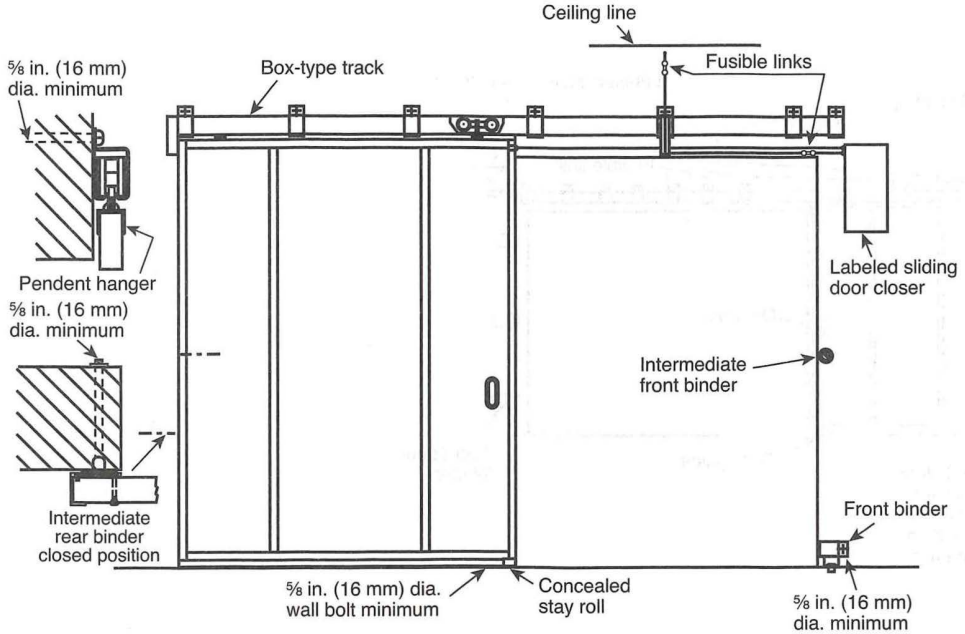
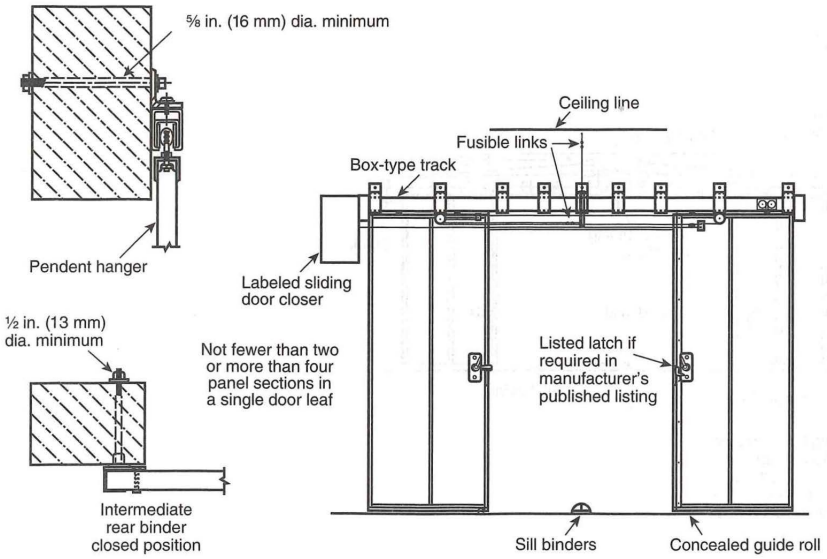


FIGURE A.4.6.4(a) Single Sliding Door (Inclined Track).



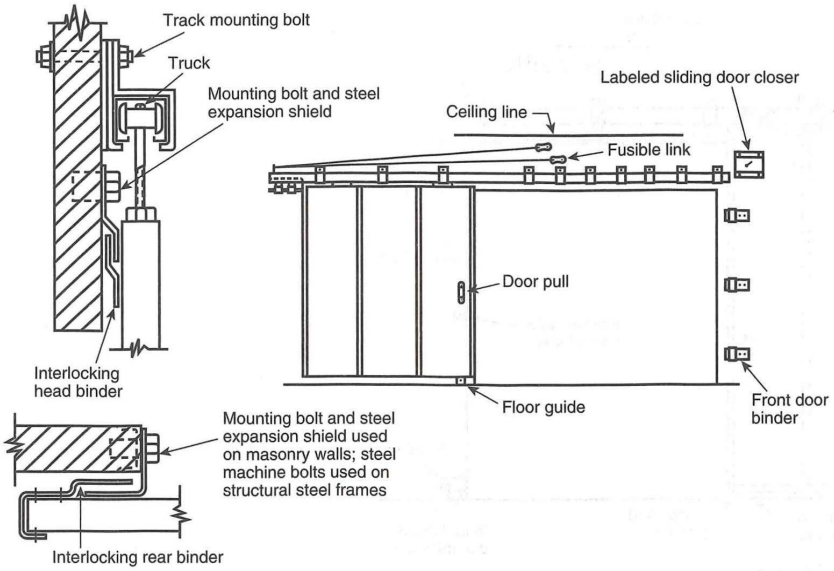
Note: Fusible links are needed on both sides of the wall.

FIGURE A.4.6.4(b) Horizontally Sliding Composite Door.



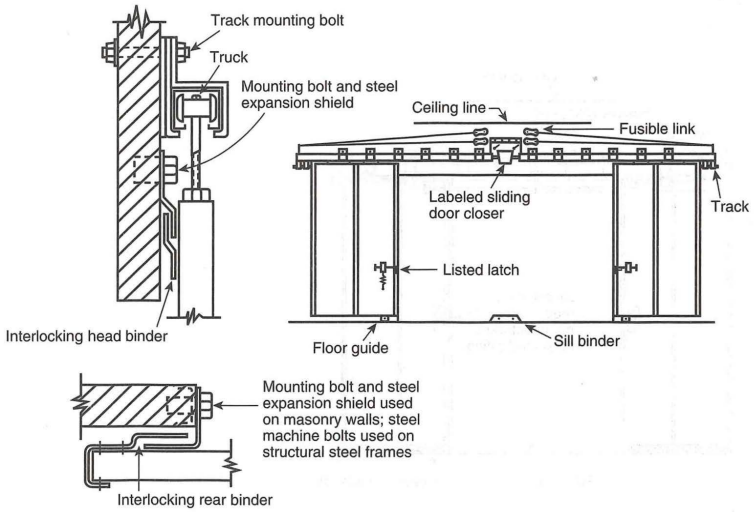
Note: Fusible links are needed on both sides of the wall.

FIGURE A.4.6.4(c) Center-Parting, Horizontally Sliding Composite Door.



Note: Fusible links are needed on both sides of the wall.

FIGURE A.4.6.4(d) Horizontally Sliding Hollow Metal Door.



Note: Fusible links are needed on both sides of the wall.

FIGURE A.4.6.4(e) Center-Parting, Horizontally Sliding Hollow Metal Door.

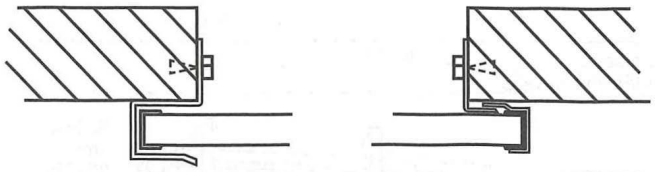


FIGURE A.4.6.4(f) Binder Arrangements.

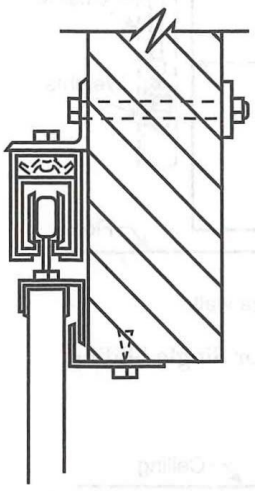
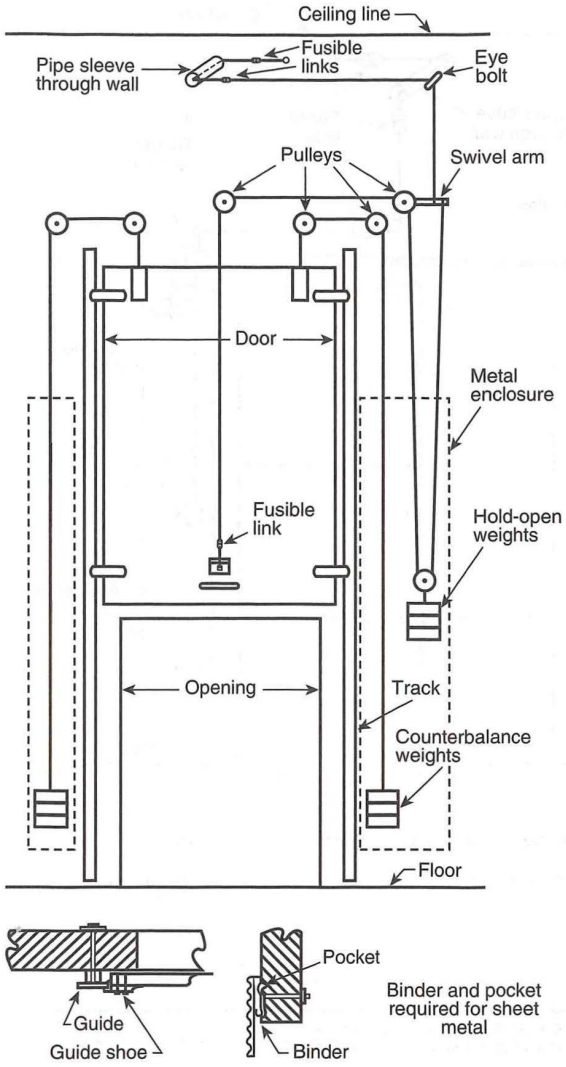


FIGURE A.4.6.4(g) Binder Arrangement on Pendent Hanger.



Note: Fusible links are needed on both sides of the wall.

FIGURE A.4.6.4(h) Vertically Sliding Door.

C.
NFPA 80 4.8.4 Clearance

4.8.4.1* Clearance under the bottom of a door shall be a maximum of ¾ in. (19 mm).

A.4.8.4.1 The maximum clearance of ¾ in. (19 mm.) under fire doors as permitted by this standard is the accepted practice in the industry. NFPA 252, ANSI/UL 10B, Standard for Safety Fire Tests of Door Assemblies, and ANSI/UL 10C, Standard for Positive Pressure Fire Tests of Door Assemblies, are test standards, not installation standards, and prescribe clearances and tolerances for swinging doors in the test wall opening.

4.8.4.2* Clearance under the bottom of the door shall be measured vertically from the bottom of the door to the top of the finished floor or threshold.

A.4.8.4.2 See Figure A.4.8.4.2(a) and Figure A.4.8.4.2(b).

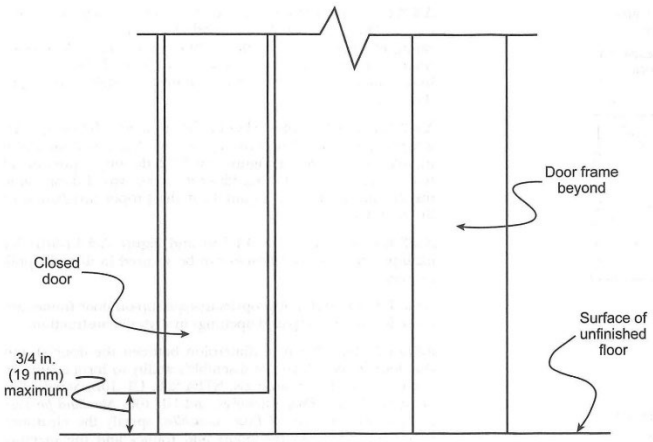


FIGURE A.4.8.4.2(a) Clearance Between Bottom of Door and Unfinished Door.

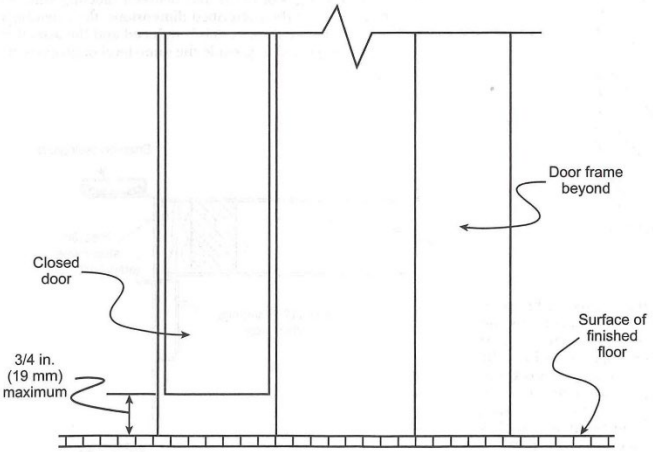


FIGURE A.4.8.4.2(b) Clearance Between Bottom of Door and Finished Floor.

4.8.4.2.1 Where latching hardware devices project from the bottom of the door, the maximum clearance dimension under the door shall be in accordance with the hardware manufacturer's installation instructions not to exceed 3⁄4 in. (19 mm).

4.8.4.2.2 Where a threshold is installed under a fire door, the clearance shall be in accordance with the hardware manufacturer's installation instructions and listing.

4.8.4.3* Products evaluated for fire doors with a bottom clearance in excess of 3⁄4 in. (19 mm) and listed for use at or under the bottom of the fire door shall be permitted where installed in accordance with their listings.

A.4.8.4.3 Where clearance under the bottom of a fire door exceeds 3⁄4 in. (19 mm), door sweeps, door bottoms, or other devices specifically listed for use on fire doors and addressing the excess clearance could be a viable option. Utilization of such devices cannot prohibit the full engagement of the bottom latch bolt.

4.8.4.4 Where the bottom of the door is more than 38 in. (965 mm) above the finished floor, the maximum clearance shall not exceed 3⁄8 in. (9.5 mm) or as specified by the manufacturer's label service procedure.

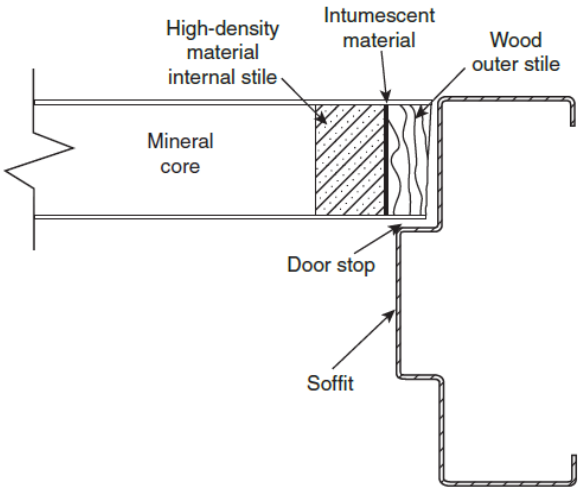
NFPA 80 6.3.1.7* Clearances.

A.6.3.1.7 The clearance dimension between the door(s) and the door frame affects the assembly's ability to form a suitable barrier under fire conditions. NFPA 252, UL 10B, Standard for Safety Fire Tests of Door Assemblies, and UL 10C, Standard for Positive Pressure Fire Tests of Door Assemblies, specify the clearance dimensions between the doors and frames and the meeting stiles of paired doors to be no greater than 1/8 in. (3.18 mm) for door assemblies subjected to fire tests conducted by one of the nationally recognized testing laboratories, regardless of the door or frame material; no over-tolerance for the clearance dimension is permitted. When the clearance gaps along the vertical and top edges of doors and between meeting stiles of paired doors exceed the prescribed dimensions, the assembly's ability to perform like the test unit is reduced and the assembly should not be expected to provide the same level of protection.

Another element that affects the performance of a fire door assembly is the door stop on the frame -- the portion of the frame that door leaf closes against. Typically, door frames that are constructed of hollow metal materials (e.g., 18, 16, and 14 gage steel) have an integral door stop that is 5/8 in. (15.88 mm) high. Other types of labeled door frames have door stops that range between ½ in. (12.7 mm) to 5/8 in. (15.88 mm). When the clearance between the door and frame is greater than 1/8 in. (3.18 mm) and the height of the door stop is less than 5/8 in. (15.88 mm), the doors might not be adequately supported under fire conditions, causing the assemblies to fail prematurely. (See Figure A.6.3.1.7.)

The clearance dimension between the edges of the doors and the door frames affect the amount of latch bolt engagement of the latching door hardware devices. When the

clearance between the door and frame is too great, the latching hardware devices might not be able to positively latch and hold the doors closed under fire conditions. (See Figure A.6.3.1.7.1.)



N **FIGURE A.6.3.1.7 Category A Positive Pressure Tested Flush Wood Door Installed in a Typical Hollow Metal Door Frame with ⅝ in. (15.88 mm) High Door Stop.**

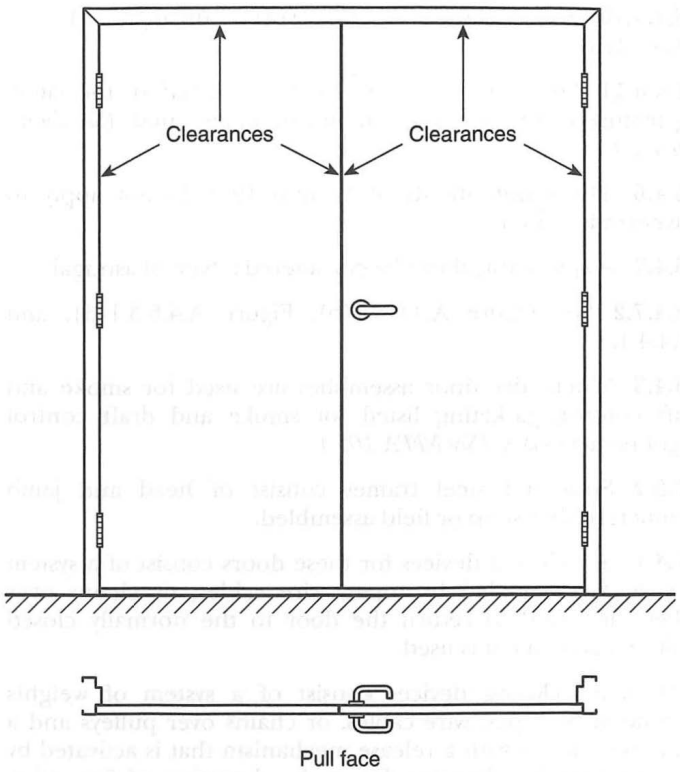


FIGURE A.6.3.1.7.1 Pull Face of a Swinging Pair of Doors.

6.3.1.7.1* Clearances dimensions between doors and frames and meeting stiles of paired doors shall be measured on the pull side of the assemblies.

A.6.3.1.7.1 See Figure A.6.3.1.7.1 for more information regarding clearances and the pull face of the door.

The clearance dimension along the vertical edges and across the tops of doors and the door frames and between meeting stiles of paired doors should not exceed the maximum dimension or be less than the minimum dimension specified in 6.3.1.7.2 through 6.3.1.7.5 when measured at any point.

6.3.1.7.2* The clearances between the top and vertical edges of hollow metal doors and the frame, and the meeting stiles of doors swinging in pairs, shall be 1/8 in. ± 1/16 in. (3.18 mm ± 1.59 mm).

A.6.3.1.7.2 Hollow metal fire doors are comprised of 20 (0.8 mm), 18 (1.0 mm), 16 (1.3 mm), and 14 (1.7 mm) gage steel face sheets that are required to be installed in hollow metal door frames or channel iron frames. The steel face sheets rapidly expand when subjected to the extreme temperatures of a fire; therefore, a minimum clearance of 1/16 in. (1.59 mm) between the doors and frames and meeting stiles of paired doors is required to allow for the expansion of the doors. Due to the expansion properties of hollow metal fire doors, the clearance dimension between the doors and frame and meeting stiles of paired doors is permitted to exceed 1/8 in. (3.18 mm) by no more than 1/16 in. (1.59 mm) under normal operating conditions.

6.3.1.7.3 High-pressure decorative laminate (HPDL)-faced doors, 1/3-hour-rated flush wood doors, and stile and rail wood doors installed in hollow metal door frames shall not have clearances greater than 1/8 in. ± 1/16 in. (3.18 mm ± 1.59 mm) between the door and frame and the meeting stiles of paired doors.

6.3.1.7.4* HPDL-faced doors, flush wood doors, and stile and rail wood doors with fire ratings greater than 1/3 hour shall not have clearances greater than 1/8 in. (3.18 mm) between the door and frame, regardless of the door frame construction, and the meeting stiles of paired doors.

A.6.3.1.7.4 When wood fire doors are subjected to the extreme temperatures of a fire, the doors shrink in size, rather than expand, as the moisture in the wood evaporates, reducing the need for a minimum clearance dimension requirement between the doors and frames and meeting stiles of paired doors. A minimal amount of clearance is needed for operational purposes. Wood fire doors with mineral core construction (e.g., ¾ hour, 1 hour, and 1 ½ hour ratings) are comprised of outer hardwood vertical stiles that are nominally ½ in. (12.7 mm) to 5/8 in. (15.88 mm) thick (before prefitting/trimming the door in height and width) and laminated to inner high-density material stiles that are approximately 1 in. thick. Consequently, since the hardwood outer stiles are subject to being consumed during a fire, the maximum clearance dimension between the doors and frames and the meeting stiles of paired doors should be not be greater than 1/8 in. (3.18 mm). Category A positive pressure – rated mineral fire doors usually include a

layer of intumescent material laminated between the outer wood stile and the inner high density material stile. (See Figure A.6.3.1.7 and Figure A.6.3.1.7.4.)

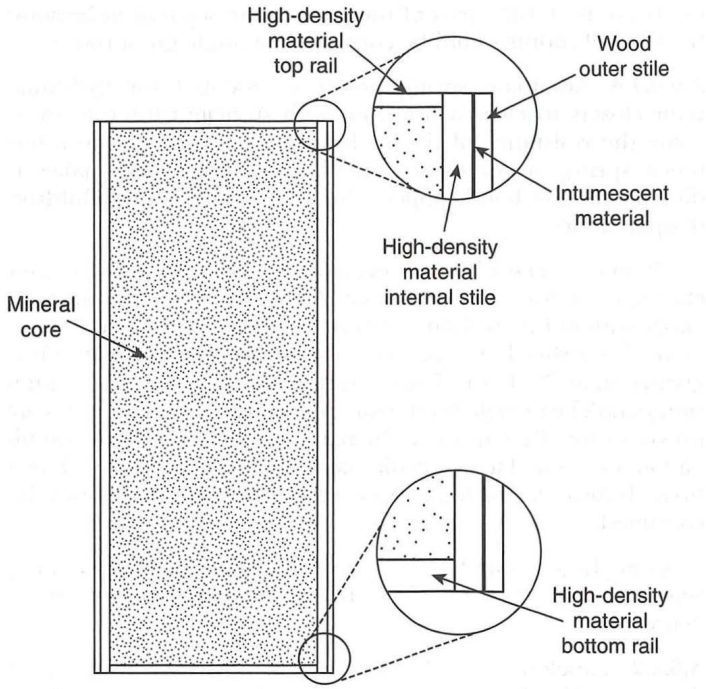


FIGURE A.6.3.1.7.4 Typical Internal Construction of Mineral Core, Category A Positive Pressure Flush Wood Doors (actual dimensions and composition of individual components vary by manufacturer).

6.3.1.7.5* Door leaves constructed of other materials shall not have clearances greater than 1/8 in. (3.18 mm) between the top and vertical edges of doors and meeting stiles of paired doors, unless otherwise permitted in the door frame, door, and latching hardware manufacturers' published listings.

A.6.3.1.7.5 Other materials used in the production of labeled fire doors include fiberglass reinforced polyester (FRP) and aluminum. In the case of the latter, some models of swinging fire doors are manufactured as units that are comprised of the door frame, door(s), pivots, and glazing materials. Latching hardware and closing devices are usually separate components from other manufacturers.

D.
NFPA 80 Figure A.14.2.1.3

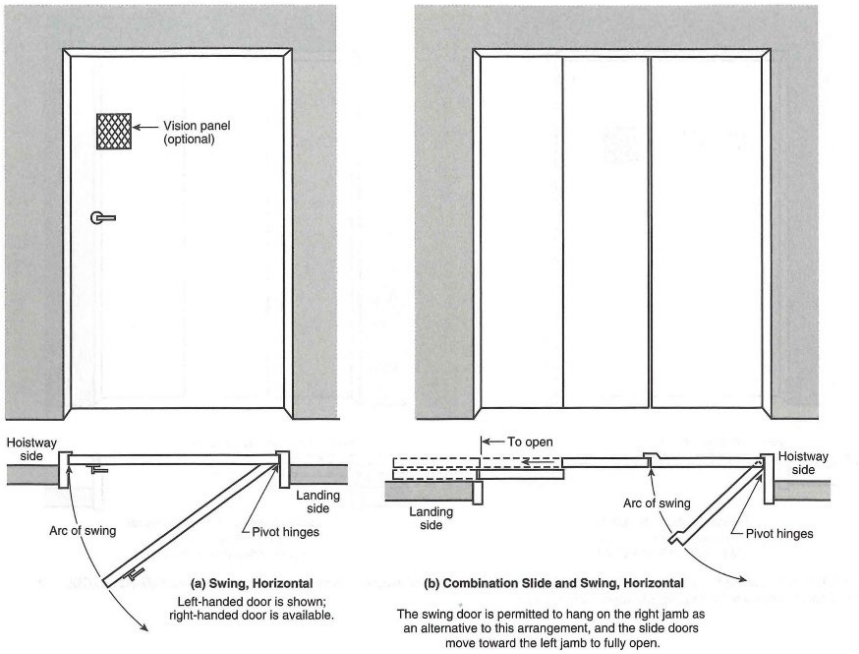


FIGURE A.14.2.1.3 Horizontal Swinging and Horizontal Combination Sliding and Swinging Doors. *(Courtesy of ASME A17.1/CSA B44-2016, Safety Code for Existing Elevators and Escalators.)*

E.
NFPA 80 Figure A.14.2.2.3(a) and Figure A.14.2.2.3(b)

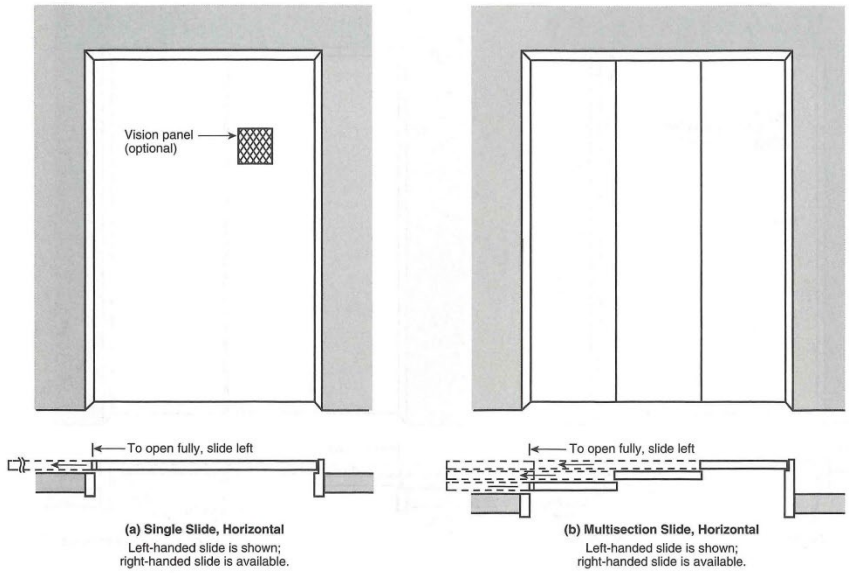
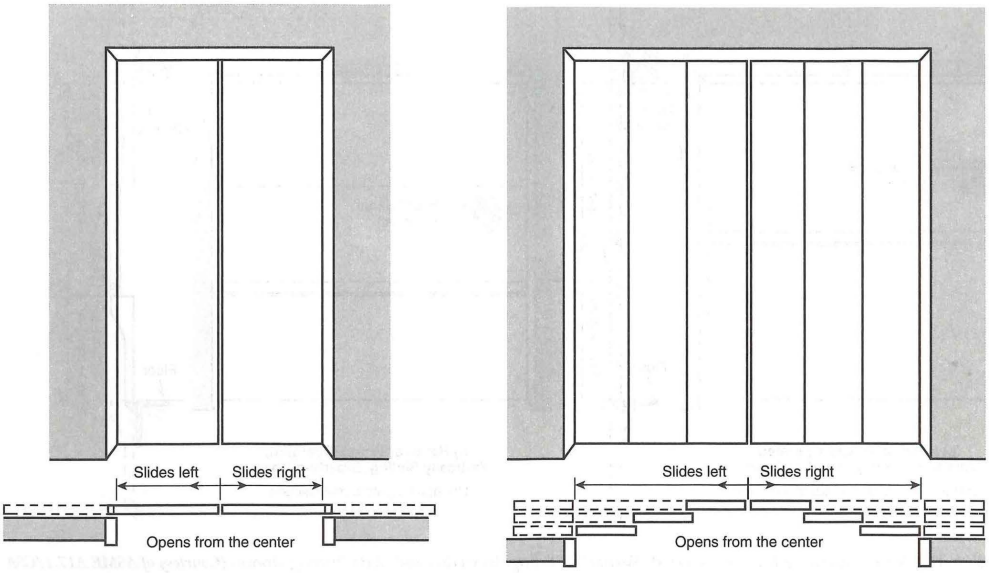


FIGURE A.14.2.2.3(a) Horizontal Single Sliding and Horizontal Multisection Sliding Doors. *(Courtesy of ASME A17.1/CSA B44-2016, Safety Code for Existing Elevators and Escalators.)*

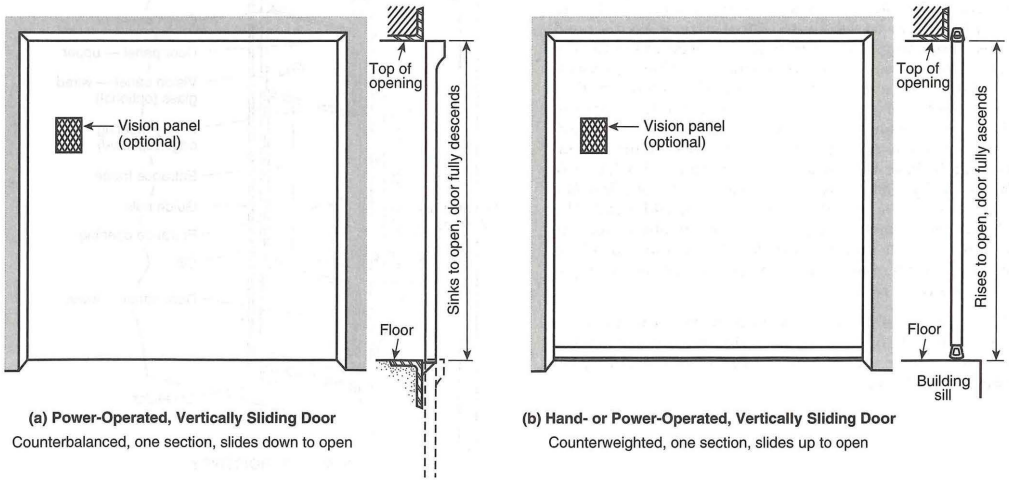


(a) Center-Parting, Horizontal Slide Doors
Two sections, single speed

(b) Center-Parting, Horizontal Slide Doors
Multiple sections, multiple speeds

FIGURE A.14.2.2.3(b) Center-Parting, Two-Section, Single-Speed Doors and Multiple-Section, Multiple-Speed Horizontally Sliding Doors. *(Courtesy of ASME A17.1/CSA B44-2016, Safety Code for Existing Elevators and Escalators.)*

F.
NFPA 80 Figure A.14.2.3(a) through Figure A.14.2.3(c)



(a) Power-Operated, Vertically Sliding Door
Counterbalanced, one section, slides down to open

(b) Hand- or Power-Operated, Vertically Sliding Door
Counterweighted, one section, slides up to open

FIGURE A.14.2.3(a) Power-Operated, Vertically Sliding Door and Hand- or Power-Operated, Vertically Sliding Door. *(Courtesy of ASME A17.1/CSA B44-2016, Safety Code for Existing Elevators and Escalators.)*

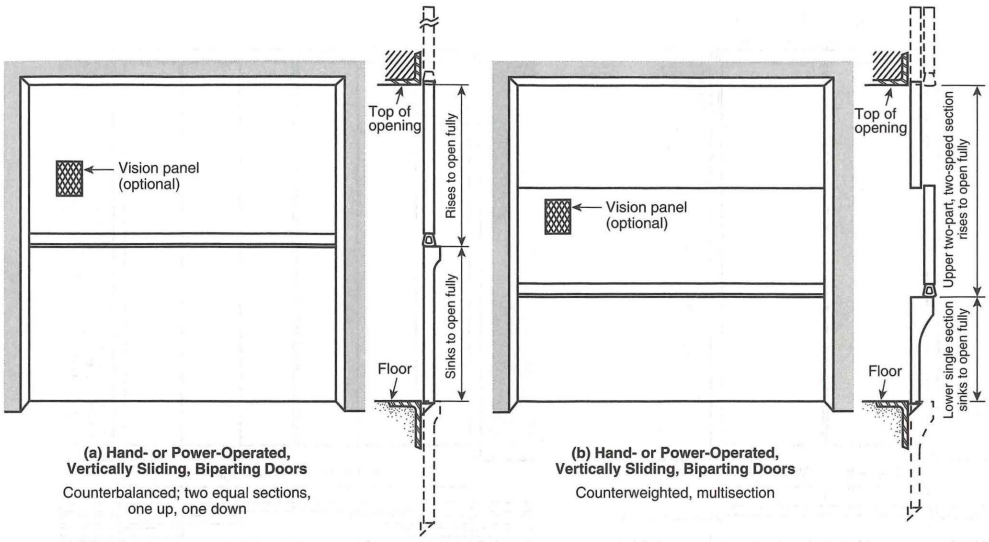


FIGURE A.14.2.3(b) Hand- or Power-Operated, Vertically Sliding, Biparting and Slide-Parting Doors. *(Courtesy of ASME A17.1/CSA B44-2016, Safety Code for Existing Elevators and Escalators.)*

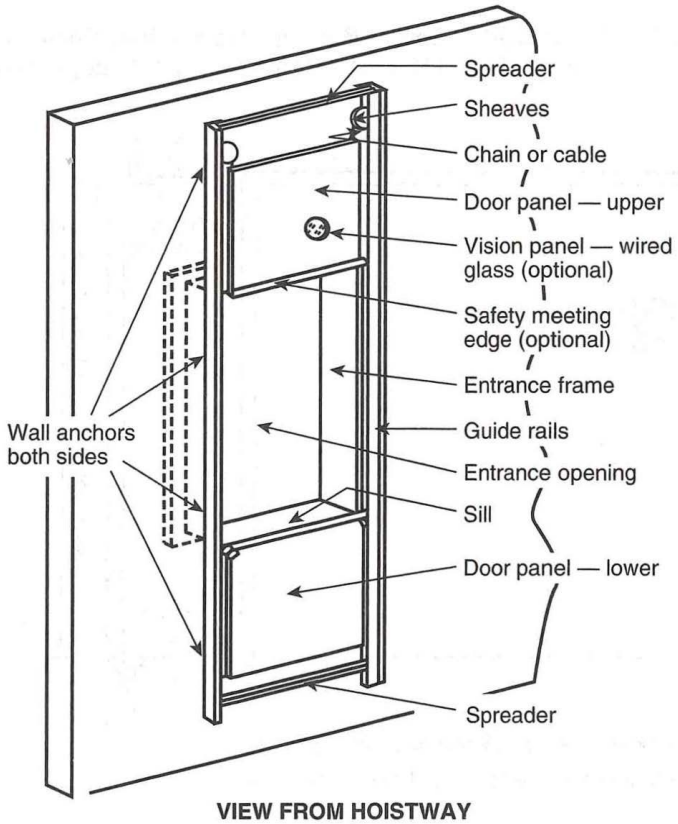


FIGURE A.14.2.3(c) Dumbwaiter Assembly Installation for Vertically Biparting Doors.

CHAPTER 11
FIRE DETECTION AND ALARM SYSTEMS

Contents

This summary is provided as a general guideline for acceptance testing and does not ensure coverage for all systems and equipment. This summary is intended to provide support for inspection staffs but the information included should not be construed as the only requirements for the systems and equipment. Codes and standards should be reviewed to confirm that all requirements are completed.

Approved Plans.

1. New installation or modification.
2. No outstanding rider comments from QAD Design Standards.
3. Confirmation that installation has been completed as per approved drawings.
4. Plans (shop drawings) are on site and available to inspection staff.
5. The minimum documentation required for new systems and additions or alterations to existing systems:
   a. *Written narrative providing intent and system description
   b. Riser diagram
   c. Floor plan layout showing locations of all devices, control equipment, and supervising station and shared communications equipment with each sheet showing the following:
      i. Point of compass (north arrow)
      ii. A graphic representation of the scale used
      iii. Room use identification
      iv. Building features that will affect the placement of initiating devices and notification appliances
   d. Sequence of operation in either an input/output matrix or narrative form
   e. Equipment technical data sheets
   f. Manufacturers' published instructions, including operation and maintenance instructions
   g. Battery capacity and safety margin calculations (where batteries are provided)
   h. Voltage drop calculations for notification appliance circuits
   i. Mounting height elevation for wall-mounted devices and appliances
   j. Where occupant notification is required, minimum sound pressure levels that must be produced by the audible notification appliances in applicable covered areas
   k. Locations of alarm notification appliances, including candela ratings for visual alarm notification appliances
   l. *Pathway diagrams between the control unit and shared communications equipment within the protected premises
   m. Completed record of completion in accordance with NFPA 72 7.5.6 and NFPA 72 7.8.2.
   n. For software-based systems, a copy of site-specific software, including specific instructions on how to obtain the means of system and software access (password)
   o. Record (as-built) drawings
   p. Records, record retention, and record maintenance in accordance with Section 7.7
   q. Completed record of inspection and testing in accordance with NFPA 72 7.6.6 and NFPA 72 7.8.2 *[see Reference A]*

Test Plan

1. A test plan shall be developed to clearly establish the scope of the testing for the fire alarm or signaling system.
2. The test plan and results shall be documented with the testing records.

Control Equipment: (Fire Alarm Control Panels)

1. Verify if system is in normal condition
   a. Does system have supervisory and trouble signals?
      i. List all trouble and supervisory signals on the system at the time of inspection.
   b. Fuses
      i. Verify rating and supervision.
   c. Interfaced equipment
      i. Verify integrity of single or multiple circuits providing interface between two or more control units. Test interfaced equipment connections by operating or simulating operation of the equipment being supervised. Verify signals required to be transmitted at the control unit.
   d. Lamps and LEDs
      i. Illuminate lamps and LEDs.
   e. Primary (main) power supply
      i. Disconnect all secondary (standby) power and test under maximum load, including all alarm appliances requiring simultaneous operation. Reconnect all secondary (standby) power at end of test. Test redundant power supplies separately.
   f. Trouble signals
      i. Audible and visual
         (1) Verify operation of control unit trouble signals. Verify ring-back feature for systems using a trouble-silencing switch that requires resetting.
      ii. Disconnect switches
         (1) If control unit has disconnect or isolating switches, verify performance of intended function of each switch. Verify receipt of trouble signal when a supervised function is disconnected.
      iii. Ground-fault monitoring circuit
         (1) If the system has a ground detection feature, verify the occurrence of ground-fault indication whenever any installation conductor is grounded.
      iv. Transmission of signals to off-premises location
         (1) Actuate an initiating device and verify receipt of alarm signal at the off-premises location.
         (2) Create a trouble condition and verify receipt of a trouble signal at the off-premises location.
         (3) Actuate a supervisory device and verify receipt of a supervisory signal at the off-premises location. If a transmission carrier is capable of operation under a single- or multiple-fault condition, actuate an initiating device during such fault condition and verify receipt of an alarm signal and a trouble signal at the off-premises location.

g. Functions
    i. Verify correct receipt of alarm, supervisory, and trouble signals (inputs); operation of evacuation signals and auxiliary functions (outputs); circuit supervision, including detection of open circuits and ground faults; and power supply supervision for detection of loss of ac power and disconnection of secondary batteries.

In-Building Fire Emergency Voice/Alarm Communications Equipment

1. Amplifier/tone generators
    a. Verify correct switching and operation of backup equipment.
2. Call-in signal silence
    a. Operate/function and verify receipt of correct visual and audible signals at control unit.
3. Off-hook indicator (ring down)
    a. Install phone set or remove phone from hook and verify receipt of signal at control unit.
4. Phone jacks
    a. Visually inspect phone jack and initiate communications path through jack.
    b. Phone set
        i. Actuate each phone set and verify correct operation.
    c. System performance
        i. Operate the system with a minimum of any five handsets simultaneously. Verify voice quality and clarity.

Remote Annunciators

1. Verify location and condition.
2. Verify the correct operation and identification of annunciators. If provided, verify the correct operation of annunciator under a fault condition.

Notification Appliance Circuit Power Extenders

1. Verify proper fuse ratings, if any. Verify that lamps and LEDs indicate normal operating status of the equipment.

Conductors — Metallic

1. Stray voltage
    a. Test all installation conductors with a volt/ohmmeter to verify that there are no stray (unwanted) voltages between installation conductors or between installation conductors and ground. Verify the maximum allowable stray voltage does not exceed 1 volt ac/dc, unless a different threshold is specified in the manufacturer's published instructions for the installed equipment.
2. Ground faults
    a. Test all installation conductors, other than those intentionally and permanently grounded, for isolation from ground per the installed equipment manufacturer's published instructions.
3. Short-circuit faults
    a. Test all installation conductors, other than those intentionally connected together, for conductor-to-conductor isolation per the manufacturer's published instructions for the installed equipment. Also test these same circuits conductor-to-ground.

4. Loop resistance
   a. With each initiating and indicating circuit installation conductor pair short-circuited at the far end, measure and record the resistance of each circuit. Verify that the loop resistance does not exceed the limits specified in the manufacturer's published instructions for the installed equipment.
5. Circuit integrity
   a. For initial and reacceptance testing, confirm the introduction of a fault in any circuit monitored for integrity results in a trouble indication at the fire alarm control unit. Open one connection at not less than 10 percent of the initiating devices, notification appliances and controlled devices on every initiating device circuit, notification appliance circuit, and signaling line circuit. Confirm all circuits perform as indicated in NFPA 72 Sections 23.5, 23.6, and 23.7.

Conductors — Nonmetallic

1. Fiber optics
   a. Test the fiber-optic transmission line by the use of an optical power meter or by an optical time domain reflectometer used to measure the relative power loss of the line. Test result data must meet or exceed ANSI/TIA 568-C.3, Optical Fiber Cabling Components Standard, related to fiber-optic lines and connection/splice losses and the control unit manufacturer's published specifications.
2. Circuit integrity
   a. For initial and reacceptance testing, confirm the introduction of a fault in any circuit monitored for integrity results in a trouble indication at the fire alarm control unit. Open one connection at not less than 10 percent of the initiating devices, notification appliances, and controlled devices on every initiating device circuit, notification appliance circuit, and signaling line circuit. Confirm all circuits perform as indicated in NFPA 72 Sections 23.5, 23.6, and 23.7.

Initiating Devices

1. Verify location and condition (all devices).
2. Smoke detectors
   a. Air sampling
      i. General
         (1) Verify that in-line filters, if any, are clean.
      ii. Sampling system piping and sampling ports
         (1) Verify that sampling system piping and fittings are installed properly, appear airtight, and are permanently fixed. Confirm that sampling pipe is conspicuously identified. Verify that sample ports or points are not obstructed.
      iii. Functional test
         (1) Test with smoke or a listed and labeled product acceptable to the manufacturer or in accordance with their published instructions. Test from the end sampling port or point on each pipe run. Verify airflow through all other ports or points.

b. Duct detectors
    i. General
        (1) Verify that detector is rigidly mounted. Confirm that no penetrations in a return air duct exist in the vicinity of the detector. Confirm the detector is installed so as to sample the airstream at the proper location in the duct.
    ii. Sampling tube
        (1) Verify proper orientation. Confirm the sampling tube protrudes into the duct in accordance with system design.
    iii. Functional Test
        (1) In addition to the testing required in NFPA 72 Table 14.4.3.2(g)(1) and Table 14.4.3.2(h), test duct smoke detectors that use sampling tubes to ensure that they will properly sample the airstream in the duct using a method acceptable to the manufacturer or in accordance with their published instructions.
c. Smoke detectors (excluding one- and two-family dwellings)
    i. Test smoke detectors in place to ensure smoke entry into the sensing chamber and an alarm response. Use smoke or a listed and labeled product acceptable to the manufacturer or in accordance with their published instructions. Other methods listed in the manufacturer's published instructions that ensure smoke entry from the protected area, through the vents, into the sensing chamber can be used.
    ii. Single- and multiplestation smoke alarms connected to protected premises systems
        (1) Perform a functional test on all single- and multiple-station smoke alarms connected to a protected premises fire alarm system by putting the smoke alarm into an alarm condition.
d. Smoke detector with built-in thermal element
    i. Functional test
        (1) Operate both portions of the detector independently as described for the respective devices.
e. Smoke detectors with control output functions
    i. Functional test
        (1) Verify that the control capability remains operable even if all of the initiating devices connected to the same initiating device circuit or signaling line circuit are in an alarm state.
f. Projected beam smoke detectors
    i. Verify beam path is unobstructed.
    ii. Functional test
        (1) Test the detector by introducing smoke, other aerosol, or an optical filter into the beam path.
g. Video image smoke and fire detectors
    i. Verify no point requiring detection is obstructed or outside the detector’s field of view.

3. Heat detectors
a. Nonrestorable (general)
    i. Do not perform heat tests. Test functionality mechanically and electrically.
b. Fixed-temperature, rate-of-rise, rate of compensation, restorable line, spot type (excluding pneumatic tube type)
    i. Perform heat test with a listed and labeled heat source or in accordance with the manufacturer’s published instructions. Assure that the test method for the

installed equipment does not damage the nonrestorable fixed-temperature element of a combination rate-of-rise/fixed-temperature element detector.

c. Fixed-temperature, nonrestorable line type
   i. Do not perform heat test. Test functionality mechanically and electrically. Measure and record loop resistance. Investigate changes from acceptance test.
d. Fixed-temperature, nonrestorable spot type
   i. After 15 years from initial installation, replace all devices or have 2 detectors per 100 laboratory tested. Replace the 2 detectors with new devices. If a failure occurs on any of the detectors removed, remove and test additional detectors to determine either a general problem involving faulty detectors or a localized problem involving 1 or 2 defective detectors.
   ii. If detectors are tested instead of replaced, repeat tests at intervals of 5 years.
e. Restorable line type, pneumatic tube only
   i. Perform heat tests (where test chambers are in circuit), with a listed and labeled heat source or in accordance with the manufacturer's published instructions of the detector or conduct a test with pressure pump.
f. Single- and multiplestation heat alarms
   i. Conduct functional tests according to manufacturer's published instructions. Do not test nonrestorable heat detectors with heat.

4. Fire-gas and other detectors
   a. Test fire–gas detectors and other fire detectors as prescribed by the manufacturer and as necessary for the application.
5. Multi-sensor fire detector or multi-criteria fire detector or combination fire detector
   a. Test each of the detection principles present within the detector (e.g., smoke/heat/CO, etc.) independently for the specific detection principle, regardless of the configuration status at the time of testing. Also test each detector in accordance with the manufacturer's published instructions.
      i. Test individual sensors together if the technology allows individual sensor responses to be verified.
   b. Perform tests as described for the respective devices by introduction of the physical phenomena to the sensing chamber of element. An electronic check (magnets, analog values, etc.) is not sufficient to comply with this requirement.
   c. Verify by using the detector manufacturer's published instructions that the test gas used will not impair the operation of either sensing chamber of a multisensor, multicriteria, or combination fire detector.
   d. Confirm the result of each sensor test through indication at the detector or control unit.
   e. Where individual sensors cannot be tested individually, test the primary sensor.
      Note – For example, it might not be possible to individually test the heat sensor in a thermally enhanced smoke detector.
   f. Record all tests and results.
6. Radiant energy fire detectors
   a. Verify no point requiring detection is obstructed or outside the detector's field of view.
   b. Test flame detectors and spark/ember detectors in accordance with the manufacturer's published instructions to determine that each detector is operative.
   c. Determine flame detector and spark/ember detector sensitivity using any of the following:
      (1) Calibrated test method
      (2) Manufacturer's calibrated sensitivity test instrument
      (3) Listed control unit arranged for the purpose

(4) Other approved calibrated sensitivity test method that is directly proportional to the input signal from a fire, consistent with the detector listing or approval.

d. If designed to be field adjustable, replace detectors found to be outside of the approved range of sensitivity or adjust to bring them into the approved range.

e. Do not determine flame detector and spark/ember detector sensitivity using a light source that administers an unmeasured quantity of radiation at an undefined distance from the detector.

7. Carbon monoxide detectors

a. Testing of CO System Detectors. For all carbon monoxide system detectors installed after January 1, 2012, carbon monoxide tests shall be performed at initial acceptance and annually by the introduction of carbon monoxide into the sensing chamber or element.

b. Carbon monoxide detectors/carbon monoxide alarms

i. CO entry test

(1) Test the devices in place to ensure CO entry to the sensing chamber by introduction through the vents, to the sensing chamber of listed and labeled product acceptable to the manufacturer or in accordance with manufacturer's published instructions

ii. Air sampling

(1) Per test methods documented in the manufacturer's published instructions, verify detector alarm response through the end sampling port on each pipe run; verify airflow through all other ports as well.

iii. Duct type

(1) Test or inspect air duct detectors to ensure that the device will sample the airstream in accordance with the manufacturer's published instructions.

iv. CO detector with control output functions

(1) Within each protected space, verify that the control capability remains operable even if all of the initiating devices connected to the same initiating device circuit or signaling line circuit are in an alarm state.

8. Supervisory signal devices

a. Control valve switch

i. Operate valve and verify signal receipt to be within the first two revolutions of the handwheel or within one-fifth of the travel distance, or per the manufacturer's published instructions. Continue to cycle outside stem and yoke valves and verify switch does not reset during full travel of the valve stem.

b. High- or low-air pressure switch

i. Operate switch and verify receipt of signal is obtained where the required pressure is increased or decreased a maximum 10 psi (70 kPa) from the required pressure level.

c. Steam pressure

i. Operate switch and verify receipt of signal is obtained before pressure decreases to 110 percent of the minimum operating pressure of the steam-operated equipment.

d. Pressure supervisory devices for other sources

i. Operate switch and verify receipt of signal is obtained where the required pressure is increased or decreased from the normal operating pressure by an amount specified in approved design documents.

e. Room temperature switch
    i. Operate switch and verify receipt of signal to indicate the decrease in room temperature to 40°F (4.4°C) and its restoration to above 40°F (4.4°C).
f. Water level switch
    i. Operate switch and verify receipt of signal indicating the water level raised or lowered a maximum 3 in. (70 mm) from the required level within a pressure tank, or a maximum 12 in. (300 mm) from the required level of a nonpressure tank. Also verify its restoral to required level.
g. Water temperature switch
    i. Operate switch and verify receipt of signal to indicate the decrease in water temperature to 40°F (4.4°C) and its restoration to above 40°F (4.4°C).

9. Manual fire alarm boxes
    a. Operate manual fire alarm boxes per the manufacturer's published instructions. Test both key-operated presignal and general alarm manual fire alarm boxes.
10. Electromechanical releasing devices
    a. Nonrestorable-type link
        i. Verify correct operation by removal of the fusible link and operation of the associated device.
    b. Restorable-type link

    Note – Fusible thermal link detectors are commonly used to close fire doors and fire dampers electrically connected to the fire alarm control unit. They are actuated by the presence of external heat, which causes a solder element in the link to fuse, or by an electric thermal device, which, when energized, generates heat within the body of the link, causing the link to fuse and separate.

        i. Verify correct operation by removal of the fusible link and operation of the associated device.
11. Fire extinguishing system(s) or suppression system(s) alarm switches
    a. Operate the switch mechanically or electrically and verify receipt of signal by the fire alarm control unit.
12. Waterflow devices
    a. Mechanical, electrosonic, or pressure-type waterflow device
        i. Water shall be flowed through an inspector's test connection indicating the flow of water equal to that from a single sprinkler of the smallest orifice size installed in the system or other listed and approved waterflow switch test methods for wetpipe systems, or an alarm test bypass connection for dry-pipe, pre-action, or deluge systems in accordance with NFPA 25.

Special Hazard Equipment

1. Abort switch (dead-man type)
    a. Operate abort switch and verify correct sequence and operation.
2. Abort switch (recycle type)
    a. Operate abort switch and verify development of correct matrix with each sensor operated.
3. Abort switch (special type)
    a. Operate abort switch and verify correct sequence and operation in accordance with authority having jurisdiction. Observe sequencing as specified on as-built drawings or in system owner's manual.
4. Cross-zone detection circuit
    a. Operate one sensor or detector on each zone. Verify occurrence of correct sequence with operation of first zone and then with operation of second zone.

5. Matrix-type circuit
   a. Operate all sensors in system. Verify development of correct matrix with each sensor operated.
6. Matrix-type circuit
   a. Operate all sensors in system. Verify development of correct matrix with each sensor operated.
7. Release solenoid circuit
   Note – Manufacturer's published instructions should be consulted to ensure a proper operational test. No suppression gas or agent is expected to be discharged during the test of the solenoid.
   a. Verify operation of solenoid.
8. Squibb release circuit
   a. Use AGI flashbulb or other test light approved by the manufacturer. Verify operation of flashbulb or light.
9. Verified, sequential, or counting zone circuit
   a. Operate required sensors at a minimum of four locations in circuit. Verify correct sequence with both the first and second detector in alarm.
10. All above devices or circuits or combinations thereof
    a. Verify supervision of circuits by creating an open circuit.

Combination Systems

1. Verify location and condition (all types)
2. Fire extinguisher electronic monitoring devices/systems
   a. Test communication between the device connecting the fire extinguisher electronic monitoring device/system and the fire alarm control unit to ensure proper signals are received at the fire alarm control unit and remote annunciator(s) if applicable.
3. Carbon monoxide detectors/systems
   a. Test communication between the device connecting the carbon monoxide device/system and the fire alarm control unit to ensure proper signals are received at the fire alarm control unit and remote annunciator(s) if applicable.

Notification Appliances

1. Verify location and condition (all appliances).
2. Audible appliances
   a. For initial and reacceptance testing, measure sound pressure levels for signals with a sound level meter meeting ANSI S1.4a, Specifications for Sound Level Meters, Type 2 requirements. Measure sound pressure levels throughout the protected area to confirm that they are in compliance with Chapter 18. Set the sound level meter in accordance with ANSI/ASA S3.41, American National Standard Audible Emergency Evacuation (E2) and Evacuation Signals with Relocation Instructions (ESRI), using the time-weighted characteristic F (FAST).
3. Loudspeakers
   a. For initial and reacceptance testing, measure sound pressure levels for signals with a sound level meter meeting ANSI S1.4a, Specifications for Sound Level Meters, Type 2 requirements. Measure sound pressure levels throughout the protected area to confirm that they are in compliance with Chapter 18. Set the sound level meter in accordance with ANSI/ASA S3.41, American National Standard Audible Emergency Evacuation (E2) and Evacuation Signals with Relocation Instructions (ESRI), using the time-weighted characteristic F (FAST).

   b. Verify audible information to be intelligible and in compliance with NFPA-72 14.4.11 *[see Reference B]*.
4. Visual appliances
   a. General
      i. Perform initial and reacceptance testing in accordance with the manufacturer's published instructions. Verify appliance locations to be per approved layout and confirm that no floor plan changes affect the approved layout. Verify the candela rating or method of candela control marking on each visual appliance and rating when reported by the FACU agrees with the approved drawings. Confirm that each appliance flashes.
   b. Candela rating
      i. Verify the appliance candela rating marking or the FACU controlled candela rating agrees with the approved drawings.

Exit Marking Audible Notification Appliances

1. Verify location and condition.
2. Perform tests in accordance with manufacturer's published instructions.

Two-Way Emergency Communications Systems

1. Verify location and condition.
2. Use the manufacturer's published instructions and the as-built drawings provided by the system supplier to verify correct operation after the initial testing phase has been performed by the supplier or by the supplier's designated representative.
3. Test the two-way communication system to verify operation and receipt of visual and audible signals at the transmitting unit and the receiving unit, respectively.
4. Operate systems with more than five stations with a minimum of five stations operating simultaneously.
5. Verify voice quality and clarity.
6. Verify directions for the use of the two-way communication system, instructions for summoning assistance via the two-way communication system, and written identification of the location is posted adjacent to the two-way communication system.
7. Verify that all remote stations are readily accessible.
8. Verify the timed automatic communications capability to connect with a constantly attended monitoring location per NFPA-72 24.5.3.4 *[see Reference C]*.

Special Procedures

1. Alarm verification
   a. Verify time delay and alarm response for smoke detector circuits identified as having alarm verification.
2. Multiplex systems
   a. Verify communications between sending and receiving units under both primary and secondary power.
   b. Verify communications between sending and receiving units under open-circuit and short-circuit trouble conditions.
   c. Verify communications between sending and receiving units in all directions where multiple communications pathways are provided.
   d. If redundant central control equipment is provided, verify switchover and all required functions and operations of secondary control equipment.

e. Verify all system functions and features in accordance with manufacturer's published instructions.

Supervising Station Alarm Systems — Receivers

1. Signal receipt
   a. Verify receipt of signal.
2. Receivers
   a. Verify location and normal condition.
   b. All equipment
      i. Perform tests on all system functions and features in accordance with the equipment manufacturer's published instructions for correct operation in conformance with the applicable sections of Chapter 26.
      ii. Actuate initiating device and verify receipt of the correct initiating device signal at the supervising station within 90 seconds. Upon completion of the test, restore the system to its functional operating condition.
      iii. If test jacks are used, perform the first and last tests without the use of the test jack.
   c. Digital alarm communicator receiver (DACR)
      i. Disconnect each transmission means in turn from the DACR, and verify audible and visual annunciation of a trouble signal in the supervising station.
      ii. Cause a signal to be transmitted on each individual incoming DACR line (path) at least once every 6 hours (24 hours for DACTs installed prior to adoption of the 2013 edition of NFPA-72). Verify receipt of these signals.
   d. Digital alarm radio receiver (DARR)
      i. Cause the following conditions of all DARRs on all subsidiary and repeater station receiving equipment. Verify receipt at the supervising station of correct signals for each of the following conditions:
         (1) AC power failure of the radio equipment
         (2) Receiver malfunction
         (3) Antenna and interconnecting cable failure
         (4) Indication of automatic switchover of the DARR
         (5) Data transmission line failure between the DARR and the supervising or subsidiary station
   e. McCulloh systems
      i. Test and record the current on each circuit at each supervising and subsidiary station under the following conditions:
         (1) During functional operation
         (2) On each side of the circuit with the receiving equipment conditioned for an open circuit
      ii. Cause a single break or ground condition on each transmission channel. If such a fault prevents the functioning of the circuit, verify receipt of a trouble signal.
         (1) RF transmitter in use (radiating)
         (2) AC power failure supplying the radio equipment
         (3) RF receiver malfunction
         (4) Indication of automatic switchover

f. Radio alarm supervising station receiver (RASSR) and radio alarm repeater station receiver (RARSR)
    i. Cause each of the following conditions at each of the supervising or subsidiary stations and all repeater station radio transmitting and receiving equipment; verify receipt of correct signals at the supervising station:
        (1) AC power failure supplying the radio equipment
        (2) RF receiver malfunction
        (3) Indication of automatic switchover, if applicable
g. Private microwave radio systems
    i. Cause each of the following conditions at each of the supervising or subsidiary stations and all repeater station radio transmitting and receiving equipment; verify receipt of correct signals at the supervising station:
        (1) RF transmitter in use (radiating)
        (2) AC power failure supplying the radio equipment
        (3) RF receiver malfunction
        (4) Indication of automatic switchover
h. Performance-based technologies
    i. Perform tests to ensure the monitoring of integrity of the transmission technology and technology path.
    ii. Where a single communications path is used, disconnect the communication path. Verify that failure of the path is annunciated at the supervising station within 60 minutes of the failure (within 5 minutes for communication equipment installed prior to adoption of the 2013 edition of NFPA-72). Restore the communication path.
    iii. Where multiple communication paths are used, disconnect both communication paths and confirm that failure of the path is annunciated at the supervising station within not more than 6 hours of the failure (within 24 hours for communication equipment installed prior to adoption of the 2013 edition of NFPA-72). Restore both communication paths.

Mass Notification System

1. Control equipment
    i. Verify a system normal condition of:
        (1) Fuses
        (2) Interfaces
        (3) Lamps/LED
        (4) Primary (main) power supply
2. Secondary power batteries
    i. Verify a system normal condition.
3. Initiating devices
    i. Verify a system normal condition.
4. Notification appliances
    i. Verify a system normal condition.
5. Antenna
    i. Verify location and condition.
6. Transceivers
    i. Verify location and condition.

Acceptance Testing Records

1. All systems including new systems and additions or alterations to existing systems shall include the following documentation, which shall be delivered to the owner or the owner's representative upon final acceptance of the system:
    (1) *An owner's manual and manufacturer's published instructions covering all system equipment
    (2) Record (as-built) drawings in accordance with NFPA 72 7.5.5 *[see Reference D]*
    (3) A completed record of completion form in accordance with NFPA 72 7.5.6
    (4) For software-based systems, record copy of the site-specific software in accordance with NFPA 72 7.5.7 *[see Reference E].*
2. The record of completion shall be documented in accordance with NFPA 72 7.5.6 using either the record of completion forms, NFPA 72 Figure 7.8.2(a) through Figure 7.8.2(f) *[see Forms]*, or an alternative document that contains only the elements of NFPA 72 Figure 7.8.2(a) through Figure 7.8.2(f) *[see Forms]* applicable to the installed system.
3. The record of completion documentation shall be completed by the installing contractor and submitted to the authority having jurisdiction and the owner at the conclusion of the job. The record of completion documentation shall be permitted to be part of the written statement required in NFPA 72 7.5.2 *[see Reference F]* and part of the documents that support the requirements of NFPA 72 7.5.8 *[see Reference G]*. When more than one contractor has been responsible for the installation, each contractor shall complete the portions of the documentation for which that contractor has responsibility.

Document Accessibility

1. With every new system, a documentation cabinet shall be installed at the system control unit or at another approved location at the protected premises.
2. The documentation cabinet shall be sized so that it can contain all necessary documentation.
3. All record documentation shall be stored in the documentation cabinet. No record documentation shall be stored in the control unit.
    a. The intent is that paper and/or electronic documents should not be stored inside the control unit because control units are not typically approved for the storage of combustible material.
4. Where the documentation cabinet is not in the same location as the system control unit, its location shall be identified at the system control unit.
5. The documentation cabinet shall be prominently labeled SYSTEM RECORD DOCUMENTS.

Routine Inspection, Testing, and Maintenance.

1. Fire detection and alarm systems and equipment shall be inspected, tested, and maintained in accordance with NFPA 72.
    a. See Chapter 11 of the Port Authority Manual "Inspection, Testing, and Maintenance Requirements for Fire Protection and Life Safety Systems".
2. Confirm that records of acceptance testing will be kept on site and for the life of the building.
3. Confirm if tasks will be completed by building or facility maintenance, outside contractor, or a combination.
4. Confirm that inspection, testing, and maintenance documentation will be kept on site and available upon request.
5. Confirm that inspection, testing, and maintenance documentation is required to be retained for a minimum of 3 years.

REFERENCES

A.

NFPA 72 2019
7.6.6 Record of Inspection and Testing.

The record of all inspections, testing, and maintenance as required by NFPA 72 14.6.2.4 shall be documented using either the record of inspection and testing forms, NFPA 72 Figure 7.8.2(g) through Figure 7.8.2(l), or an alternative record that includes all the applicable information shown in NFPA 72 Figure 7.8.2(g) through Figure 7.8.2(l).

NFPA 72 2019
7.8.2 Forms for Documentation. Forms for documentation shall be as follows:

(1)* Unless otherwise permitted or required in NFPA 72 7.5.6 or NFPA 72 7.8.1.2, Figure 7.8.2(a) through Figure 7.8.2(f) shall be used to document the record of completion and inspection.(SIG-FUN)
(2)* Unless otherwise permitted or required in NFPA 72 7.6.6 or NFPA 72 7.8.1.2, NFPA 72 Figure 7.8.2(g) through Figure 7.8.2(l) shall be used to document the record of inspection and testing. (SIG-TMS)

Note: See Forms for NFPA 72 Figures 7.8.2(a) through Figures 7.8.2(l)

B.

NFPA 72 2019
14.4.11* Voice Intelligibility.

14.4.11.1 Voice communication using prerecorded messages and manual voice announcements shall be verified as being intelligible in accordance with the requirements of NFPA 72 18.4.11.
14.4.11.2 Intelligibility shall not be required to be determined through quantitative measurements.
14.4.11.3 Quantitative measurements as described in NFPA 72 Annex D shall be permitted but shall not be required.

C.

NFPA 72 2019
24.5.3.4* If the mass notification system serves more than one building, it shall be capable of providing separate messages to one individual building or to multiple buildings at any given time.

D.

NFPA 72 2019

7.5.5 Record Drawings (As-Builts). (SIG-FUN)

7.5.5.1 Record drawings shall consist of current updated shop drawings reflecting the actual installation of all system equipment, components, and wiring.

7.5.5.2* A sequence of operations in input/output matrix or narrative form shall be provided with the record drawings to reflect actual programming at the time of completion.

7.5.5.3 Where necessary, revised calculations in accordance with NFPA 72 7.4.10 shall be provided depicting any changes due to installation conditions.

7.5.5.4 Record drawings shall be turned over to the owner with a copy placed inside the documentation cabinet in accordance with NFPA 72 Section 7.7.

E.

NFPA 72 2019

7.5.7 Site-Specific Software. (SIG-TMS)

7.5.7.1 For software-based systems, a copy of the site-specific software shall be provided to the system owner or owner's designated representative.

7.5.7.1.1 The site-specific software documentation shall include both the user passcode and either the system programming password or specific instructions on how to obtain the programming password from the system manufacturer.

7.5.7.1.2 The passwords provided shall enable currently certified qualified programming personnel to access, edit, modify, and add to the existing system site-specific software.

7.5.7.2 A copy of the site-specific software shall be stored onsite in nonvolatile, nonerasable, nonrewritable memory.

F.

NFPA 72-2019

7.5.2 Before requesting final approval of the installation, if required by the authority having jurisdiction, the installing contractor shall furnish a written statement stating that the system has been installed in accordance with approved plans and tested in accordance with the manufacturer's published instructions and the appropriate NFPA requirements. (SIGFUN)

G.

NFPA 72 2019

7.5.8* Verification of Compliant Installation. (SIG-FUN)

7.5.8.1 Where required by the authority having jurisdiction, compliance of the completed installation with the requirements of this Code shall be certified by a qualified and impartial third-party organization acceptable to the authority having jurisdiction.

7.5.8.2 Verification of compliant installation shall be performed according to testing requirements and procedures specified in 14.4.1 and 14.4.2.

7.5.8.3 Verification shall ensure that:

(1) All components and functions are installed and operate per the approved plans and sequence of operation.
(2) All required system documentation is complete and is archived on site.
(3) For new supervising station systems, the verification shall also ascertain proper arrangement, transmission, and receipt of all signals required to be transmitted off-premises and shall meet the requirements of 14.4.1 and 14.4.2.
(4) For existing supervising station systems that are extended, modified, or reconfigured, the verification shall be required for the new work only, and reacceptance testing in accordance with Chapter 14 shall be acceptable.
(5) Written confirmation has been provided that any required corrective actions have been completed.

A.7.5.8 This section is intended to provide a basis for the authority having jurisdiction to require third-party verification and certification that the authority having jurisdiction and the system owner can rely on to reasonably assure that the fire alarm system installation complies with the applicable requirements. Where the installation is an extension, modification, or reconfiguration of an existing system, the intent is that the verification be applicable only to the new work and that reacceptance testing be acceptable.

FORMS

System Record of Completion

SYSTEM RECORD OF COMPLETION

This form is to be completed by the system installation contractor at the time of system acceptance and approval.
It shall be permitted to modify this form as needed to provide a more complete and/or clear record.
Insert N/A in all unused lines.
Attach additional sheets, data, or calculations as necessary to provide a complete record.

Form Completion Date: _____ Supplemental Pages Attached: _____

1. PROPERTY INFORMATION

Name of property: _____
Address: _____
Description of property: _____
Name of property representative: _____
Address: _____
Phone: _____ Fax: _____ E-mail: _____

2. INSTALLATION, SERVICE, TESTING, AND MONITORING INFORMATION

Installation contractor: _____
Address: _____
Phone: _____ Fax: _____ E-mail: _____
Service organization: _____
Address: _____
Phone: _____ Fax: _____ E-mail: _____
Testing organization: _____
Address: _____
Phone: _____ Fax: _____ E-mail: _____
Effective date for test and inspection contract: _____
Monitoring organization: _____
Address: _____
Phone: _____ Fax: _____ E-mail: _____
Account number: _____ Phone line 1: _____ Phone line 2: _____
Means of transmission: _____
Entity to which alarms are retransmitted: _____ Phone: _____

3. DOCUMENTATION

On-site location of the required record documents and site-specific software: _____

4. DESCRIPTION OF SYSTEM OR SERVICE

This is a: ❑ New system ❑ Modification to existing system Permit number: _____
NFPA 72 edition: _____

4.1 Control Unit

Manufacturer: _____ Model number: _____

4.2 Software and Firmware

Firmware revision number: _____

4.3 Alarm Verification

❑ This system does not incorporate alarm verification.
Number of devices subject to alarm verification: _____ Alarm verification set for _____ seconds

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Δ FIGURE 7.8.2(a) System Record of Completion. (SIG-FUN)

SYSTEM RECORD OF COMPLETION *(continued)*

5. SYSTEM POWER

5.1 Control Unit

5.1.1 Primary Power

Input voltage of control panel: _____ Control panel amps: _____

Overcurrent protection: Type: _____ Amps: _____

Branch circuit disconnecting means location: _____ Number: _____

5.1.2 Secondary Power

Type of secondary power: _____

Location, if remote from the plant: _____

Calculated capacity of secondary power to drive the system:

In standby mode (hours): _____ In alarm mode (minutes): _____

5.2 Control Unit

❑ This system does not have power extender panels

❑ Power extender panels are listed on supplementary sheet A

6. CIRCUITS AND PATHWAYS

Pathway Type	Dual Media Pathway	Separate Pathway	Class	Survivability Level
Signaling Line				
Device Power				
Initiating Device				
Notification Appliance				
Other (specify):				

7. REMOTE ANNUNCIATORS

Type	Location

8. INITIATING DEVICES

Type	Quantity	Addressable or Conventional	Alarm or Supervisory	Sensing Technology
Manual Pull Stations				
Smoke Detectors				
Duct Smoke Detectors				
Heat Detectors				
Gas Detectors				
Carbon Monoxide Detectors				
Waterflow Switches				
Tamper Switches				

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△ FIGURE 7.8.2(a) *Continued*

This summary is provided as a general guideline for acceptance testing and does not ensure coverage for all systems and equipment. This summary is intended to provide support for inspection staffs but the information included should not be construed as the only requirements for the systems and equipment. Codes and standards should be reviewed to confirm that all requirements are completed.

SYSTEM RECORD OF COMPLETION *(continued)*

9. NOTIFICATION APPLIANCES

Type	Quantity	Description
Audible		
Visual		
Combination Audible and Visual		

10. SYSTEM CONTROL FUNCTIONS

Type	Quantity
Hold-Open Door Releasing Devices	
HVAC Shutdown	
Fire/Smoke Dampers	
Door Unlocking	
Elevator Recall	
Elevator Shunt Trip	

11. INTERCONNECTED SYSTEMS

❑ This system does not have interconnected systems.

❑ Interconnected systems are listed on supplementary sheet _____.

12. CERTIFICATION AND APPROVALS

12.1 System Installation Contractor

This system as specified herein has been installed according to all NFPA standards cited herein.

Signed: _____ Printed name: _____ Date: _____

Organization: _____ Title: _____ Phone: _____

12.2 System Operational Test

This system as specified herein has tested according to all NFPA standards cited herein.

Signed: _____ Printed name: _____ Date: _____

Organization: _____ Title: _____ Phone: _____

12.3 Acceptance Test

Date and time of acceptance test: _____

Installing contractor representative: _____

Testing contractor representative: _____

Property representative: _____

AHJ representative: _____

Δ FIGURE 7.8.2(a) *Continued*

This summary is provided as a general guideline for acceptance testing and does not ensure coverage for all systems and equipment. This summary is intended to provide support for inspection staffs but the information included should not be construed as the only requirements for the systems and equipment. Codes and standards should be reviewed to confirm that all requirements are completed.

Emergency Communications Systems – Supplementary Record of Completion

EMERGENCY COMMUNICATIONS SYSTEMS SUPPLEMENTARY RECORD OF COMPLETION

This form is a supplement to the System Record of Completion. It includes systems and components specific to emergency communications systems.
This form is to be completed by the system installation contractor at the time of system acceptance and approval.
It shall be permitted to modify this form as needed to provide a more complete and/or clear record.
Insert N/A in all unused lines.

Form Completion Date: _____ Number of Supplemental Pages Attached: _____

1. PROPERTY INFORMATION

Name of property: _____

Address: _____

2. DESCRIPTION OF SYSTEM OR SERVICE

❑ Fire alarm with in-building fire emergency voice alarm communication system (EVAC)

❑ Mass notification system

❑ Combination system, with the following components:

❑ Fire alarm ❑ EVACS ❑ MNS ❑ Two-way, in-building, emergency communications system

❑ Other (specify): _____

NFPA 72 edition: _____ Additional description of system(s): _____

_____

2.1 In-Building Fire Emergency Voice Alarm Communications System

Manufacturer: _____ Model number: _____

Number of single voice alarm channels: _____ Number of multiple voice alarm channels: _____

Number of loudspeakers: _____ Number of loudspeaker circuits: _____

Location of amplification and sound processing equipment: _____

_____

_____

Location of paging microphone stations:

Location 1: _____

Location 2: _____

Location 3: _____

2.2 Mass Notification System

2.2.1 System Type:

❑ In-building MNS–combination

❑ In-building MNS ❑ Wide-area MNS ❑ Distributed recipient MNS

❑ Other (specify): _____

FIGURE 7.8.2(b) Emergency Communications System Supplementary Record of Completion. (SIG-FUN)

EMERGENCY COMMUNICATIONS SYSTEMS
SUPPLEMENTARY RECORD OF COMPLETION *(continued)*

2. DESCRIPTION OF SYSTEM OR SERVICE *(continued)*

2.2.2 System Features:

❑ Combination fire alarm/MNS ❑ MNS autonomous control unit ❑ Wide-area MNS to regional national alerting interface
❑ Local operating console (LOC) ❑ Distributed-recipient MNS (DRMNS) ❑ Wide-area MNS to DRMNS interface
❑ Wide-area MNS to high power loudspeaker array (HPLA) interface ❑ In-building MNS to wide-area MNS interface
❑ Other (specify): _____

2.2.3 MNS Local Operating Consoles

Location 1: _____
Location 2: _____
Location 3: _____

2.2.4 High Power Loudspeaker Arrays

Number of HPLA loudspeaker initiation zones: _____
Location 1: _____
Location 2: _____
Location 3: _____

2.2.5 Mass Notification Devices

Combination fire alarm/MNS visual devices: _____ MNS-only visual devices: _____
Textual signs: _____ Other (describe): _____
Supervision class: _____

2.2.6 Special Hazard Notification

❑ This system does not have special suppression predischarge notification.
❑ MNS systems DO NOT override notification appliances required to provide special suppression predischarge notification.

3. TWO-WAY EMERGENCY COMMUNICATIONS SYSTEMS

3.1 Telephone System

Number of telephone jacks installed: _____ Number of warden stations installed: _____
Number of telephone handsets stored on site: _____
Type of telephone system installed: ❑ Electrically powered ❑ Sound powered

3.2 Area of Refuge (Area of Rescue Assistance) Emergency Communications Systems

Number of stations: _____ Location of central control point: _____
Days and hours when central control point is attended: _____
Location of alternate control point: _____
Days and hours when alternate control point is attended: _____

Δ FIGURE 7.8.2(b) *Continued*

This summary is provided as a general guideline for acceptance testing and does not ensure coverage for all systems and equipment. This summary is intended to provide support for inspection staffs but the information included should not be construed as the only requirements for the systems and equipment. Codes and standards should be reviewed to confirm that all requirements are completed.

EMERGENCY COMMUNICATIONS SYSTEMS
SUPPLEMENTARY RECORD OF COMPLETION *(continued)*

3. TWO-WAY EMERGENCY COMMUNICATIONS SYSTEMS *(continued)*

3.3 Elevator Emergency Communications Systems

Number of elevators with stations: _____ Location of central control point: _____

Days and hours when central control point is attended: _____

Location of alternate control point: _____

Days and hours when alternate control point is attended: _____

3.4 Other Two-Way Communications System

Describe: _____

4. CONTROL FUNCTIONS

This system activates the following control functions specific to emergency communications systems:

Type	Quantity
Mass Notification Override of Alarm Signaling Systems or Appliances	

See Main System Record of Completion for additional information, certifications, and approvals.

Δ FIGURE 7.8.2(b) *Continued*

This summary is provided as a general guideline for acceptance testing and does not ensure coverage for all systems and equipment. This summary is intended to provide support for inspection staffs but the information included should not be construed as the only requirements for the systems and equipment. Codes and standards should be reviewed to confirm that all requirements are completed.

Power Systems – Supplementary Record of Completion

POWER SYSTEMS SUPPLEMENTARY RECORD OF COMPLETION

This form is a supplement to the System Record of Completion. It includes systems and components specific to power systems that incorporate generators, ESS systems, remote battery systems, or other complex power systems. This form is to be completed by the system installation contractor at the time of system acceptance and approval. It shall be permitted to modify this form as needed to provide a more complete and/or clear record. Insert N/A in all unused lines.

Form Completion Date: _____ Number of Supplemental Pages Attached: _____

1. PROPERTY INFORMATION

Name of property: _____

Address: _____

2. SYSTEM POWER

2.1 Control Unit

2.1.1 Primary Power

Input voltage of control panel: _____ Control panel amps: _____

Overcurrent protection: Type: _____ Amps: _____

Location (of primary supply panelboard): _____

Disconnecting means location: _____

2.1.2 Engine-Driven Generator

Location of generator: _____

Location of fuel storage: _____ Type of fuel: _____

2.1.3 Energy Storage Systems

Equipment powered by ESS system: _____

Location of ESS system: _____

Calculated capacity of ESS batteries to drive the system components connected to it:

In standby mode (hours): _____ In alarm mode (minutes): _____

2.1.4 Batteries

Location: _____ Type: _____ Nominal voltage: _____ Amp/hour rating: _____

Calculated capacity of batteries to drive the system:

In standby mode (hours): _____ In alarm mode (minutes): _____

2.2 In-Building Fire Emergency Voice Alarm Communications System or Mass Notification System

2.2.1 Primary Power

Input voltage of EVACS or MNS panel: _____ EVACS or MNS panel amps: _____

Overcurrent protection: Type: _____ Amps: _____

Location (of primary supply panelboard): _____

Disconnecting means location: _____

 NFPA 72 (p. 1 of 3)

Δ FIGURE 7.8.2(c) Power Systems Supplementary Record of Completion. (SIG-FUN)

POWER SYSTEMS
SUPPLEMENTARY RECORD OF COMPLETION *(continued)*

2. SYSTEM POWER *(continued)*

2.2.2 Engine-Driven Generator

Location of generator: _____

Location of fuel storage: _____ Type of fuel: _____

2.2.3 Energy Storage Systems

Equipment powered by ESS system: _____

Location of ESS system: _____

Calculated capacity of ESS batteries to drive the system components connected to it:

In standby mode (hours): _____ In alarm mode (minutes): _____

2.2.4 Batteries

Location: _____ Type: _____ Nominal voltage: _____ Amp/hour rating: _____

Calculated capacity of batteries to drive the system:

In standby mode (hours): _____ In alarm mode (minutes): _____

2.3 Notification Appliance Power Extender Panels

❑ This system does not have power extender panels.

2.3.1 Primary Power

Input voltage of power extender panel(s): _____ Power extender panel amps: _____

Overcurrent protection: Type: _____ Amps: _____

Location (of primary supply panelboard): _____

Disconnecting means location: _____

2.3.2 Engine Driven Generator

Location of generator: _____

Location of fuel storage: _____ Type of fuel: _____

2.3.3 Energy Storage Systems

Equipment powered by ESS system: _____

Location of ESS system: _____

Calculated capacity of ESS batteries to drive the system components connected to it:

In standby mode (hours): _____ In alarm mode (minutes): _____

2.3.4 Batteries

Location: _____ Type: _____ Nominal voltage: _____ Amp/hour rating: _____

Calculated capacity of batteries to drive the system:

In standby mode (hours): _____ In alarm mode (minutes): _____

Δ FIGURE 7.8.2(c) *Continued*

POWER SYSTEMS
SUPPLEMENTARY RECORD OF COMPLETION *(continued)*

2. SYSTEM POWER *(continued)*

2.4 Supervising Station Transmission Equipment

❑ This system does not use transmission equipment within the building powered by any other source than the alarm system control unit.

2.4.1 Primary Power

Input voltage of shared transmission equipment: _____

Shared transmission equipment panel amps: _____

Overcurrent protection: Type: _____ Amps: _____

Location (of primary supply panelboard): _____

Disconnecting means location: _____

2.4.2 Engine Driven Generator

Location of generator: _____

Location of fuel storage: _____ Type of fuel: _____

2.4.3 Energy Storage Systems

Equipment powered by ESS system: _____

Calculated capacity of ESS batteries to drive the system components connected to it:

In standby mode (hours): _____ In alarm mode (minutes): _____

2.4.4 Batteries

Location: _____ Type: _____ Nominal voltage: _____ Amp/hour rating: _____

Calculated capacity of batteries to drive the system:

In standby mode (hours): _____ In alarm mode (minutes): _____

See Main System Record of Completion for additional information, certifications, and approvals.

 NFPA 72 (p. 3 of 3)

Δ **FIGURE 7.8.2(c)** *Continued*

Notification Appliance Power Panel – Supplementary Record of Completion

NOTIFICATION APPLIANCE POWER PANEL SUPPLEMENTARY RECORD OF COMPLETION

This form is a supplement to the System Record of Completion. It includes a list of types and locations of notification appliance power extender panels.
This form is to be completed by the system installation contractor at the time of system acceptance and approval.
It shall be permitted to modify this form as needed to provide a more complete and/or clear record.
Insert N/A in all unused lines.

Form Completion Date: _____ Number of Supplemental Pages Attached: _____

1. PROPERTY INFORMATION

Name of property: _____

Address: _____

2. NOTIFICATION APPLIANCE POWER EXTENDER PANELS

Make and Model	Location	Area Served	Power Source

See Main System Record of Completion for additional information, certifications, and approvals.

 NFPA 72

Δ FIGURE 7.8.2(d) Notification Appliance Power Panel Supplementary Record of Completion. (SIG-FUN)

Interconnected Systems – Supplementary Record of Completion

INTERCONNECTED SYSTEMS SUPPLEMENTARY RECORD OF COMPLETION

This form is a supplement to the System Record of Completion. It includes a list of types and locations of systems that are interconnected to the main system.
This form is to be completed by the system installation contractor at the time of system acceptance and approval.
It shall be permitted to modify this form as needed to provide a more complete and/or clear record.
Insert N/A in all unused lines.

Form Completion Date: _____ Number of Supplemental Pages Attached: _____

1. PROPERTY INFORMATION

Name of property: _____

Address: _____

2. INTERCONNECTED SYSTEMS

Description	Location	Purpose

See Main System Record of Completion for additional information, certifications, and approvals.

 NFPA 72

Δ FIGURE 7.8.2(e) Interconnected Systems Supplementary Record of Completion. (SIG-FUN)

Deviations From Adopted Codes and Standards – Supplementary Record of Completion

DEVIATIONS FROM ADOPTED CODES AND STANDARDS SUPPLEMENTARY RECORD OF COMPLETION

This form is a supplement to the System Record of Completion. It enables the designer and/or installer to document and justify deviations from accepted codes or standards.
This form is to be completed by the system installation contractor at the time of system acceptance and approval.
It shall be permitted to modify this form as needed to provide a more complete and/or clear record.
Insert N/A in all unused lines.

Form Completion Date: _____ Number of Supplemental Pages Attached: _____

1. PROPERTY INFORMATION

Name of property: _____

Address: _____

2. DEVIATIONS FROM ADOPTED CODES OR STANDARDS

Description	Purpose

See Main System Record of Completion for additional information, certifications, and approvals.

 NFPA 72

Δ FIGURE 7.8.2(f) Deviations from Adopted Codes and Standards Supplementary Record of Completion. (SIG-FUN)

System Record of Inspection and Testing

SYSTEM RECORD OF INSPECTION AND TESTING

This form is to be completed by the system inspection and testing contractor at the time of a system test.
It shall be permitted to modify this form as needed to provide a more complete and/or clear record.
Insert N/A in all unused lines.
Attach additional sheets, data, or calculations as necessary to provide a complete record.

Inspection/Test Start Date/Time: _____ Inspection/Test Completion Date/Time: _____

Supplemental Form(s) Attached: _____ (yes/no)

1. PROPERTY INFORMATION

Name of property: _____
Address: _____
Description of property: _____
Name of property representative: _____
Address: _____
Phone: _____ Fax: _____ E-mail: _____

2. TESTING AND MONITORING INFORMATION

Testing organization: _____
Address: _____
Phone: _____ Fax: _____ E-mail: _____
Monitoring organization: _____
Address: _____
Phone: _____ Fax: _____ E-mail: _____
Account number: _____ Phone line 1: _____ Phone line 2: _____
Means of transmission: _____
Entity to which alarms are retransmitted: _____ Phone: _____

3. DOCUMENTATION

Onsite location of the required record documents and site-specific software: _____

4. DESCRIPTION OF SYSTEM OR SERVICE

4.1 Control Unit

Manufacturer: _____ Model number: _____

4.2 Software Firmware

Firmware revision number: _____

4.3 System Power

4.3.1 Primary (Main) Power

Nominal voltage: _____ Amps: _____ Location: _____
Overcurrent protection type: _____ Amps: _____ Disconnecting means location: _____

 NFPA 72 (p. 1 of 4)

Δ FIGURE 7.8.2(g) System Record of Inspection and Testing. (SIG-TMS)

SYSTEM RECORD OF INSPECTION AND TESTING *(continued)*

4. DESCRIPTION OF SYSTEM OR SERVICE *(continued)*

4.3.2 Secondary Power

Type: _____ Location: _____

Battery type (if applicable): _____

Calculated capacity of batteries to drive the system:

In standby mode (hours): _____ In alarm mode (minutes): _____

5. NOTIFICATIONS MADE PRIOR TO TESTING

Monitoring organization	Contact: _____	Time: _____
Building management	Contact: _____	Time: _____
Building occupants	Contact: _____	Time: _____
Authority having jurisdiction	Contact: _____	Time: _____
Other, if required	Contact: _____	Time: _____

6. TESTING RESULTS

6.1 Control Unit and Related Equipment

Description	Visual Inspection	Functional Test	Comments
Control unit	❑	❑	
Lamps/LEDs/LCDs	❑	❑	
Fuses	❑	❑	
Trouble signals	❑	❑	
Disconnect switches	❑	❑	
Ground-fault monitoring	❑	❑	
Supervision	❑	❑	
Local annunciator	❑	❑	
Remote annunciators	❑	❑	
Remote power panels	❑	❑	
	❑	❑	

6.2 Secondary Power

Description	Visual Inspection	Functional Test	Comments
Battery condition	❑	❑	
Load voltage	❑	❑	
Discharge test	❑	❑	
Charger test	❑	❑	
Remote panel batteries	❑	❑	

△ FIGURE 7.8.2(g) *Continued*

This summary is provided as a general guideline for acceptance testing and does not ensure coverage for all systems and equipment. This summary is intended to provide support for inspection staffs but the information included should not be construed as the only requirements for the systems and equipment. Codes and standards should be reviewed to confirm that all requirements are completed.

SYSTEM RECORD OF INSPECTION AND TESTING *(continued)*

6. TESTING RESULTS *(continued)*

6.3 Alarm and Supervisory Alarm Initiating Device

Attach supplementary device test sheets for all initiating devices.

6.4 Notification Appliances

Attach supplementary appliance test sheets for all notification appliances.

6.5 Interface Equipment

Attach supplementary interface component test sheets for all interface components.

Circuit Interface / Signaling Line Circuit Interface / Fire Alarm Control Interface

6.6 Supervising Station Monitoring

Description	Yes	No	Time	Comments
Alarm signal	❑	❑		
Alarm restoration	❑	❑		
Trouble signal	❑	❑		
Trouble restoration	❑	❑		
Supervisory signal	❑	❑		
Supervisory restoration	❑	❑		

6.7 Public Emergency Alarm Reporting System

Description	Yes	No	Time	Comments
Alarm signal	❑	❑		
Alarm restoration	❑	❑		
Trouble signal	❑	❑		
Trouble restoration	❑	❑		
Supervisory signal	❑	❑		
Supervisory restoration	❑	❑		

Δ FIGURE 7.8.2(g) *Continued*

This summary is provided as a general guideline for acceptance testing and does not ensure coverage for all systems and equipment. This summary is intended to provide support for inspection staffs but the information included should not be construed as the only requirements for the systems and equipment. Codes and standards should be reviewed to confirm that all requirements are completed.

SYSTEM RECORD OF INSPECTION AND TESTING *(continued)*

7. NOTIFICATIONS THAT TESTING IS COMPLETE

Monitoring organization	Contact: _____	Time: _____
Building management	Contact: _____	Time: _____
Building occupants	Contact: _____	Time: _____
Authority having jurisdiction	Contact: _____	Time: _____
Other, if required	Contact: _____	Time: _____

8. SYSTEM RESTORED TO NORMAL OPERATION

Date: _____ Time: _____

9. CERTIFICATION

This system as specified herein has been inspected and tested according to NFPA 72, _____ edition, Chapter 14.

Signed: _____ Printed name: _____ Date: _____

Organization: _____ Title: _____ Phone: _____

Qualifications (refer to 10.5.3): _____

10. DEFECTS OR MALFUNCTIONS NOT CORRECTED AT CONCLUSION OF SYSTEM INSPECTION, TESTING, OR MAINTENANCE

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

10.1 Acceptance by Owner or Owner's Representative:

The undersigned accepted the test report for the system as specified herein:

Signed: _____ Printed name: _____ Date: _____

Organization: _____ Title: _____ Phone: _____

Δ FIGURE 7.8.2(g) *Continued*

Notification Appliance – Supplementary Record of Inspection and Testing

NOTIFICATION APPLIANCE
SUPPLEMENTARY RECORD OF INSPECTION AND TESTING

This form is a supplement to the System Record of Inspection and Testing.
It includes a notification appliance test record.
This form is to be completed by the system inspection and testing contractor at the time of the inspection and/or test.
It shall be permitted to modify this form as needed to provide a more complete and/or clear record.
Insert N/A in all unused lines.

Inspection/Test Start Date/Time: _____ Inspection/Test Completion Date/Time: _____

Number of Supplemental Pages Attached: _____

1. PROPERTY INFORMATION

Name of property: _____

Address: _____

2. NOTIFICATION APPLIANCE TEST RESULTS

Appliance Type	Location/Identifier	Test Results

 NFPA 72 (p. 1 of 2)

Δ FIGURE 7.8.2(h) Notification Appliance Supplementary Record of Inspection and Testing. (SIG-TMS)

NOTIFICATION APPLIANCE SUPPLEMENTARY RECORD OF INSPECTION AND TESTING *(continued)*

2. NOTIFICATION APPLIANCE TEST RESULTS *(continued)*

Appliance Type	Location/Identifier	Test Results

See main System Record of Inspection and Testing for additional information, certifications, and approvals.

NFPA 72 (p. 2 of 2)

△ **FIGURE 7.8.2(h)** *Continued*

This summary is provided as a general guideline for acceptance testing and does not ensure coverage for all systems and equipment. This summary is intended to provide support for inspection staffs but the information included should not be construed as the only requirements for the systems and equipment. Codes and standards should be reviewed to confirm that all requirements are completed.

Initiating Device – Supplementary Record of Inspection and Testing

INITIATING DEVICE
SUPPLEMENTARY RECORD OF INSPECTION AND TESTING

This form is a supplement to the System Record of Inspection and Testing.
It includes an initiating device test record.
This form is to be completed by the system inspection and testing contractor at the time of the inspection and/or test.
It shall be permitted to modify this form as needed to provide a more complete and/or clear record.
Insert N/A in all unused lines.

Inspection/Test Start Date/Time: _____ Inspection/Test Completion Date/Time: _____

Number of Supplemental Pages Attached: _____

1. PROPERTY INFORMATION

Name of property: _____

Address: _____

2. INITIATING DEVICE TEST RESULTS

Device Type	Address	Location	Test Results

△ FIGURE 7.8.2(i) Initiating Device Supplementary Record of Inspection and Testing. (SIG-TMS)

INITIATING DEVICE
SUPPLEMENTARY RECORD OF INSPECTION AND TESTING *(continued)*

2. INITIATING DEVICE TEST RESULTS *(continued)*

Device Type	Address	Location	Test Results

See main System Record of Inspection and Testing for additional information, certifications, and approvals.

Δ **FIGURE 7.8.2(i)** *Continued*

Mass Notification System – Supplementary Record of Inspection and Testing

MASS NOTIFICATION SYSTEM
SUPPLEMENTARY RECORD OF INSPECTION AND TESTING

This form is a supplement to the System Record of Inspection and Testing.
It includes a mass notification system test record.
This form is to be completed by the system inspection and testing contractor at the time of the inspection and/or test.
It shall be permitted to modify this form as needed to provide a more complete and/or clear record.
Insert N/A in all unused lines.

Inspection/Test Start Date/Time: _____ Inspection/Test Completion Date/Time: _____

Number of Supplemental Pages Attached: _____

1. PROPERTY INFORMATION

Name of property: _____

Address: _____

2. MASS NOTIFICATION SYSTEM

2.1 System Type

❑ In-building MNS—combination

❑ In-building MNS—stand alone ❑ Wide-area MNS ❑ Distributed recipient MNS

❑ Other (specify): _____

2.2 System Features

❑ Combination fire alarm/MNS ❑ MNS ACU only ❑ Wide-area MNS to regional national alerting interface

❑ Local operating console (LOC) ❑ Direct recipient MNS (DRMNS) ❑ Wide-area MNS to DRMNS interface

❑ Wide-area MNS to high-power loudspeaker array (HPLA) interface ❑ In-building MNS to wide-area MNS interface

❑ Other (specify): _____

3. IN-BUILDING MASS NOTIFICATION SYSTEM

3.1 Primary Power

Input voltage of MNS panel: _____ MNS panel amps: _____

3.2 Engine-Driven Generator ❑ This system does not have a generator.

Location of generator: _____

Location of fuel storage: _____ Type of fuel: _____

3.3 Energy Storage Systems ❑ This system does not have an ESS.

Equipment powered by an ESS system: _____

Location of ESS system: _____

Calculated capacity of ESS batteries to drive the system components connected to it:

In standby mode (hours): _____ In alarm mode (minutes): _____

3.4 Batteries

Location: _____ Type: _____ Nominal voltage: _____ Amp/hour rating: _____

Calculated capacity of batteries to drive the system:

In standby mode (hours): _____ In alarm mode (minutes): _____

❑ Batteries are marked with date of manufacture.

 NFPA 72 (p. 1 of 2)

Δ FIGURE 7.8.2(j) Mass Notification System Supplementary Record of Inspection and Testing. (SIG-TMS)

MASS NOTIFICATION SYSTEM
SUPPLEMENTARY RECORD OF INSPECTION AND TESTING *(continued)*

4. MASS NOTIFICATION EQUIPMENT TEST RESULTS

Description	Visual Inspection	Functional Test	Comments
Functional test			
Reset/power down test			
Fuses			
Primary power supply			
ESS power test			
Trouble signals			
Disconnect switches			
Ground-fault monitoring			
CCU security mechanism			
Prerecorded message content			
Prerecorded message activation			
Software backup performed			
Test backup software			
Fire alarm to MNS interface			
MNS to fire alarm interface			
In-building MNS to wide-area MNS			
MNS to direct recipient MNS			
Sound pressure levels Occupied ❑ Yes ❑ No Ambient dBA:_____ Alarm dBA:_____ (attach supplementary notification appliance form(s) with locations, values, and weather conditions)			
System intelligibility Test method:_____ Score:_____ CIS value: _____ (attach supplementary notification appliance form(s) with locations, values, and weather conditions)			
Other (specify):			

See main System Record of Inspection and Testing for additional information, certifications, and approvals.

Δ FIGURE 7.8.2(j) *Continued*

This summary is provided as a general guideline for acceptance testing and does not ensure coverage for all systems and equipment. This summary is intended to provide support for inspection staffs but the information included should not be construed as the only requirements for the systems and equipment. Codes and standards should be reviewed to confirm that all requirements are completed.

Emergency Communication Systems – Supplementary Record of Inspection and Testing

EMERGENCY COMMUNICATIONS SYSTEMS
SUPPLEMENTARY RECORD OF INSPECTION AND TESTING

This form is a supplement to the System Record of Inspection and Testing.
It includes systems and components specific to emergency communication systems.
This form is to be completed by the system inspection and testing contractor at the time of the inspection and/or test.
It shall be permitted to modify this form as needed to provide a more complete and/or clear record.
Insert N/A in all unused lines.

Inspection/Test Start Date/Time: _____ Inspection/Test Completion Date/Time: _____

Number of Supplemental Pages Attached: _____

1. PROPERTY INFORMATION

Name of property: _____

Address: _____

2. DESCRIPTION OF SYSTEM OR SERVICE

❑ Fire alarm with in-building fire emergency voice alarm communication system (EVAC)

❑ Mass notification system

❑ Combination system, with the following components:

❑ Fire alarm ❑ EVACS ❑ MNS ❑ Two-way, in-building, emergency communication system

❑ Other (specify): _____

Additional description of system(s): _____

_____

2.1 In-Building Fire Emergency Voice Alarm Communication System

Manufacturer: _____ Model number: _____

Number of single voice alarm channels: _____ Number of multiple voice alarm channels: _____

Number of loudspeakers: _____ Number of loudspeaker circuits: _____

Location of amplification and sound processing equipment: _____

_____

_____

Location of paging microphone stations:

Location 1: _____

Location 2: _____

Location 3: _____

2.2 Mass Notification System

2.2.1 System Type:

❑ In-building MNS—combination

❑ In-building MNS ❑ Wide-area MNS ❑ Distributed recipient MNS

❑ Other (specify): _____

Δ FIGURE 7.8.2(k) Emergency Communications Systems Supplementary Record of Inspection and Testing. (SIG-TMS)

EMERGENCY COMMUNICATIONS SYSTEMS
SUPPLEMENTARY RECORD OF INSPECTION AND TESTING *(continued)*

2. DESCRIPTION OF SYSTEM OR SERVICE *(continued)*

2.2.2 System Features:

❑ Combination fire alarm/MNS ❑ MNS autonomous control unit ❑ Wide-area MNS to regional national alerting interface
❑ Local operating console (LOC) ❑ Distributed-recipient MNS (DRMNS) ❑ Wide-area MNS to DRMNS interface
❑ Wide-area MNS to high-power loudspeaker array (HPLA) interface ❑ In-building MNS to wide-area MNS interface
❑ Other (specify): _____

2.2.3 MNS Local Operating Consoles

Location 1: _____
Location 2: _____
Location 3: _____

2.2.4 High-Power Loudspeaker Arrays

Number of HPLA loudspeaker initiation zones: _____
Location 1: _____
Location 2: _____
Location 3: _____

2.2.5 Mass Notification Devices

Combination fire alarm/MNS visual devices: _____ MNS-only visual devices: _____
Textual signs: _____ Other (describe): _____
Supervision class: _____

2.2.6 Special Hazard Notification

❑ This system does not have special suppression pre-discharge notification
❑ MNS systems DO NOT override notification appliances required to provide special suppression pre-discharge notification

3. TWO-WAY EMERGENCY COMMUNICATION SYSTEMS

3.1 Telephone System

Number of telephone jacks installed: _____ Number of warden stations installed: _____
Number of telephone handsets stored on site: _____
Type of telephone system installed: ❑ Electrically powered ❑ Sound powered

3.2 Area of Refuge (Area of Rescue Assistance) Emergency Communications Systems

Number of stations: _____ Location of central control point: _____
Days and hours when central control point is attended: _____
Location of alternate control point: _____
Days and hours when alternate control point is attended: _____

Δ FIGURE 7.8.2(k) *Continued*

This summary is provided as a general guideline for acceptance testing and does not ensure coverage for all systems and equipment. This summary is intended to provide support for inspection staffs but the information included should not be construed as the only requirements for the systems and equipment. Codes and standards should be reviewed to confirm that all requirements are completed.

EMERGENCY COMMUNICATIONS SYSTEMS
SUPPLEMENTARY RECORD OF INSPECTION AND TESTING *(continued)*

3. TWO-WAY EMERGENCY COMMUNICATIONS SYSTEMS *(continued)*

3.3 Elevator Emergency Communications Systems

Number of elevators with stations: _____ Location of central control point: _____

Days and hours when central control point is attended: _____

Location of alternate control point: _____

Days and hours when alternate control point is attended: _____

3.4 Other Two-Way Communication System

Describe: _____

4. TESTING RESULTS

4.1 Control Unit and Related Equipment

Description	Visual Inspection	Functional Test	Comments
Control unit	❑	❑	
Lamps/LEDs/LCDs	❑	❑	
Fuses	❑	❑	
Trouble signals	❑	❑	
Disconnect switches	❑	❑	
Ground fault monitoring	❑	❑	
Supervision	❑	❑	
Local annunciator	❑	❑	
Remote annunciators	❑	❑	
Remote power panels	❑	❑	
Other:	❑	❑	

4.2 Secondary Power

Description	Visual Inspection	Functional Test	Comments
Battery condition	❑	❑	
Load voltage	❑	❑	
Discharge test	❑	❑	
Charger test	❑	❑	
Remote panel batteries	❑	❑	

Δ FIGURE 7.8.2(k) *Continued*

This summary is provided as a general guideline for acceptance testing and does not ensure coverage for all systems and equipment. This summary is intended to provide support for inspection staffs but the information included should not be construed as the only requirements for the systems and equipment. Codes and standards should be reviewed to confirm that all requirements are completed.

EMERGENCY COMMUNICATIONS SYSTEMS SUPPLEMENTARY RECORD OF INSPECTION AND TESTING *(continued)*

4. TESTING RESULTS *(continued)*

4.3 Emergency Communications Equipment

Description	Visual Inspection	Functional Test	Comments
Control unit	❑	❑	
Lamps/LEDs/LCDs	❑	❑	
Fuses	❑	❑	
Secondary power supply	❑	❑	
Trouble signals	❑	❑	
Disconnect switches	❑	❑	
Ground fault monitoring	❑	❑	
Panel supervision	❑	❑	
System performance	❑	❑	
System audibility	❑	❑	
System intelligibility	❑	❑	
Other:	❑	❑	

4.4 Mass Notification Equipment

Description	Visual Inspection	Functional Test	Comments
Functional test	❑	❑	
Reset/Power down test	❑	❑	
Fuses	❑	❑	
Primary power supply	❑	❑	
ESS power test	❑	❑	
Trouble signals	❑	❑	
Disconnect switches	❑	❑	
Ground fault monitoring	❑	❑	
CCU security mechanism	❑	❑	
Prerecorded message content	❑	❑	
Prerecorded message activation	❑	❑	
Software backup performed	❑	❑	
Test backup software	❑	❑	
Fire alarm to MNS Interface	❑	❑	
MNS to fire alarm interface	❑	❑	
In-building MNS to wide-area MNS	❑	❑	
MNS to direct recipient MNS	❑	❑	

△ **FIGURE 7.8.2(k)** *Continued*

This summary is provided as a general guideline for acceptance testing and does not ensure coverage for all systems and equipment. This summary is intended to provide support for inspection staffs but the information included should not be construed as the only requirements for the systems and equipment. Codes and standards should be reviewed to confirm that all requirements are completed.

EMERGENCY COMMUNICATIONS SYSTEMS
SUPPLEMENTARY RECORD OF INSPECTION AND TESTING *(continued)*

4. TESTING RESULTS *(continued)*

4.4 Mass Notification Equipment *(continued)*

Description	Visual Inspection	Functional Test	Comments
Sound pressure levels (attach report with locations, values, and weather conditions)	❑	❑	
System intelligibility ❑ CSI ❑ STI (attach report with locations, values, and weather conditions)	❑	❑	
Other:	❑	❑	

4.5 Two-Way Communication Equipment

Description	Visual Inspection	Functional Test	Comments
Phone handsets	❑	❑	
Phone jacks	❑	❑	
Off-hook indicator	❑	❑	
Call-in signal	❑	❑	
System performance	❑	❑	
System audibility	❑	❑	
System intelligibility	❑	❑	
Other:	❑	❑	

See main System Record of Inspection and Testing for additional information, certifications, and approvals.

Δ **FIGURE 7.8.2(k)** *Continued*

Interface Component – Supplementary Record of Inspection and Testing

INTERFACE COMPONENT
SUPPLEMENTARY RECORD OF INSPECTION AND TESTING

This form is a supplement to the System Record of Inspection and Testing.
It includes an interface component test record for circuit interfaces, signaling line circuit interfaces, and fire alarm control interfaces.
This form is to be completed by the system inspection and testing contractor at the time of the inspection and/or test.
It shall be permitted to modify this form as needed to provide a more complete and/or clear record.
Insert N/A in all unused lines.

Inspection/Test Start Date/Time: _____ Inspection/Test Completion Date/Time: _____

Number of Supplemental Pages Attached: _____

1. PROPERTY INFORMATION

Name of property: _____

Address: _____

2. INTERFACE COMPONENT TEST RESULTS

Interface Component Type	Address	Location	Test Results

 NFPA 72 (p. 1 of 2)

Δ FIGURE 7.8.2(l) Interface Component Supplementary Record of Inspection and Testing. (SIG-TMS)

INTERFACE COMPONENT
SUPPLEMENTARY RECORD OF INSPECTION AND TESTING *(continued)*

2. INTERFACE COMPONENT TEST RESULTS *(continued)*

Interface Component Type	Address	Location	Test Results

See main System Record of Inspection and Testing for additional information, certifications, and approvals.

Δ **FIGURE 7.8.2(l)** *Continued*

CHAPTER 12
AIRCRAFT HANGAR FIRE PROTECTION SYSTEMS

This chapter focuses on fire protection systems designed to protect Group I aircraft hangars containing fueled aircraft. Fire protection requirements for Group II, III, and IV hangars, as well as unfueled aircraft hangars, will be similar and utilize combinations of automatic systems including but not limited to sprinkler systems, foam sprinkler deluge systems, low and/or high expansion foam systems, supplementary underwing protection, and fire detection systems.

Full system approval will be a combination of acceptance testing for the individual systems and full system operational tests with the maximum number of systems expected to operate. Depending on the fire protection systems installed, full discharge tests will be required for initial acceptance.

Information regarding high expansion foam systems is focused on total flooding systems. NFPA 11 should be reviewed for criteria on local application systems and portable foam generating devices.

Contents

Approved Plans.

1. New installation or modification.
2. No outstanding rider comments from QAD Design Standards.
3. Confirmation that installation has been completed as per approved drawings.
4. Plans (shop drawings) are on site and available to inspection staff.

System Equipment

1. Identify the system equipment including but not limited to:
   a. Automatic sprinkler systems
   b. Foam water sprinkler systems.
   c. High expansion foam systems
   d. Supplementary and low-level protection systems
   e. Automatic fire detection systems
   f. Hand hose lines.
   g. Fire pumps
      i. Pressure Maintenance (Jockey or Make-Up) Pumps.
   h. Fire standpipe system
   i. Fire rated doors

Visual Inspection

1. Conduct a walkthrough of the installation to confirm:
   a. Clear access to control valves.
   b. All control valves are documented and accounted for.
   c. All control valves are in their normal position.

Automatic Sprinkler Systems

1. See Chapter 1 for Automatic Sprinkler Systems.

Foam Water Sprinkler Systems

1. See Chapter 6 for Foam Water Sprinkler Systems.

Deluge Foam-Water Sprinkler Systems

1. Manual actuation stations shall be located so that each system can be individually operated from both inside and outside the aircraft storage and servicing area. The manual stations shall be installed so that they are unobstructed, readily accessible, and located in the normal paths of exit from the area.

High Expansion Foam Systems

1. Total Flooding Systems – General Information.
   a. A total flooding system shall consist of fixed foam-generating apparatus complete with a piped supply of foam concentrate and water, arranged to discharge into an enclosed space or enclosure around the hazard.

b. Total flooding systems shall be permitted to be used where a permanent enclosure is provided around the hazard to enable the required amount of fire-extinguishing medium to accumulate at the proper depth and to be maintained for a period of time required to ensure fire control or extinguishment in a specific combustible material.
c. Leakage
    i. Openings below design filling depth, such as doorways and windows, shall be arranged to close automatically before, or simultaneously with, the start of the foam discharge, with due consideration for evacuation of personnel.
    ii. Openings shall be designed to maintain closure during a fire and shall be capable of withstanding pressures of foam and sprinkler water discharge.
    iii. Where openings cannot be protected by automatic closing devices, the total flooding system shall be designed to compensate for the probable loss of foam.
        (1) The system design shall be tested to ensure proper performance.
        (2) If the foam system is permitted to start prior to complete closure of the space to be filled, additional foam output shall be allowed to compensate for the losses.
        (3) This shall be verified by test based on the individual site conditions.
d. Ventilation.
    i. Where outside air is used for foam generation, high-level venting shall be provided for air that is displaced by the foam.
    ii. Where forced-air ventilating systems interfere with the proper buildup of foam, they shall be automatically shut down or closed.

2. Operating Devices. Operating devices shall include foam generators, valves, proportioners, eductors, discharge controls, and shutdown equipment.
    a. Foam Generators — Aspirator Type. Aspirator-type foam generators can be fixed or portable. Jet streams of foam solution aspirate sufficient amounts of air that is then entrained on the screens to produce foam. *[see Reference A – NFPA 11 Figure A.6.7.4(b)]*. These generators usually produce foam with expansion ratios of not more than 250:1.
    b. Foam Generators—Blower Type. Blower type foam generators can be fixed or portable. The foam solution is discharged as a spray onto screens through which an airstream developed by a fan or blower is passing. The blower can be powered by electric motors, internal combustion engines, air, gas, or hydraulic motors or water motors. The water motors are usually powered by foam solution. *[See Reference B – NFPA 11 Figure A.6.7.4(c)]*
3. Manual controls for actuation and shutdown shall be conveniently located and accessible at all times, including the time of fire and system operation.
    a. Manual controls for actuation shall operate the system to the same extent as the automatic control.
    b. All manual operating devices shall be identified with signs as to the hazards they protect.
4. All required door and window closers, vent openers, and electrical equipment shutdown devices shall be considered integral parts of the system and shall function simultaneously with the system operation.
5. Air Supply.
    a. Air from outside the hazard area shall be used for foam generation unless data is provided to show that air from inside the hazard can be successfully employed.
    b. Vents from the fire area shall be located to prevent recirculation of combustion products or other materials deleterious to the formation of foam into foam generator air inlets.

Supplementary Protection Systems.

1. Actuation of any deluge foam-water sprinkler system shall simultaneously operate the supplementary protection system.
2. Manual actuation stations shall be provided for each supplementary protection system and shall be located both inside and outside the aircraft maintenance and servicing area. Stations shall be located as close as possible to the aircraft positions to facilitate early system actuation in the event of a fire.
3. Actuation of any closed-head sprinkler system or fire detection system shall simultaneously operate the low-level foam protection system.
4. Supplementary Low-Expansion Foam Systems
   a. Where oscillating nozzles are used, the discharge pattern limits shall be established for the design. Positive securement of the limits of oscillation shall be provided by such devices as set screws, locking pins, or other approved methods. When placed in service, the manual override feature, if any, shall be locked out to provide for automatic operation only.
   b. Where monitor-type nozzles are used, an individual manual control valve shall be provided for each unit. This valve shall be supervised.
5. Supplementary High-Expansion Foam Systems
   a. Supplementary high-expansion foam systems shall utilize surfactants as the foaming ingredient and shall be designed for local application.
   b. The foam generators shall be located at the ceiling or on exterior walls in such a way that only air from outside the aircraft storage and servicing area can be used for foam generation. Roof vents shall be located to avoid recirculation of combustion products into the air inlets of the foam generators.

Automatic Fire Detection Systems

1. See Chapter 11 for Fire Detection and Alarm Systems

Hand Hose Systems

1. Hand hose systems shall be installed in every hangar to provide for manual fire control.
2. The hand hose systems shall be arranged to permit application of water or other extinguishing agents on each side and into the interior of the aircraft located in each aircraft storage and servicing area. At least two hose lines shall be designed to be operated simultaneously.
3. Foam-Water Hand Hose Systems.
   a. Foam-water hand hose systems shall be installed in aircraft storage and servicing areas.
   b. The systems shall conform with the applicable portions of NFPA 14 and NFPA 11.
   c. These hand hose systems shall be supplied from a connection to the sprinkler system header or from a direct connection to the water source.
   d. Each hand hose connection shall be a minimum of 38 mm (1½ in.) in size and fitted with a control valve. The hose shall be of a diameter to provide a minimum flow of 227 L/min (60 gpm).
   e. The hose shall be installed on an approved rack or reel. Hose shall be fitted with an approved foam-maker nozzle or a combination-type nozzle designed to permit foam application or water spray. Nozzles shall be of the shutoff type or shall have a shutoff valve at the nozzle inlet.

f. Foam–liquid concentrate shall be permitted to be supplied from a central distribution system, separate from or a part of a foam-water sprinkler system, or from stationary foam–liquid concentrate containers fitted with listed proportioning devices.
g. The minimum supply of foam–liquid concentrate shall be large enough to provide operation of at least two hand hose lines for a period of 20 minutes at a foam solution discharge rate of 227 L/min (60 gpm) each.

4. Water Hand Hose Systems
   a. Water hand hose and standpipe systems shall be installed in accordance with NFPA 14 in all shop, office, and non-aircraft-storage areas in hangars, except where special hazards that require special protection exist.
   b. Hoses shall be fitted with listed adjustable stream pattern nozzles designed to permit straight stream or water spray application

Fire Pumps

1. See Chapter 4 for Fire Pumps

Fire Standpipe Systems

1. See Chapter 2 for Fire Standpipe Systems

Fire Rated Doors and Other Opening Protectives

1. See Chapter 10 for Fire Rated Doors and other Opening Protectives

System Acceptance.

1. Conduct individual system acceptance testing.
   a. Coordinate individual system acceptance testing with systems operations acceptance testing when possible.
   b. Refer to individual system acceptance testing criteria.
      i. Hydrostatic pressure tests shall be conducted on each system as specified in NFPA 11, NFPA 13, NFPA 14, or NFPA 16, as applicable.
      ii. All devices and equipment installed as part of the system shall be tested.
      iii. Full-flowing tests with water only shall be made on each foam-water deluge system as a means of checking the sprinkler distribution and to ensure against clogging of piping and sprinklers by foreign matter carried by the water.
      iv. The smallest single foam-water deluge system shall be discharged using foam concentrate or a listed or approved alternative test method (see NFPA 11). This test shall be run for a length of time to stabilize discharge before test samples are taken to determine the proportioning rate.
      v. Any proportioner not tested under the requirements of NFPA 409 6.2.11.4 *[1.b.iv above]* or NFPA 409 6.2.11.5 *[2.c below]* shall be individually tested with foam concentrate or a listed or approved alternative test method (see NFPA 11) to determine the proportioning rate.
      vi. The timing of the foam system discharge shall be measured beginning at the time of system actuation.
2. Conduct testing of system operations.
   a. Coordinate testing of system operations with individual system acceptance testing when possible.

b. Full-flowing tests with water only shall be made on each foam-water deluge system as a means of checking the sprinkler distribution and to ensure against clogging of piping and sprinklers by foreign matter carried by the water. The maximum number of systems that are designed to operate in case of fire, including supplementary systems, shall be in full operation simultaneously to provide a check on the adequacy and condition of the water supply. Suitable gauge connections and gauges shall be provided to verify hydraulic calculations.
c. The maximum number of systems expected to operate shall be simultaneously discharged with foam or a listed or approved alternative test method (see NFPA 11). This test shall be run for a length of time to stabilize discharge before test samples are taken to determine the proportioning rate.
d. Supplementary and low-level protection systems shall be subjected to foam flow tests with foam, or a listed or approved alternative test method (see NFPA 11), flowing simultaneously from the maximum number of sprinkler systems expected to operate, to ensure that the hazard is protected in conformance with the design specification and to determine whether the flow pressures, agent discharge capacity, foam coverage, proportioning rate, and other operating characteristics are satisfactory.
e. The timing of the foam system discharge shall be measured beginning at the time of system actuation.

Control Valves

1. Identify the make and model of each control valve.
2. Identify how each control valve is supervised.
3. Operate each control valve through its full range and return to normal position.
4. Test the operation of each electronic valve supervision device.

Valve Identification

1. All control, drain, and test connection valves shall be provided with signs indicating their purpose.
2. Signs shall be permanently marked and shall be constructed of weather-resistant metal or rigid plastic materials.

Acceptance Testing Records

1. Acceptance testing records will be a combination of the information generated for each system installed including but not limited to:
   a. Sprinklers
   b. Foam water systems
   c. Fire detection systems
   d. Fire doors and other opening protectives
2. Summary of all fire protection and life safety systems installed.
3. Accepting testing report for each system installed.
4. Other documentation from A/EOR confirming that all work has been completed.
5. As built drawings including sequence of operations.
6. Location for acceptance testing records

Operations and Maintenance Information

1. System component instructions
2. System care and maintenance instructions
3. Copy of NFPA 25
4. Hydraulic data/calculations

Routine Inspection, Testing, and Maintenance

1. Inspection, testing, and maintenance of fire protection systems in aircraft hangars shall be performed in accordance with NFPA 11, NFPA 25, NFPA 70, NFPA 72, or NFPA 80 as applicable and as supplemented by NFPA 409 Table 11.1.1.
    a. See applicable chapters for the systems installed in the Port Authority Manual "Inspection, Testing, and Maintenance Requirements for Fire Protection and Life Safety Systems".
2. Confirm that records of acceptance testing will be kept on site and for the life of the building.
3. Confirm if tasks will be completed by building or facility maintenance, outside contractor, or a combination.
4. Confirm that inspection, testing, and maintenance documentation will be kept on site and available upon request.
5. Confirm that inspection, testing, and maintenance documentation is required to be retained for a minimum of 3 years.

REFERENCES

A.
NFPA 11 2016 – Figure A.6.7.4(b)

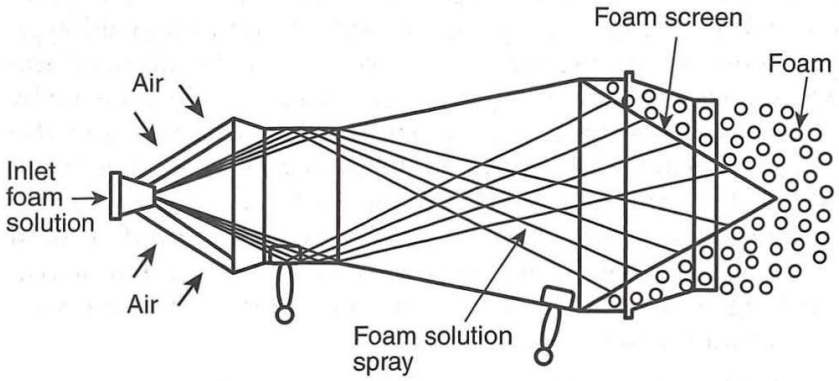

FIGURE A.6.7.4(b) Aspirating-Type Foam Generator.

B.
NFPA 11 2016 – Figure A.6.7.4(c)

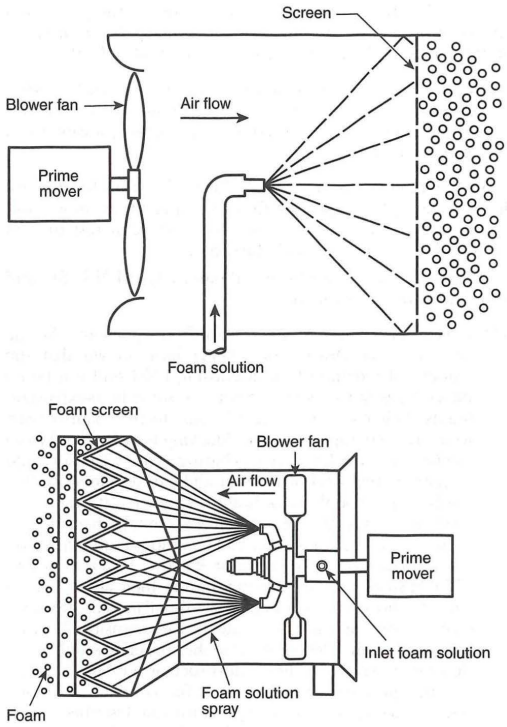

FIGURE A.6.7.4(c) Blower-Type Foam Generators.

CHAPTER 13
SMOKE MANAGEMENT SYSTEMS

Contents

Control Air Tubing

Requirements for control air tubing are not included in this summary. Assumption is that all devices are controlled and operated electronically. If equipment requiring control air is installed, refer to the appropriate building code for requirements.

Approved plans.

1. New installation or modification.
2. No outstanding rider comments from QAD Design Standards.
3. Confirmation that installation has been completed as per approved drawings.
4. Plans (shop drawings) are on site and available to inspection staff.

Scope and Purpose

NJ, NYS	NYC
909.1 Scope and Purpose This section applies to mechanical or passive smoke control systems where they are required by other provisions of this code. The purpose of this section is to establish minimum requirements for the design, installation and acceptance testing of smoke control systems that are intended to provide a tenable environment for the evacuation or relocation of occupants. These provisions are not intended for the preservation of contents, the timely restoration of operations or for assistance in fire suppression or overhaul activities. Smoke control systems regulated by this section serve a different purpose than the smoke- and heat-removal provisions found in Section 910. Mechanical smoke control systems shall not be considered exhaust systems under: NJ Chapter 5 of the International Mechanical Code NYS Chapter 5 of the Mechanical Code of New York State.	909.1 Scope and Purpose This section applies to mechanical or passive smoke control systems where they are required by other provisions of this code. A smoke control system, where required, facilitates the evacuation of the occupants. The purpose of this section is to establish minimum requirements for the design, installation and acceptance testing of smoke control systems that are intended to provide a tenable environment for the evacuation or relocation of occupants. These provisions are not intended for the preservation of contents, the timely restoration of operations or for assistance in fire suppression or post-fire smoke purge. Smoke control systems regulated by this section serve a different purpose than the smoke- and heat-venting provisions found in Section 910. Mechanical smoke control systems shall not be considered exhaust systems under Chapter 5 of the New York City Mechanical Code.

Special Inspection and Test Requirements

NJ, NYS	NYC
909.3 Special Inspection and Test Requirements In addition to the ordinary inspection and test requirements that buildings, structures and parts thereof are required to undergo, smoke control systems subject to the provisions of Section 909 shall undergo special inspections and tests sufficient to verify the proper commissioning of the smoke control design in its final installed condition. The design submission accompanying the construction documents shall clearly detail procedures and methods to be used and the items subject to such inspections and tests. Such commissioning shall be in accordance with generally accepted engineering practice and, where possible, based on published standards for the particular testing involved. The special inspections and tests required by this section shall be conducted under the same terms in Section 1704.	909.3 Special Inspection and Test Requirements In addition to the ordinary inspection and test requirements that buildings, structures and parts thereof are required to undergo, smoke control systems subject to the provisions of Section 909 shall undergo special inspections and tests sufficient to verify the proper commissioning of the smoke control design in its final installed condition. The design submission accompanying the construction documents shall clearly detail procedures and methods to be used and the devices, flow measurement, and other items subject to such inspections and tests. Such commissioning shall be in accordance with generally accepted engineering practice and, where possible, based on published standards for the particular testing involved. The special inspections and tests required by this section shall be conducted under the same terms in Section 1705. Records of the special inspection, including device locations, duct air leakage, pressure differentials, air/smoke flow measurements, smoke detection and control verification shall be maintained on the premises as a baseline against which future tests can be compared.

Smoke Barrier Construction

NJ, NYS	NYC
909.5 Smoke Barrier Construction Smoke barriers required for passive smoke control and a smoke control system using the pressurization method shall comply with (IBCNJ, BCNYS) Section 709 (Fire Partitions). The maximum allowable leakage area shall be the aggregate area calculated using the approved leakage area ratios.	909.5 Smoke Barrier Construction Smoke barriers required for passive smoke control and a smoke control system using the pressurization method shall comply with Section 709. Smoke barriers shall be constructed and sealed to limit leakage areas exclusive of protected openings. The maximum allowable leakage area shall be the aggregate area calculated using the following leakage area ratios.
909.5.1 Total Leakage Area Total leakage area of the barrier is the product of the smoke barrier gross area multiplied by the allowable leakage area ratio, plus the area of other openings such as gaps around doors and operable windows.	909.5.1 Total leakage area. Total leakage area of the barrier is the product of the smoke barrier gross area multiplied by the allowable leakage area ratio, plus the area of other openings such as gaps around doors and operable windows.
909.5.2 Testing of Leakage Area Compliance with the maximum total leakage area shall be determined by achieving the minimum air pressure difference across the barrier with the system in the smoke control mode for mechanical smoke control systems utilizing the pressurization method. Compliance with the maximum total leakage area of passive smoke control systems shall be verified through methods such as door fan testing or other methods, as approved.	909.5.2 Testing of leakage area. Compliance with the maximum allowable leakage area shall be determined by achieving the minimum air pressure difference across the barrier with the system in the smoke control mode for mechanical smoke control systems utilizing the pressurization method. Compliance with the maximum allowable leakage area of passive smoke control systems shall be verified through methods such as door fan testing or other methods, as approved by the commissioner and the Fire Commissioner.
909.5.3 Opening Protection Openings in smoke barriers shall be protected by automatic-closing devices actuated by the required controls for the mechanical smoke control system. Door openings shall be protected by fire door assemblies complying with Section 716. Exceptions: 1. Passive smoke control systems with automatic-closing devices actuated by spot-type smoke detectors listed for releasing service installed in accordance with Section 907.3. 2. Fixed openings between smoke zones that are protected utilizing the airflow method.	909.5.3 Opening protection. Openings in smoke barriers shall be protected by automatic-closing devices actuated by the required controls for the mechanical smoke control system. Door openings shall be protected by fire door assemblies complying with Section 716.5.3. Exceptions: 1. Passive smoke control systems with automatic-closing devices actuated by spot-type smoke detectors listed for releasing service installed in accordance with Section 907.3. 2. Fixed openings between smoke zones that are protected utilizing the airflow method.
909.5.3.2 Ducts and Air Transfer Openings Ducts and air transfer openings are required to be protected with a minimum Class II, 250°F (121°C) smoke damper complying with Section 717.	909.5.3.2 Ducts and air transfer openings. Ducts and air transfer openings are required to be protected with a minimum Class II, 250°F (121.1°C) smoke damper complying with Section 717.

Pressurization Method

NJ, NYS	NYC
909.6 Pressurization Method The primary mechanical means of controlling smoke shall be by pressure differences across smoke barriers. Maintenance of a tenable environment is not required in the smoke control zone of fire origin.	909.6 Pressurization Method The primary mechanical means of controlling smoke shall be by pressure differences across smoke barriers. Maintenance of a tenable environment is not required in the smoke control zone of fire origin.
909.6.1 Minimum Pressure Difference The pressure difference across a smoke barrier used to separate smoke zones shall be not less than 0.05-inch water gage (0.0124 kPa) in fully sprinklered buildings. In buildings permitted to be other than fully sprinklered, the smoke control system shall be designed to achieve pressure differences not less than two times the maximum calculated pressure difference produced by the design fire.	909.6.1 Minimum pressure difference. The minimum pressure difference across a smoke barrier shall be 0.05-inch water gauge (0.0124 kPa) in fully sprinklered buildings. In buildings permitted to be other than fully sprinklered, the smoke control system shall be designed to achieve pressure differences not less than two times the maximum calculated pressure difference produced by the design fire.
909.6.2 Maximum Pressure Difference The maximum air pressure difference across a smoke barrier shall be determined by required door-opening or closing forces. The actual force required to open exit doors when the system is in the smoke control mode shall be in accordance with Section 1010.1.3 (Door Opening Force). Opening and closing forces for other doors shall be determined by standard engineering methods for the resolution of forces and reactions. The calculated force to set a side-hinged, swinging door in motion shall be determined.	909.6.2 Maximum pressure difference. The maximum air pressure difference across a smoke barrier shall be determined by required door-opening or closing forces. The actual force required to open exit doors when the system is in the smoke control mode shall be in accordance with Section 1010.1.3. Opening and closing forces for other doors shall be determined by standard engineering methods for the resolution of forces and reactions. The calculated force to set a side-hinged, swinging door in motion shall be determined.
909.6.3 Pressurized Stairways and Elevator Hoistways Where stairways or elevator hoistways are pressurized, such pressurization systems shall comply with Section 909 as smoke control systems, in addition to the requirements of Sections 909.20 of this code and 909.21 of the Fire Code.	909.6.3 Pressurized stairways and elevator hoistways. Where stairways or elevator hoistways are pressurized, such pressurization systems shall comply with Section 909 of this code as smoke control systems, in addition to the requirements of Sections 909.20 and 909.21 of this code and the New York City Fire Code.

Airflow Design Method

NJ, NYS	NYC
909.7 Airflow Design Method Where approved, smoke migration through openings fixed in a permanently open position, which are located between smoke control zones by the use of the airflow method, shall be permitted. The design airflow shall be in accordance with this section. Airflow shall be directed to limit smoke migration from the fire zone. The geometry of openings shall be considered to prevent flow reversal from	909.7 Airflow design method Where approved by the commissioner, smoke migration through openings fixed in a permanently open position, which are located between smoke control zones by the use of the airflow method, shall be permitted. The design air flow shall be in accordance with this section. Air flow shall be directed to limit smoke migration from the fire zone. The geometry of openings shall be considered to

turbulent effects. Smoke control systems using the airflow method shall be designed in accordance with NFPA 92.	prevent flow reversal from turbulent effects. Smoke control systems using the airflow method shall be designed in accordance with NFPA 92.
909.7.1 Prohibited Conditions This method shall not be employed where either the quantity of air or the velocity of the airflow will adversely affect other portions of the smoke control system, unduly intensify the fire, disrupt plume dynamics or interfere with exiting. Airflow toward the fire shall not exceed 200 feet per minute (1.02 m/s). Where the calculated airflow exceeds this limit, the airflow method shall not be used.	909.7.1 Prohibited conditions. This method shall not be employed where either the quantity of air or the velocity of the airflow will adversely affect other portions of the smoke control system, unduly intensify the fire, disrupt plume dynamics or interfere with exiting. In no case shall airflow toward the fire exceed 200 feet per minute (1.02 m/s). Where the calculated airflow exceeds this limit, the airflow method shall not be used.

Exhaust Method

NJ, NYS	NYC
909.8 Exhaust Method Where approved by the fire code official, mechanical smoke control for large enclosed volumes, such as in atriums or malls, shall be permitted to utilize the exhaust method. Smoke control systems using the exhaust method shall be designed in accordance with NFPA 92.	909.8 Exhaust method. Where approved by the commissioner, mechanical smoke control for large enclosed volumes, such as in atriums or malls, shall be permitted to utilize the exhaust method. Smoke control systems using the exhaust method shall be designed in accordance with NFPA 92.
909.8.1 Smoke Layer The height of the lowest horizontal surface of the smoke layer interface shall be maintained not less than 6 feet (1829 mm) above a walking surface that forms a portion of a required egress system within the smoke zone.	909.8.1 Smoke layer. The height of the lowest horizontal surface of the accumulating smoke layer shall be maintained not less than 6 feet (1828.8 mm) above any walking surface that forms a portion of a required egress system within the smoke zone

Equipment

NJ, NYS	NYC
909.10 Equipment Equipment including, but not limited to, fans, ducts, automatic dampers and balance dampers, shall be suitable for its intended use, suitable for the probable exposure temperatures that the rational analysis indicates and as approved.	909.10 Equipment Equipment including, but not limited to, fans, ducts, automatic dampers and balance dampers, shall be suitable for its intended use, suitable for the probable exposure temperatures that the rational analysis indicates and as approved by the commissioner.
909.10.1 Exhaust Fans Components of exhaust fans shall be rated and certified by the manufacturer for the probable temperature rise to which the components will be exposed. This temperature rise shall be computed.	909.10.1 Exhaust fans. Components of exhaust fans shall be rated and certified by the manufacturer for the probable temperature rise to which the components will be exposed. This temperature rise shall be computed in accordance with NFPA 92.

909.10.2 Ducts Duct materials and joints shall be capable of withstanding the probable temperatures and pressures to which they are exposed as determined in accordance with Section 909.10.1. Ducts shall be constructed and supported in accordance with the applicable jurisdiction mechanical code. Ducts shall be leak tested to 1.5 times the maximum design pressure in accordance with nationally accepted practices. Measured leakage shall not exceed 5 percent of design flow. Results of such testing shall be a part of the documentation procedure. Ducts shall be supported directly from fire-resistance-rated structural elements of the building by substantial, noncombustible supports. Exception: Flexible connections, for the purpose of vibration isolation, complying with the applicable jurisdiction mechanical code and that are constructed of approved fire-resistance-rated materials.	909.10.2 Ducts. Duct materials and joints shall be capable of withstanding the probable temperatures and pressures to which they are exposed as determined in accordance with Section 909.10.1. Ducts shall be constructed and supported in accordance with the New York City Mechanical Code. Ducts shall be leak tested to 1.5 times the maximum design pressure in accordance with nationally accepted practices. Measured leakage shall not exceed 5 percent of design flow. Results of such testing shall be a part of the documentation procedure. Ducts shall be supported directly from fire-resistance-rated structural elements of the building by substantial, noncombustible supports. Exception: Flexible connections, for the purpose of vibration isolation, complying with the New York City Mechanical Code and that are constructed of approved fire-resistance-rated materials.
909.10.3 Equipment, Inlets and Outlets Equipment shall be located so as to not expose uninvolved portions of the building to an additional fire hazard. Outside air inlets shall be located so as to minimize the potential for introducing smoke or flame into the building. Exhaust outlets shall be so located as to minimize reintroduction of smoke into the building and to limit exposure of the building or adjacent buildings to an additional fire hazard.	909.10.3 Equipment, inlets and outlets. Equipment shall be located so as not to expose uninvolved portions of the building to an additional fire hazard. Outside air inlets shall be located so as to minimize the potential for introducing smoke or flame into the building. Exhaust outlets shall be located so as to minimize reintroduction of smoke into the building and to limit exposure of the building or adjacent buildings to an additional fire hazard.
909.10.4 Automatic Dampers Automatic dampers, regardless of the purpose for which they are installed within the smoke control system, shall be listed and conform to the requirements of approved, recognized standards.	909.10.4 Automatic dampers. Automatic dampers, regardless of the purpose for which they are installed within the smoke control system, shall comply with Section 717.3.1.
909.10.5 Fans In addition to other requirements, belt-driven fans shall have 1.5 times the number of belts required for the design duty, with the minimum number of belts being two. Fans shall be selected for stable performance based on normal temperature and, where applicable, elevated temperature. Calculations and manufacturer's fan curves shall be part of the documentation procedures. Fans shall be supported and restrained by noncombustible devices in accordance with the requirements of Chapter 16. Motors driving fans shall not be operated beyond their nameplate horsepower (kilowatts), as determined from measurement of actual current draw, and shall have a minimum service factor of 1.15.	909.10.5 Fans. In addition to other requirements, belt-driven fans shall have 1.5 times the number of belts required for the design duty with the minimum number of belts being two. Fans shall be selected for stable performance based on normal temperature and, where applicable, elevated temperature. Calculations and manufacturer’s fan curves shall be part of the documentation procedures. Fans shall be supported and restrained by noncombustible devices in accordance with the requirements of Chapter 16. Motors driving fans shall not be operated beyond their nameplate horsepower (kilowatts), as determined from measurement of actual current draw, and shall have a minimum service factor of 1.15.

	909.10.6 Seismic Requirements. Smoke control systems covered by Section 909 are required to function after an earthquake. Such smoke control systems shall be seismically designed in accordance with Section 1613 of this code and ASCE 7. The component importance factor, Ip, shall be taken as 1.5 in accordance with ASCE 7, Section 13.1.3. The smoke control system includes all components required for its operation, including but not limited to fans, ducts, electrical power, switchboards, motor control centers, starters, and controls. Exception: Smoke control systems in structures classified in Seismic Design Categories A or B shall have a component importance factor, Ip, of 1.0.

Standby Power

NJ, NYS	NYC
909.11 Standby Power Smoke control systems shall be provided with standby power in accordance with Section 2702.	909.11 Standby power. The smoke control system shall be supplied with two sources of power. The primary power supply shall be from the normal building power systems, while the secondary power source shall be from a standby power system complying with Section 2702.
909.11.1 Equipment Room The standby power source and its transfer switches shall be in a room separate from the normal power transformers and switch gears and ventilated directly to and from the exterior. The room shall be enclosed with not less than 1-hour fire barriers constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 711, or both.	909.11.1 Equipment room. The standby power source shall be located in a room separate from the normal power transformers and switch gears, and ventilated directly to and from the exterior. The room shall be enclosed with not less than 2-hour fire barriers constructed in accordance with Section 707, or with not less than 2-hour fire-resistance-rated horizontal assemblies constructed in accordance with Section 711, or both.
909.11.2 Power Sources and Power Surges Elements of the smoke control system relying on volatile memories or the like shall be supplied with uninterruptable power sources of sufficient duration to span 15-minute primary power interruption. Elements of the smoke control system susceptible to power surges shall be suitably protected by conditioners, suppressors or other approved means.	909.11.2 Power sources and power surges. Elements of the smoke [management] control system relying on electronic volatile memories or similar systems shall be supplied with uninterruptable power sources of sufficient duration to span a 15-minute primary power interruption. Elements of the smoke [management] control system susceptible to power surges shall be suitably protected by conditioners, suppressors or other approved means.

Detection and Control Systems

NJ, NYS	NYC
909.12 Detection and Control Systems Fire detection systems providing control input or output signals to mechanical smoke control systems or elements thereof shall comply with the requirements of Section 907. Such systems shall be equipped with a control unit complying with UL 864 and listed as smoke control equipment.	909.12 Detection and control systems. Fire detection systems providing control input or output signals to mechanical smoke control systems or elements thereof shall comply with the requirements of Section 907. Such systems shall be equipped with a control unit complying with UL 864 and listed as smoke control equipment.
909.12.1 Verification Control systems for mechanical smoke control systems shall include provisions for verification. Verification shall include positive confirmation of actuation, testing, manual override and the presence of power downstream of all disconnects. A preprogrammed weekly test sequence shall report abnormal conditions audibly, visually and by printed report. The preprogrammed weekly test shall operate all devices, equipment and components used for smoke control. Exception: Where verification of individual components tested through the preprogrammed weekly testing sequence will interfere with, and produce unwanted effects to, normal building operation, such individual components are permitted to be bypassed from the preprogrammed weekly testing, where approved by the building official and in accordance with both of the following: 1. Where the operation of components is bypassed from the preprogrammed weekly test, presence of power downstream of all disconnects shall be verified weekly by a listed control unit. 2. Testing of all components bypassed from the preprogrammed weekly test shall be in accordance with Section 909.20.6 of the Fire Code.	909.12.1 Verification. Control systems for mechanical smoke control systems shall include provisions for verification. Verification shall include positive confirmation of actuation, testing, manual override and the presence of power downstream of all disconnects. A preprogrammed weekly test sequence shall report, abnormal conditions audibly, visually and by printed report. The preprogrammed weekly test shall operate all devices, equipment and components used for smoke control. Exception: Where verification of individual components tested through the preprogrammed weekly testing sequence will interfere with, and produce unwanted effects to, normal building operation, such individual components are permitted to be bypassed from the preprogrammed weekly testing, where approved by the Fire Department and in accordance with both of the following: 1. Where the operation of components is bypassed from the preprogrammed weekly test, presence of power downstream of all disconnects shall be verified weekly by a listed control unit. 2. Testing of all components bypassed from the preprogrammed weekly test shall be tested semi-annually, and be tested under standby power conditions in accordance with Section 909 of the New York City Fire Code.
909.12.2 Wiring In addition to meeting requirements of NFPA 70, all wiring, regardless of voltage, shall be fully enclosed within continuous raceways.	909.12.2 Wiring. In addition to meeting requirements of the New York City Electrical Code, all wiring, regardless of voltage, shall be fully enclosed within continuous raceways.
909.12.3 Activation Smoke control systems shall be activated in accordance with this section.	909.12.3 Activation. Smoke control systems shall be activated in accordance with this section.

909.12.3.1 Pressurization, Airflow or Exhaust Method Mechanical smoke control systems using the pressurization, airflow or exhaust method shall have completely automatic control.	909.12.3.1 Pressurization, airflow or exhaust method. Mechanical smoke control systems using the pressurization, airflow or exhaust method shall have completely automatic control.
909.12.3.2 Passive Method Passive smoke control systems actuated by approved spot-type detectors listed for releasing service shall be permitted.	909.12.3.2 Passive method. Passive smoke control systems actuated by spot-type detectors listed for releasing service shall be permitted.
909.12.4 Automatic Control Where completely automatic control is required or used, the automatic-control sequences shall be initiated from an appropriately zoned automatic sprinkler system complying with Section 903.3.1.1, manual controls provided with ready access for the fire department and any smoke detectors required by engineering analysis.	909.12.4 Automatic control. Where completely automatic control is required or used, the automatic-control sequences shall be initiated from an appropriately zoned automatic sprinkler system complying with Section 903.3.1.1, manual controls that are readily accessible to the Fire Department and any smoke detectors required by engineering analysis. See Section 909.16 for manual control requirements.
	909.12.4.1 Building Management System. Automatic and manual operation of the smoke control system may alternately be done through a Building Management System (BMS) that is approved by the Fire Department and meets the following requirements: 1. The BMS system shall be listed for UL 864 UUKL Smoke Control. 2. The BMS Control Center shall be staffed 24 hours a day by operators trained in the building's smoke control systems and their operation. The smoke control system shall be operated by a certificate of fitness holder where required by the New York City Fire Code. 3. The control room shall be 2-hour fire-resistance-rated construction. 4. BMS annunciation and additional control station locations shall be located in the fire command center in accordance with Section 909.16.

Marking and Identification

NJ, NYS	NYC
909.14 Marking and Identification The detection and control systems shall be clearly marked at all junctions, accesses and terminations.	909.14 Marking and identification. The detection and control systems shall be clearly marked at all junctions, accesses and terminations.

Control Diagrams

NJ, NYS	NYC
909.15 Control Diagrams Identical control diagrams showing all devices in the system and identifying their location and function shall be maintained current and kept on file with the fire code official, the fire department and in the fire command center in a format and manner approved by the fire code official.	909.15 Control diagrams. Identical control diagrams showing all devices in the system and identifying their location and function shall be maintained current and kept on file with the department, the Fire Department and in the fire command center in a format and manner approved by the Fire Commissioner.

Fire Fighter's Smoke Control Panel

NJ, NYS	NYC
909.16 Fire Fighter's Smoke Control Panel A fire fighter's smoke control panel for fire department emergency response purposes only shall be provided and shall include manual control or override of automatic control for mechanical smoke control systems. The panel shall be located in a fire command center complying with Section 911 in high-rise buildings or buildings with smoke-protected assembly seating. In all other buildings, the fire fighter's smoke control panel shall be installed in an approved location adjacent to the fire alarm control panel. The fire fighter's smoke control panel shall comply with Sections 909.16.1 through 909.16.3.	909.16 Firefighter’s smoke control panel. A firefighter’s smoke control panel for Fire Department emergency response purposes only shall be provided and shall include manual control or override of automatic control for mechanical smoke control systems. The panel shall be located in a fire command center complying with Section 911 in high-rise buildings or buildings with smoke-protected assembly seating. In all other buildings, the firefighter’s smoke control panel shall be installed in the ground floor lobby of the building, adjacent to the fire alarm control panel or remote annunciator, or in another approved location. The firefighter’s smoke control panel shall either be a separate panel or can be integrated with a UUKL listed fire alarm control panel. The [fire-fighter’s] firefighter’s smoke control panel shall comply with Sections 909.16.1 through 909.16.3. Where required in Section [916] 917, the post-fire smoke purge system shall be manually activated from the firefighter’s control panel or an adjacent panel.
909.16.1 Smoke Control Systems Fans within the building shall be shown on the fire fighter's control panel. A clear indication of the direction of airflow and the relationship of components shall be displayed. Status indicators shall be provided for all smoke control equipment, annunciated by fan and zone, and by pilot-lamp-type indicators as follows: 1. Fans, dampers and other operating equipment in their normal status — WHITE. 2. Fans, dampers and other operating equipment in their off or closed status — RED. 3. Fans, dampers and other operating equipment in their on or open status — GREEN.	909.16.1 Panel indicators. Fans within the building shall be shown on the firefighter’s control panel. A clear indication of the direction of airflow and the relationship of components shall be displayed. Status indicators shall be provided for all smoke control equipment, annunciated by fan and zone, and by pilot-lamp-type indicators as follows: 1. Fans, dampers and other operating equipment in their normal status — WHITE. 2. Fans, dampers and other operating equipment in their on or open status — GREEN. 3. Fans, dampers and other operating equipment in a fault status — YELLOW/AMBER.

4. Fans, dampers and other operating equipment in a fault status — YELLOW/AMBER.	4. Fans, dampers and other operating equipment in their off or closed status — RED. The indicators shall be provided in the following order: WHITE, GREEN, YELLOW/AMBER then RED.
909.16.2 Smoke Control Panel The fire fighter's control panel shall provide control capability over the complete smoke control system equipment within the building as follows: 1. ON-AUTO-OFF control over each individual piece of operating smoke control equipment that can be controlled from other sources within the building. This includes stairway pressurization fans; smoke exhaust fans; supply, return and exhaust fans; elevator shaft fans and other operating equipment used or intended for smoke control purposes. 2. OPEN-AUTO-CLOSE control over individual dampers relating to smoke control and that are controlled from other sources within the building. 3. ON-OFF or OPEN-CLOSE control over smoke control and other critical equipment associated with a fire or smoke emergency and that can only be controlled from the fire fighter's control panel. Exceptions: 1. Complex systems, where approved, where the controls and indicators are combined to control and indicate all elements of a single smoke zone as a unit. 2. Complex systems, where approved, where the control is accomplished by computer interface using approved, plain English commands.	909.16.2 Panel controls. The firefighter’s control panel shall provide control capability over the complete smoke control system equipment within the building as follows: 1. ON-AUTO-OFF control over each individual piece of operating smoke control equipment that can also be controlled from other sources within the building. This includes stairway pressurization fans; smoke exhaust fans; supply, return and exhaust fans; elevator shaft fans and other operating equipment used or intended for smoke control purposes. 2. OPEN-AUTO-CLOSE control over dampers relating to smoke control and that are also controlled from other sources within the building. Dampers are permitted to be controlled by individual damper or grouped by smoke zone. 3. ON-OFF or OPEN-CLOSE control over smoke control and other critical equipment associated with a fire or smoke emergency and that can only be controlled from the firefighter’s control panel. The firefighter’s control panel shall be configured as described in Section 911. Exceptions: 1. Systems, where approved by the commissioner and the Fire Department, where the controls and indicators are combined to control and indicate all elements of a single smoke zone as a unit. 2. Systems, where approved by the commissioner and the Fire Department, where the control is accomplished by computer interface using approved, plain English commands.
909.16.3 Control Action and Priorities The fire-fighter's control panel actions shall be as follows: 1. ON-OFF and OPEN-CLOSE control actions shall have the highest priority of any control point within the building. Once issued from the fire fighter's control panel, automatic or manual control from any other control point within the building shall not contradict the control action. Where automatic means are provided to interrupt normal, nonemergency equipment operation or produce a specific result to safeguard the building or equipment including, but not limited to, duct freezestats, duct smoke detectors, high-temperature cutouts, temperature-actuated linkage and similar devices, such means shall be capable of being overridden by the fire fighter's control panel. The last control action as indicated by each fire fighter's control	909.16.3 Control action and priorities. The firefighter’s control panel actions shall be as follows: 1. ON-OFF and OPEN-CLOSE control actions shall have the highest priority of any control point within the building. Once issued from the firefighter’s control panel, automatic or manual control from any other control point within the building shall not contradict the control action. Where automatic means are provided to interrupt normal, nonemergency equipment operation or produce a specific result to safeguard the building or equipment including, but not limited to, duct freezestats, duct smoke detectors, high-temperature cutouts, temperature-actuated linkage and similar devices, such means shall be capable of being overridden by the firefighter’s control panel. The last control action as indicated by each firefighter’s control

panel switch position shall prevail. Control actions shall not require the smoke control system to assume more than one configuration at any one time. Exception: Power disconnects required by NFPA 70. 2. Only the AUTO position of each three-position fire-fighter's control panel switch shall allow automatic or manual control action from other control points within the building. The AUTO position shall be the NORMAL, nonemergency, building control position. Where a fire fighter's control panel is in the AUTO position, the actual status of the device (on, off, open, closed) shall continue to be indicated by the status indicator described in Section 909.16.1. Where directed by an automatic signal to assume an emergency condition, the NORMAL position shall become the emergency condition for that device or group of devices within the zone. Control actions shall not require the smoke control system to assume more than one configuration at any one time.	panel switch position shall prevail. Control actions shall not require the smoke control system to assume more than one configuration at any one time. Exception: Power disconnects required by the New York City Electrical Code. 2. Only the AUTO position of each three-position firefighter's control panel switch shall allow automatic or manual control action from other control points within the building. The AUTO position shall be the NORMAL, nonemergency, building control position. Where a [fire-fighter's] firefighter's control panel is in the AUTO position, the actual status of the device (on, off, open, closed) shall continue to be indicated by the status indicator described in Section 909.16.1. Where directed by an automatic signal to assume an emergency condition, the NORMAL position shall become the emergency condition for that device or group of devices within the zone. Control actions shall not require the smoke control system to assume more than one configuration at any one time.

System Response Time

NJ, NYS	NYC
909.17 System Response Time Smoke-control system activation shall be initiated immediately after receipt of an appropriate automatic or manual activation command. Smoke control systems shall activate individual components (such as dampers and fans) in the sequence necessary to prevent physical damage to the fans, dampers, ducts and other equipment. For purposes of smoke control, the fire fighter's control panel response time shall be the same for automatic or manual smoke control action initiated from any other building control point. The total response time, including that necessary for detection, shutdown of operating equipment and smoke control system startup, shall allow for full operational mode to be achieved before the conditions in the space exceed the design smoke condition. The system response time for each component and their sequential relationships shall be detailed in the required rational analysis and verification of their installed condition reported in the required final report.	909.17 System response time. Smoke-control system activation shall be initiated immediately after receipt of an appropriate automatic or manual activation command. Smoke control systems shall activate individual components (such as dampers and fans) in the sequence necessary to prevent physical damage to the fans, dampers, ducts and other equipment. For purposes of smoke control, the firefighter's control panel response time shall be the same for automatic or manual smoke control action initiated from any other building control point. The total response time, including that necessary for detection, shutdown of operating equipment and smoke control system startup, shall allow for full operational mode to be achieved before the conditions in the space exceed the design smoke condition. The system response time for each component and their sequential relationships shall be detailed in the required rational analysis and verification of their installed condition reported in the required final report.

Acceptance Testing

NJ, NYS	NYC
909.18 Acceptance Testing Devices, equipment, components and sequences shall be individually tested. These tests, in addition to those required by other provisions of this code, shall consist of determination of function, sequence and, where applicable, capacity of their installed condition.	909.18 Acceptance testing. Devices, equipment, components and sequences shall be individually tested. These tests, in addition to those required by other provisions of this code, shall consist of determination of function, sequence and, where applicable, capacity of their installed condition.
909.18.1 Detection Devices Smoke or fire detectors that are a part of a smoke control system shall be tested in accordance with Chapter 9 in their installed condition. Where applicable, this testing shall include verification of airflow in both minimum and maximum conditions.	909.18.1 Detection devices. Smoke or fire detectors that are a part of a smoke control system shall be tested in accordance with Chapter 9 in their installed condition. [When] Where applicable, this testing shall include verification of airflow in both minimum and maximum conditions.
909.18.2 Ducts Ducts that are part of a smoke control system shall be traversed using generally accepted practices to determine actual air quantities.	909.18.2 Ducts. Ducts that are part of a smoke control system shall be traversed using generally accepted practices to determine actual air quantities.
909.18.3 Dampers Dampers shall be tested for function in their installed condition.	909.18.3 Dampers. Dampers shall be tested for function in their installed condition.
909.18.4 Inlets and Outlets Inlets and outlets shall be read using generally accepted practices to determine air quantities.	909.18.4 Inlets and outlets. Inlets and outlets shall be read using generally accepted practices to determine air quantities.
909.18.5 Fans Fans shall be examined for correct rotation. Measurements of voltage, amperage, revolutions per minute (rpm) and belt tension shall be made.	909.18.5 Fans. Fans shall be examined for correct rotation. Measurements of voltage, amperage, revolutions per minute (rpm) and belt tension shall be made.
909.18.6 Smoke Barriers Measurements using inclined manometers or other approved calibrated measuring devices shall be made of the pressure differences across smoke barriers. Such measurements shall be conducted for each possible smoke control condition.	909.18.6 Smoke barriers. Measurements using inclined manometers or other approved calibrated measuring devices shall be made of the pressure differences across smoke barriers. Such measurements shall be conducted for each possible smoke control condition.
909.18.7 Controls Each smoke zone equipped with an automatic-initiation device shall be put into operation by the actuation of one such device. Each additional device within the zone shall be verified to cause the same sequence without requiring the operation of fan motors in order to prevent damage. Control sequences shall be verified throughout the system, including verification of override from the fire fighter's control panel and simulation of standby power conditions.	909.18.7 Controls. Each smoke zone equipped with an automatic-initiation device shall be put into operation by the actuation of one such device. Each additional device within the zone shall be verified to cause the same sequence without requiring the operation of fan motors in order to prevent damage. Control sequences shall be verified throughout the system, including verification of override from the firefighter’s control panel and simulation of standby power conditions.

909.18.8 Testing for Smoke Control Smoke control systems shall be tested by a special inspector in accordance with Section 1705.18.	909.18.8 Special inspections for smoke control. Smoke control systems shall be tested by a special inspector in accordance with Chapter 17.
1705.18 Testing for Smoke Control Smoke control systems shall be tested by a special inspector.	1705.18 Testing for smoke control. Testing of smoke control systems shall be witnessed in its entirety by a special inspector in accordance with Sections 1705.18.1 and 909. Exception: Post-fire smoke purge systems that are not required to function as a smoke control system shall be permitted to be inspected pursuant to the special inspection requirements of Section 1705.21.
1705.18.1 Testing Scope The test scope shall be as follows: 1. During erection of ductwork and prior to concealment for the purposes of leakage testing and recording of device location. 2. Prior to occupancy and after sufficient completion for the purposes of pressure difference testing, flow measurements and detection and control verification.	1705.18.1 Testing scope. The test scope shall be as follows: 1. During erection of ductwork and prior to concealment for the purposes of leakage testing and recording of device location. 2. Prior to occupancy and after sufficient completion for the purposes of pressure difference testing, flow measurements and detection and control verification.
909.18.8.1 Scope of Testing Testing shall be conducted in accordance with the following: 1. During erection of ductwork and prior to concealment for the purposes of leakage testing and recording of device location. 2. Prior to occupancy and after sufficient completion for the purposes of pressure-difference testing, flow measurements, and detection and control verification.	909.18.8.1 Scope of Testing Testing shall be conducted in accordance with the following: 1. During erection of ductwork and prior to concealment for the purposes of leakage testing and recording of device location. 2. Prior to occupancy and after sufficient completion for the purposes of pressure-difference testing, flow measurements, and detection and control verification.
909.18.8.2 Qualifications Approved agencies for smoke control testing shall have expertise in fire protection engineering, mechanical engineering and certification as air balancers.	909.18.8.2 Qualifications. Special inspectors for smoke control shall have a certification as air balancers and expertise in fire protection engineering or mechanical engineering.
909.18.8.3 Reports A complete report of testing shall be prepared by the approved agency. The report shall include identification of all devices by manufacturer, nameplate data, design values, measured values and identification tag or mark. The report shall be reviewed by the responsible registered design professional and, when satisfied that the design intent has been achieved, the responsible registered design professional shall sign, seal and date the report.	909.18.8.3 Reports. A complete report of testing shall be prepared by the special inspector or approved agency. The report shall include identification of all devices by manufacturer, nameplate data, design values, measured values and identification tag or mark. The report shall be reviewed by the responsible engineer and, when satisfied that the design intent has been achieved, the engineer shall seal, sign and date the report.
909.18.8.3.1 Report Filing A copy of the final report shall be filed with the fire code official and an identical copy shall be maintained in an approved location at the building.	909.18.8.3.1 Report filing. A copy of the final report and each inspection report shall be filed with the department and Fire Commissioner, and

	an identical copy shall be maintained in an approved location at the building.
909.18.9 Identification and Documentation Charts, drawings and other documents identifying and locating each component of the smoke control system, and describing its proper function and maintenance requirements, shall be maintained on file at the building as an attachment to the report required by Section 909.18.8.3. Devices shall have an approved identifying tag or mark on them consistent with the other required documentation and shall be dated indicating the last time they were successfully tested and by whom.	909.18.9 Identification and documentation. Charts, drawings and other documents identifying and locating each component of the smoke control system, and describing its proper function and maintenance requirements, shall be maintained on file at the building as an attachment to the report required by Section 909.18.8.3. Devices shall have an approved identifying tag or mark on them consistent with the other required documentation and shall be dated indicating the last time they were successfully tested and by whom.
	909.18.10 Reacceptance testing. The smoke control system shall require a reacceptance test after any modifications to the system or physical changes to the building that may affect system performance. Reacceptance testing shall be a retest of the entire system in accordance with Sections 909.18.1 through 909.18.9.

System Acceptance

NJ, NYS	NYC
909.19 System Acceptance Buildings, or portions thereof, required by this code to comply with this section shall not be issued a certificate of occupancy until such time that the fire code official determines that the provisions of this section have been fully complied with and that the fire department has received satisfactory instruction on the operation, both automatic and manual, of the system and a written maintenance program complying with the requirements of Section 909.20.1 of the Fire Code has been submitted and approved. Exception: In buildings of phased construction, a temporary certificate of occupancy, as approved by the fire code official, shall be allowed provided that those portions of the building to be occupied meet the requirements of this section and that the remainder does not pose a significant hazard to the safety of the proposed occupants or adjacent buildings.	909.19 System acceptance. Buildings, or portions thereof, required by this code to comply with this section shall not be issued a certificate of occupancy until such time that the department determines that the provisions of this section have been fully satisfied and a written maintenance program is approved by the New York City Fire Department. Exception: In buildings of phased construction, the department may issue a temporary certificate of occupancy provided that those portions of the building to be occupied meet the requirements of this section and that the remainder does not pose a significant hazard to the safety of the proposed occupants or adjacent buildings.

Acceptance Testing Records

1. Acceptance testing records will be a combination of the information generated for each component of the system installed including but not limited to:
   a. Fire detection systems
   b. Fire doors and other opening protectives
   c. Satisfactory testing of the fire fighter's smoke control panel.
   d. Confirmation of satisfactory system response time.
   e. Satisfactory testing of standby power for system operation.
   f. Inspection and testing documentation regarding construction of the Smoke Barrier.
2. Summary of all fire protection and life safety system equipment installed including fans, dampers, and control equipment for the smoke management system.
3. Other documentation from A/EOR confirming that all work has been completed.
4. As built drawings including sequence of operations.
5. Identification of the onsite location for acceptance testing records.

Routine Inspection, Testing, and Maintenance.

1. Inspection, testing, and maintenance of fire protection and life safety systems shall be performed in accordance with the following standards including but not limited to NFPA 25, NFPA 72, or NFPA 80.
   a. See applicable chapters for the systems installed in the Port Authority Manual “Inspection, Testing, and Maintenance Requirements for Fire Protection and Life Safety Systems”.
1. Confirm if tasks will be completed by building or facility maintenance, outside contractor, or a combination.
2. Confirm that inspection, testing, and maintenance documentation will be kept on site and available upon request.
3. Confirm that inspection, testing, and maintenance documentation is required to be retained for 3 years.