

# LESSONS LEARNED – QAD GUIDELINES FOR SUCCESSFUL CONSTRUCTION INSPECTIONS

DEFINITIONS.....	2
GENERAL OBSERVATIONS .....	3
DESIGN ISSUE CONSIDERATIONS .....	4
Vertical Transportation Design Issues .....	4
Use of Glazing Materials .....	4
Elevators .....	4
MRL (Machine Room Less) Elevators .....	5
Escalators and Moving Walks.....	5
Fire Protection Design Issues .....	6
Preaction Sprinkler Systems .....	6
Clean Agent Systems - Failing door fan pressurization tests .....	6
Fire Fighting Foam Systems – Installed inside of buildings .....	6
Deluge Sprinkler Systems - Installed Inside of Buildings .....	7
Fire Protection for Electrical/Computer Rooms .....	7
Fire Protection for Elevators Pits .....	7
GUIDELINES FOR SUCCESSFUL INSPECTIONS.....	8
General.....	8
Construction Standards .....	8
Structural.....	8
Architectural .....	9
Mechanical.....	9
Electrical .....	10
Vertical Transportation .....	10
Elevators .....	10
Escalators .....	11
Fire Protection.....	11
General Comments.....	11
Automatic Sprinkler Systems.....	11
Fire Standpipe Systems.....	12
Private Service Mains .....	12
Fire Pumps .....	12
Foam Water Sprinkler/Spray Systems .....	13
Dry Chemical Systems.....	14

Commercial Kitchen Hood, Duct, And Cooking Appliance Fire Extinguishing Systems.....	14
Clean Agent Systems .....	14
Fire Doors, Smoke Doors, And Other Opening Protectives. ....	15
Fire Detection and Alarm Systems .....	15
Smoke Management Systems .....	16

## DEFINITIONS

- 1) Inspection – A formal examination and evaluation of the completed contract or TAA to confirm that work is installed as per the approved drawings, safe for its intended use, and code compliant. Inspections are intended to be non-destructive but are conducted at the owner’s risk to demonstrate full function and completion of the proposed work. The examination will consist of but is not limited to:
  - a) visual review,
  - b) full functional testing of systems and equipment installed,
  - c) measurements of required specifications,
  - d) confirmation that building operations continue to perform as required,
- 2) Site Walkthrough
  - a) Is conducted on sites where the work is incomplete
  - b) Not considered an inspection of completed work
  - c) Held at the request of the REO to assist with identifying potential issues that may interfere with final acceptance.
  - d) May also be used to collectively work on a solution to a specific site related issue.
  - e) Information generated during the walkthrough is not intended to be “Comments” on the areas visited.
- 3) Partial inspection (Not applicable for Vertical Transportation projects)
  - a) An inspection intended to formally review and examine a defined scope of work within the contract or TAA project.
  - b) The work inspected is to be complete with no additional work planned or required for the defined area/systems/equipment.
  - c) Ongoing construction work to complete the project cannot interfere or interface with the work inspected for the requested partial inspection.
    - i) Interference or interfacing with work previously inspected may require a reinspection to confirm continued satisfactory operation and/or performance.
      - (1) Example – A completed fire rated wall, accepted under a previous partial inspection, will require a reinspection after new penetrations are made in the wall by ongoing construction work.
- 4) Final inspection
  - a) An inspection intended to formally review and examine the full scope of the project.
  - b) Partial inspections may be conducted on defined portions of the project with the goal of adding up to the full scope of the project.
    - i) On completion of all planned work, a final inspection must be scheduled to review the full scope of the project.

## GENERAL OBSERVATIONS

- 1) Throughout this document, there is one underlying reason for most comments identified at acceptance inspections. Simply put, inspections are requested for work that is incomplete or ready for final inspection. Comments generated in all disciplines usually reflect failure to install, pretest, and verify that work has been sufficiently completed. QAD is aware of:
  - a. Construction staff acknowledgement that work is incomplete and that the inspection request is premature but are given no choice in proceeding with ill-fated inspections.
  - b. TAA inspections being requested without TCAP Form TAA Ph 2 12, signed and sealed by the A/EOR, documenting that work is complete.
  - c. The engineering contract process does not include a step to confirm that work is complete and ready for inspection similar to the TCAP form identified above. As a result, incomplete work leads to numerous comments that could have been avoided. Resolution lies in holding participants responsible for incomplete work and discontinuing inspections when it becomes obvious that the work is not substantially complete.
- 2) Comments at inspections are often a result of other trades interfacing with completed work. This has proven to be a concern with vertical transportation projects noting the interaction with fire protection systems, emergency power systems, structural integrity, and equipment operation. Coordinating trades to satisfactorily complete work should be prioritized by REO staffs.
- 3) Prior to the start of construction, all contractors and sub-contractors must meet code requirements to perform the proposed work. For example, in NJ, contractors are required to be licensed and certified by the state to perform work on fire protection systems. Similarly, in NYC, contractors are required to be licensed and have the necessary Certificates of Fitness for the specific task. Staff have identified projects completed by contractors who were not certified requiring another approved contractor to review and accept the work as code compliant.
- 4) At final acceptance inspections, inspectors have found different equipment or systems installed rather than what was identified on approved design drawings. QAD is aware that changes can and will be made during construction to provide similar, approved equal equipment. These changes should be identified prior to the start of the inspection. Further review may be required if the changes are considered substantial.

## DESIGN ISSUE CONSIDERATIONS

The following is provided to focus attention on issues that should be included during the design stage of projects. On numerous occasions, during the final acceptance process, inspections identify deficiencies that require extraordinary efforts to correct at that time. The information provided below should be included in the design considerations and shown on drawings where possible to avoid potential problems in the field.

### Vertical Transportation Design Issues

#### Use of Glazing Materials

##### 1) Elevators

- a) The following must be permanently marked ANSI Z97.1 or 16 CFR Part 1201 and be visible after installation:
  - i) Glass hoistway enclosure walls.
  - ii) Glass car enclosure walls.
  - iii) Glass car doors.
  - iv) Glass hoistway doors.
  - v) Cab glass flooring panels.
  - vi) Transparent glazing material for hoistway door vision panels, if not clear wire glass.
  - vii) Laminated glass car door vision panels if not clear wire glass:
    - (1) Glass or plastic escalator balustrade panels.
    - (2) Glass or plastic escalator deck barricades.
    - (3) Glass or plastic escalator ceiling intersection guards.

##### 2) Escalators and moving walks

- a) If glass or plastic is used for the escalator (balustrade panels, deck barricades, ceiling intersection guards etc..) it must conform to ANSI Z97.1 or 16 CFR Part 1201.

#### Elevators

- 1) Confirm that all fire detection systems associated with car operations are installed and pretested including but not limited to:
  - a) Elevator recall on fire detection signals.
  - b) Installation of smoke and heat detectors in the elevator machine room.
  - c) Installation of a smoke detector inside the elevator pit.
    - i) Heat detector for hydraulic elevator pits.
  - d) Smoke detectors at top of the elevator shaft.
  - e) A heat detector inside the pit where sprinklers are more than 2 feet above the pit floor.
  - f) If sprinklers are installed in the hoistway provide NEMA4 enclosures for all electrical items located within 4ft above pit floor. The associated wiring must be rated for wet locations as per NFPA.
- 2) Confirm that self-closing and self-locking door hardware is installed for the elevator machine room door.
- 3) Confirm that a simplex NON-GFCI outlet is installed in the pit sump pump.
- 4) Provide a permanent and legible sign on or adjacent to the elevator machine room door. The sign should state "ELEVATOR MACHINE ROOM" with the elevator unit numbers associated with the room.
- 5) Confirm that 19 foot-candles of light is provided at all points of the elevator pit floor.
- 6) In NJ, confirm that all hoistway ledges (except divider beams) over 4 inches (as per ASME A17.1) must be beveled at an angle not less than 75° with the horizontal and meet the strength requirements.

- 7) In NYC, confirm that all hoistway ledges (except divider beams) over 2 inches (as per NYC Building Code) must be beveled at an angle not less than 75° with the horizontal and meet the strength requirements.

#### MRL (Machine Room Less) Elevators

- 1) Access to elevator spaces from roof tops.
  - a) If access to elevator spaces from roof tops is required, then guard rails shall be provided for fall hazard protection. If the elevator space on the roof is more than 35 inches from the roof top, then permanent, noncombustible stairs that are no more than 60 degrees from the horizontal and have standard noncombustible railings, shall be provided to access the platform or upper roof levels.
  - b) Pathways on roofs to elevator spaces and elevator access doors on roofs should be provided with adequate lighting and should be provided with means to prevent falls and trips etc.
- 2) Confirm that access openings in elevator hoistway enclosures where full bodily entry is not necessary for maintenance and inspection of components shall be:
  - a) Located to permit the required maintenance and inspection.
  - b) Of maximum width of 600 mm (24 in.) and a maximum height of 600 mm (24 in.). These dimensions shall be permitted to be increased, provided that any resultant opening through the access opening into the hoistway shall reject a 300 mm (12 in.) diameter ball.
    - i) Provided with doors that shall be kept closed and locked. Keys to unlock the access doors to the elevator hoistways shall be of Group 1 Security\*.  
\* Group 1 covers access or operation of equipment restricted to elevator personnel. This key shall not be part of a master key system.
    - ii) Labeled "ELEVATOR EQUIPMENT" with letters not less than 51 mm (2 in.) high.
    - iii) Labeled "DANGER: ELEVATOR HOISTWAY" with letters not less than 51 mm (2 in.) high and have an electrical safety switch that will remove power from the hoist machine and brake if the door is opened.
    - iv) Labeled with the elevator number (ex: PE1, PE A1, PE B2...etc.).
- 3) If access doors are provided to access elevator governors, where full bodily entry is not possible, the governors shall be within arm's reach to for resetting and maintenance purposes.
- 4) Where a floor or platform is provided at the top of the hoistway, machinery spaces above such a floor or platform shall have a clear headroom of not less than the following:
  - i) Spaces containing motor-generators 84 in.
  - ii) Spaces containing only overhead, secondary, or deflecting sheaves, 42 in.
  - iii) Spaces containing overhead, secondary, or deflecting sheaves, and governors, signal machines, or other equipment, 53 in.
- 5) For MRL elevators located in NYC, a permanent sign must be located on or adjacent to the Phase I key switch. The sign must indicate the location of the mainline disconnect switches for that bank of elevators. Lettering must be a minimum of 6 mm (0.25 in.) high in red or a color contrasting with a red background.

#### Escalators and Moving Walks

- 1) Confirm that smoke detection devices are installed as required.
- 2) Provide fall protection guarding between the deck barricade and the adjacent wall/balustrade at both landings.
- 3) If the escalator is designed to shutdown on a fire alarm signal, confirm that a 15 second warning is provided prior to shutting down the escalator.

- 4) The sides and undersides of the escalator/moving walk trusses, group of adjacent trusses, and machinery spaces must be enclosed in noncombustible or limited combustible materials (per the building code) to protect these spaces in case of a fire. This is different than protecting the building from a fire that starts in the escalator/moving walk. Enclosure of the truss or machinery space in a fire rated ceiling or installing sprinklers in these spaces is not allowed in lieu of enclosing them.
- 5) Provide permanent and legible labels at the entrance or egress ends of the escalator with the escalator/moving walk unit number.
- 6) Specify floor access plates that weigh less than 70 lbs per plate to access escalator or moving walk pits.

### Fire Protection Design Issues

#### Preaction Sprinkler Systems

- 1) Preaction sprinkler systems should be considered as a first option when alternative automatic fire extinguishing systems are being researched. Clean agent, foam, deluge, or dry chemical systems may have potential advantages in specific areas however, the routine inspection, testing, and maintenance requirements for these alternative fire extinguishing systems are often overlooked and subsequently, not completed as required. Wet sprinkler systems continue to provide the most reliable means of fire suppression however, when conditions dictate an alternative is needed, preaction sprinkler systems offer additional safeguards that may provide satisfactory protection while addressing specific concerns. Acceptance and routine testing is not burdensome and does not require discharge testing or other tests that may damage area contents.

#### Clean Agent Systems - Failing door fan pressurization tests

- 1) Initial construction of the protected enclosure cannot satisfactorily seal the space to contain the extinguishing agent. An initial enclosure evaluation is required to identify possible points of leakage. Following Annex C of NFPA 2001, a pressure run-up inspection is conducted focusing on all dampers, doors, hatches, perimeter walls, and the floor slab for major leaks. After all leaks are addressed, the next door fan test should demonstrate satisfactory performance of the extinguishing agent. Test reports are required for each enclosure integrity test and should document the initial results and satisfactory performance. The final acceptance test should only be scheduled after test reports are submitted and reviewed. Past practices of repeating door fan tests at the final acceptance inspection until attempts are conducted to get a successful test.

#### Fire Fighting Foam Systems – Installed inside of buildings

- 1) Examples of protected areas and equipment include:
  - Aircraft hangars
  - Flammable/combustible liquid storage and/or distribution systems.
  - Transformers or similar large electrical equipment.
- 2) Experience shows that when foam-water deluge sprinkler/spray systems are installed inside of buildings, the initial acceptance and routine tests become points of contention. Building management and/or maintenance staffs claim that performance of the code required full discharge tests will damage equipment in the room in addition to damaging the walls, floor, and possibly areas directly under the protected space. In most cases, the protected space houses additional electrical equipment that is not required for the space and are not designed to continue operating if the deluge system is activated. Design for a space protected by this type of system must closely scrutinize all electrical equipment including but not limited to:
  - Limiting installations to required electrical equipment only,

- Protecting electrical equipment with water resistive enclosures and/or water shields,
  - Locating electrical equipment away from discharge area.
  - Water resistant construction and proper drainage.
- 3) Foam-water wet, dry, and preaction sprinkler systems do not require full discharge testing like deluge sprinkler systems but are required to demonstrate satisfactory system component operation through flow testing. Test headers for each system should be included in the design so that proportioners can be properly tested by flowing the minimum volume of foam through the system. The test header usually consists of a connection for a hose assembly to direct and capture the discharge.
  - 4) Full discharge testing of foam water deluge sprinkler systems can be done without damaging existing electrical equipment by protecting equipment with plastic sheeting or other means to block spray from the system discharge.
  - 5) Light fixtures that may be impacted by foam water deluge system discharge should be waterproof to prevent damage.
  - 6) Hand hoseline foam systems require flow testing to demonstrate satisfactory operation of the proportioner. Capturing discharge from this equipment should not be an issue.

#### Deluge Sprinkler Systems - Installed Inside of Buildings

- 1) Primarily used as water curtains for protection of openings in fire rated construction. Deluge sprinkler systems have been used to protect large openings, baggage conveyor openings, and large electrical equipment such as transformers.
- 2) Deluge sprinkler systems create similar opinions to the foam water sprinkler systems identified above. Concerns against performing full discharge tests, although code required for initial acceptance and routine testing, delays and/or prevents demonstrating satisfactory system performance. System Design must include ability to perform the required testing.
- 3) Design for this deluge sprinkler extinguishing systems must include provision for appropriate drainage after system discharge.

#### Fire Protection for Electrical/Computer Rooms

- 1) Pre-action sprinkler systems are recommended because of additional protection from accidental discharge while alleviating challenges to maintain physical enclosure integrity associated with clean agent extinguishing system requirements.

#### Fire Protection for Elevators Pits

- 1) Pre-action systems are recommended because of additional protection from accidental discharge.

## GUIDELINES FOR SUCCESSFUL INSPECTIONS

The following information is provided as a guide to avoid typical deficiencies QAD identifies during construction inspections. The guidelines address specific concerns that are not unique to any facility but are repetitive and seen at more than one location. Guidelines are provided to assist contractors, inspection staff, and design professionals better prepare for a successful inspection. The assumption made for the information provided is that the requested inspection is a final inspection and intended to be the last time that the space/work/equipment will be looked at and that occupancy or use is intended to start immediately thereafter.

For the purposes of this document, the term damper is intended to include any damper used as opening protectives in walls, ceilings, or floors including but not limited to fire dampers, smoke dampers, combination fire/smoke dampers, etc.

### General

- 1) Confirm that approved plans (shop drawings) are on site and available to inspection staff.
  - a) A hard copy of the drawings is necessary. Plans shown on a laptop or tablet are not acceptable.
  - b) Plans provided should match information on the Design Standards approved drawing list.
- 2) For TAAs, confirm that all TCAP documentation has been completed including:
  - a) All documentation required for inspections has been submitted and accepted including
  - b) Confirm that the A/EOR attends the inspection
- 3) Confirm that REO representatives are familiar with the project, location, systems, and equipment to be inspected.
- 4) Confirm that staff are in attendance to provide access to areas, equipment, control panels, building functions, etc., required for the requested inspection.
- 5) Confirm that all equipment is available to conduct the requested inspection including calibrated gauges, ladders, lights, special tools for operating equipment, etc.

### Construction Standards

#### Structural

- 1) Confirm that seismic bracing has been installed at the top of masonry block walls.
- 2) Ensure that flux has been removed from all welds for satisfactory inspection.
- 3) Confirm that all tension control (TC) bolts are sheared as required.
- 4) Confirm that all moment plates are welded as required.
- 5) Confirm that re-bars are provided at negative moments at pile caps.
- 6) Confirm that column bearing plates are grouted as required.
- 7) Confirm that additional re-bar is installed at slab and wall openings as required.
- 8) Confirm that expansion joints are free from debris.
- 9) Confirm that returns are completed on all welded connections.
- 10) Confirm that all test reports are provided including for controlled backfill material.
- 11) Confirm that structural steel connections (beam to beam, beam to column) are welded or bolted as shown on approved drawings. Changed connections will require documentation from the A/EOR.



- 12) Confirm that the installation of anchor bolts follows all details shown on the approved drawings including the correct size, number, and washer type, etc.
- 13) Ensure that the shank of bolts extends a minimum of at least one thread beyond the nut.

#### Architectural

- 1) Confirm that all components required for ADA compliance (ramps, stair handrails, bathroom stalls, parking spaces, etc.) are completed.
- 2) Confirm that bracing for non-bearing walls is installed.
- 3) Confirm that all fire rated doors are installed as per approved drawings and labeled.
- 4) Confirm that lighting fixtures in suspended ceilings, weighing 56 pounds or more, are independently supported.
- 5) Confirm that wiring used to support ceiling systems is correctly installed, vertical, and not skewed around obstacles.
- 6) Confirm that expansion fittings are provided for mechanical and electrical piping at expansion joints.
- 7) Confirm that the stud spacing in fire rated assemblies complies with specified UL design requirements.
- 8) Confirm that partition walls intersecting fire rated assemblies do not interrupt or violate the rating of the assembly.
- 9) Confirm that fire rated enclosures are constructed properly and that all sides, including ceiling assemblies, are connected and sealed to maintain the required fire rating.
- 10) Confirm that the suspended ceiling black iron, used for support of non-ceiling elements, is approved by the A/EOR.
- 11) Complete construction of fire rated assemblies by confirming that joints are taped and spackled, including above ceiling areas, as required.
- 12) Confirm that doors in a means of egress are not locked or bolted and are readily openable from the egress side without the use of a key or special knowledge or effort.
- 13) Confirm that post construction fasteners, for threaded/pencil rods, conform to specifications in the construction documents. Non-conforming fasteners will require additional testing to confirm support strength.
- 14) Confirm that fire rated doors automatically close and latch. Be aware of double leaf door operation where a coordinator may be required.
- 15) Ensure that minimum heights for ceilings, doorways, and ramps are compliant with code requirements.
- 16) Ensure the architectural ceiling's support is installed as per the EOR design.

#### Mechanical

- 1) Verify that all dampers have been installed as per approved design.
- 2) Verify that breakaway connections are provided for dampers penetrating fire rated walls.
- 3) Confirm that seismic bracing for sprinkler, gas, and other mechanical and electrical piping systems.
- 4) Confirm that the annular space around a fire damper does not exceed the manufacturer's installation requirements.
- 5) Confirm that all retaining angles around dampers are properly installed as per the manufacturer's installation instructions.
- 6) Confirm that duct breakaway connections are installed as per the manufacturer's installation instructions including the number of fasteners used.
- 7) Confirm that access doors and identification labels are provided for all dampers.
- 8) Confirm that a gap is provided for indirect waste in kitchen facilities.

- 9) Confirm that traps, not exposed to regular water usage and in danger of evaporating, are provided with trap primers.

#### Electrical

- 1) Confirm that high voltage equipment is enclosed.
- 2) Verify that all GFCI receptacles are installed.
- 3) Complete grounding for manholes, electrical components, and equipment as required.
- 4) Confirm that labeling is completed for electrical equipment, components, and panels.
- 5) Confirm that flex/MC cable has not been installed instead of rigid conduit identified by contract requirements.
- 6) Ensure that the proper disconnect means are installed for all electrical equipment.
- 7) Confirm that minimum clear space requirements (in front of and above) is provided for all installed electrical equipment.
- 8) Ensure bonding is properly installed for materials that are likely to be energized.

### Vertical Transportation

#### Elevators

- 1) Confirm that the communication system/emergency telephone in the car is:
  - a) Connected to a location where it will be answered 24/7 by personnel that will take appropriate action (e.g. elevator maintenance company).
  - b) Provided with a means to automatically redirect the emergency telephone to a location where it will be answered 24/7 by personnel that will take appropriate action (e.g. elevator maintenance company) when on-site personnel do not answer it.
  - c) Provided with a means to indicate on demand to the authorized personnel answering the call the building location and the elevator number.
- 2) Confirm that a permanent label is provided on the mainline disconnect with the elevator/escalator unit number.
- 3) Confirm that a permanent label is provided on all electrical disconnects that indicate the feeding location for the disconnect.
- 4) Confirm that permanent Labels are provided on all disconnects in the elevator machine room (car lighting, oil cooler, mainline disconnect, etc.).
- 5) Confirm that an ABC rated portable fire extinguisher is provided in the elevator machine room, properly hung, and is accessible near the access door.
- 6) Be prepared to perform the required weight test.
- 7) Confirm that permanent labels are provided for all elevator entrances with the elevator unit designation. The elevator unit designation lettering on the label must be a minimum of 3 inches in height.
- 8) Confirm that the code data plate for the controller and/or mainline disconnect is provided in plain sight and is securely attached.
- 9) Confirm that the code required door time data plate is provided for the front and/or rear car doors.
- 10) Confirm that labels on the machine room fire rated door and frame are not painted over.
- 11) Confirm that the maintenance control program (MCP) for the unit is provided and located in the elevator machine room.
- 12) Confirm that the elevator machine room, pit, car top, hoistway door tracks, car door tracks are clean and free of dust, debris, dirt, loose wire.
- 13) Confirm that any storage or other non-elevator related items are removed from the elevator machine room.

- 14) Glass in hoistway doors must be flush with the door frame on the landing side.
- 15) Glass in car doors must be flush with the door frame on the car side.

#### Escalators

- 1) Confirm that stop-switches are satisfactorily pretested.
- 2) Confirm that threshold plates are satisfactorily pretested.
- 3) Confirm that unit shutdown is satisfactorily pretested for proper timing.
- 4) Provide the maintenance Control Program (MCP) for the unit.
- 5) Provide tamper resistant fasteners for the deck barricades.
- 6) Pretest and confirm that the handrail speed monitor will activate if the speed of the handrail deviates from the speed of the steps by more than 15% continuously or for more than 2 seconds and satisfactorily retest. This procedure must be verified in the field.
- 7) Confirm that the seams of the handrail guides are substantially flush.
- 8) Verify that the escalator pit and exterior is clean of dust and debris.

### Fire Protection

#### General Comments

- 1) Install all required portable fire extinguishers throughout the site.
- 2) Complete/replace/patch all missing structural fire proofing.
- 3) Review the 2022 Port Authority Fire Protection and Life Safety Systems Acceptance Inspections & Testing (FPLS AIT) Manual that was used as a reference for this document. The Manual provides additional information, details, and forms.  
<https://www.panynj.gov/content/dam/port-authority/about/studies-and-reports-pdfs/FPLS-Acceptance-Inspections-Testing-Manual.pdf>

#### Automatic Sprinkler Systems

- 1) Be prepared to provide documentation confirming completed system installation including but not limited to:
  - a) Completed Contractor's Material and Test Certificate for Aboveground Piping
  - b) Completed Contractor's Material and Test Certificate for Underground Piping.
  - c) NYC Certification of Compliance with Color Coding of Standpipe/Sprinkler Piping and Valve Handles
- 2) Provide all required sprinkler system signage
  - a) System identification
  - b) Control, drain, and test connection valves
  - c) General Information Sign
  - d) Hydraulic Design Information Sign
  - e) Antifreeze Information Sign
  - f) Auxiliary Drain Sign
- 3) Confirm that sprinkler heads are properly installed including but not limited to:
  - a) Removal of shipping blocks and caps
  - b) Installation of sprinkler head escutcheons and caps
  - c) Replacing painted sprinkler heads and caps.
  - d) Replacing sprinkler heads and caps covered with spray on fireproofing or other foreign materials.
  - e) Adjusting all sprinkler heads so that arms are parallel with sprinkler piping.

- 4) Confirm that support for sprinkler piping is installed as required including but not limited to:
  - a) Support for sprinkler armovers when they are of excessive length.
  - b) Sprinkler piping is independently supported.
  - c) Complete installation of all seismic support for sprinkler piping including straps, clamps, or other equipment required for designed performance.
- 5) Confirm that sprinkler heads are correctly installed including but not limited to:
  - a) Provide unobstructed discharge
  - b) Are not less than 6 feet apart (unless approved design shows details)
  - c) Are installed to protect areas under ductwork or other obstructions greater than 48 inches wide.
  - d) Are installed in electrical closets.

#### Fire Standpipe Systems

- 1) Be prepared to provide documentation confirming completed system installation including but not limited to:
  - a) Completed NFPA 14 Contractor's Material and Test Certificate for Aboveground Piping
  - b) Completed Contractor's Material and Test Certificate for Underground Piping.
  - c) Confirm that all piping has been properly flushed.
  - d) Confirm that piping has been hydrostatically tested
  - e) NYC Certification of Compliance with Color Coding of Standpipe/Sprinkler Piping and Valve Handles
- 2) Confirm that all hose valves and caps, hose, nozzles, cabinets are installed and ready for inspection.
  - a) Inspection may include opening and closing hose valves and checking tightness of hose valve caps.
- 3) The contractor must be prepared to conduct a flow test of the system from the most hydraulically remote station.
  - a) If a manual standpipe system, the contractor must make arrangements for a fire department pumper, portable pump, or other approved means to supply water and test the system for its designed capacity.
- 4) Confirm that pressure regulating devices are pretested for satisfactory operation.
- 5) Confirm that backflow prevention assemblies are pretested for satisfactory operation.
- 6) Confirm that each fire alarm system signaling device is pretested for transmission and initiation of the defined sequence of operations.

#### Private Service Mains

- 1) Be prepared to provide documentation confirming completed system installation including but not limited to:
  - a) Completed Contractor's Material and Test Certificate for Underground Piping.
- 2) Confirm that all appurtenances are installed, flushed, and pretested.
  - a) Confirm the number of fire hydrants that were installed.
  - b) Confirm the number of valves
  - c) Identify how and when flushing was completed.

#### Fire Pumps

- 1) Be prepared to provide documentation confirming completed system installation including but not limited to:
  - a) NFPA Contractor's Material and Test Certificate for Fire Pump Systems
  - b) NFPA Contractor's Material and Test Certificate for Private Service Mains Feeding Fire Pumps(s).

- 2) Complete preparations for field acceptance tests including but not limited to:
  - a) Review manufacturer's certified pump test curve.
  - b) Confirming that the pump manufacturer, the engine manufacturer (when supplied), the controller manufacturer, and the transfer switch manufacturer (when supplied) or their factory authorized representatives will attend the testing.
  - c) Confirm that all required test equipment is on site including calibrated test gauges, tachometer, pitot tube, clamp-on volt/ammeter, 50 foot lengths of 2 ½ inch lined hose, and fixed outlet flow devices.
- 3) Be prepared to complete an acceptable fire pump acceptance test form.
  - a) A sample Centrifugal Fire Pump Acceptance Test Form is provided in Chapter 4 of the Port Authority Fire Protection and Life Safety Systems Acceptance Inspections & Testing Manual.
- 4) Test fire pump operation
  - a) Confirm fire pump start settings
  - b) For motor driven pumps
  - c) For diesel engine driven pumps
- 5) Alternate Power Supply
  - a) Test the pump operation and transfer to the alternate power supply
- 6) Conduct required fire pump flow testing
  - a) Demonstrate satisfactory performance at minimum, rated, and peak loads.
- 7) Perform required controller acceptance testing
  - a) As a minimum, no fewer than six automatic and six manual operations shall be performed during the acceptance test.
  - b) An electric-driven fire pump shall be operated for a period of at least 5 minutes at full speed during each of the operations
  - c) The fire pump or foam concentrate pump shall be in operation for not less than 1 hour total time.
    - i) It is not the intent to discharge water for the full 1-hour test duration.
- 8) Fire pump alarm and signal devices
  - a) Confirm that pump running, loss of phase, and phase reversal signals are satisfactorily pretested to the central monitoring station.
  - b) Confirm that all supervisory signals are pretested.
- 9) Pressure Maintenance Devices
  - a) Jockey pumps
    - i) Confirm the start and stop pressures for the system.
    - ii) Demonstrate satisfactory performance of the pumps.

#### Foam Water Sprinkler/Spray Systems

- 1) Be prepared to provide documentation confirming completed system installation including but not limited to:
  - a) NFPA Contractor's Material and Test Certificate for Foam-Water Sprinkler/Spray Systems
  - b) Foam-Water Sprinkler System – General Information Form
  - c) NYC Certification of Compliance with Color Coding of Standpipe/Sprinkler Piping and Valve Handles
- 2) Confirm that all required system signage is provided including but not limited to:
  - a) Fire Department Connection sign
  - b) General Information sign
  - c) Hydraulic Design Information sign

- 3) Prepare for system testing:
  - a) Confirm that contractor has all test equipment to demonstrate satisfactory system performance.
  - b) Prepare for foam discharge from a single system.
  - c) Prepare for foam discharge from the maximum number of systems expected to operate.
- 4) Make preparations for testing proportioning equipment.
  - a) Flow testing is required to generate foam solution samples for testing.
  - b) Foam solution samples are produced by flowing sufficient effluent at calculated discharge demands and operating pressures.

#### Dry Chemical Systems

- 1) Be prepared to provide documentation confirming completed system installation including but not limited to:
  - a) An acceptable dry chemical system acceptance test report.
    - i) A sample of a dry chemical system acceptance test report is in Chapter 7 of the FPLS AIT Manual.
- 2) Confirm that the system is installed as per the approved design.
  - a) Confirm that the correct discharge nozzles are installed and have blow off caps.
- 3) Confirm that the system piping is pressure tested.
- 4) Confirm that fire alarm signals from the system are pretested to the local panel and central monitoring station.
  - a) Confirm that all alarm, supervisory, and trouble signals are correctly identified.
- 5) Demonstrate that the system operates both automatically and manually.

#### Commercial Kitchen Hood, Duct, And Cooking Appliance Fire Extinguishing Systems

- 1) Be prepared to provide documentation confirming completed system installation including but not limited to:
  - a) A NFPA Wet Chemical System Acceptance Test Report
- 2) NYC – Verify that all signage is installed as per NYC Fire Code Table 609.7 including:
  - a) Exhaust system diagram
  - b) Location of emission control devices
  - c) Identification of each emission control device
  - d) Operation and maintenance instructions
  - e) Instructions for fire extinguishing system manual activation
  - f) Portable fire extinguisher warning sign
- 3) Be prepared to demonstrate satisfactory performance of the fire extinguishing system including:
  - a) Operation of safety interlocks to shutdown power and gas supplies to cooking equipment under the hood.
  - b) Full sequence of operation testing including shutdown of supply and/or exhaust air fans, building alarms, and any other required building functions.
- 4) Confirm that an inspection and cleaning schedule for the exhaust system hood and ductwork is provided.

#### Clean Agent Systems

- 1) Be prepared to provide documentation confirming completed system installation including but not limited to:
  - a) An acceptable clean agent system acceptance test report.
- 2) Confirm that the release circuit can be successfully demonstrated without releasing the extinguishing agent for testing under all scenarios.

- 3) Confirm that manual pull stations are:
  - a) accurately identified to the hazard they protect.
  - b) pretested to initiate immediate release of extinguishing agent including override of abort switch operation.
  - c) Require two separate and distinct actions for operation.
- 4) Be prepared to provide all door fan test reports, including initial and final tests, to demonstrate satisfactory enclosure integrity.
  - a) Confirm that technician is certified to perform testing on the specific protected area.
- 5) Confirm that abort switches are installed correctly and that they operate as per design specifications.

#### Fire Doors, Smoke Doors, And Other Opening Protectives.

- 1) Provide a list of all fire doors, smoke doors, sliding/rolling fire doors, fire dampers, smoke dampers, and all other opening protectives, to include location, type, identifier, etc.
- 2) Fire Doors/Smoke Doors
  - a) Provide a report from the contractor with the following information:
    - i) Date of inspection.
    - ii) Name of person performing the inspection.
    - iii) Type and description of each fire door assembly.
    - iv) Verification of visual inspection and functional operation.
  - b) Swinging Doors
    - i) Confirm that the closing devices are correctly installed and working properly.
    - ii) Confirm that the doors swing easily and freely.
    - iii) Confirm that the doors fully latch upon closing.
    - iv)
  - c) Horizontally Sliding, Vertically Sliding, and Rolling Doors
    - i) Confirm that the guides are aligned and free of obstructions for rolling doors.
    - ii) Release devices (smoke detectors, fusible links) are in the correct location not painted or obstructed.
    - iii) Confirm that fusible link assemblies including chains, cables, s-hooks, etc., are in good condition and are not kinked, twisted, or pinched.
    - iv) Confirm that door closing speeds are not excessive or too slow.
- 3) Dampers
  - a) Confirm that all dampers are installed as required meeting manufacturer's installation instructions including but not limited to:
    - i) Access doors, within reach of the damper for maintenance
    - ii) Retaining angles, on all four sides of the duct and possibly both sides of the wall.
    - iii) Breakaway connections
    - iv) Installed within the plane of the wall.
      - (1) Variations for installation outside of the plane of the wall may be possible following manufacturer's instructions.
    - v) Confirm that all dampers and access doors are labeled as required.
      - (1) Satisfactory labels should be discussed prior to inspection.
  - b) Confirm that dampers are operationally tested by the contractor prior to final acceptance test.

#### Fire Detection and Alarm Systems

- 1) Be prepared to provide documentation confirming completed system installation including but not limited to:
  - a) An approved written test plan.

- i) The test plan must be provided to all participants of the fire alarm final acceptance tests prior to the scheduled date.
    - ii) The test plan must include the full sequence of operations
    - iii) List of all fire alarm initiating devices
    - iv) List of all supervisory signal devices
  - b) Record of Completion documentation as per NFPA 72.
  - c) Fire alarm print outs from the central station service confirming that the systems has been pretested and is receiving all fire alarm system signals.
- 2) For smoke detection systems:
- a) For area smoke detectors, confirm that they are located properly.
    - i) Smoke detectors cannot be located within 4 inches of a wall.
    - ii) Smoke detectors are located at least 36 inches away from HVAC diffusers.
    - iii) A smoke detector is installed directly above the fire alarm control panel
    - iv) For solid joist and beam construction, confirm that areas within beam pockets are properly protected.
  - b) For duct smoke detection systems, confirm that:
    - i) air pressure differential test results are provided for all duct smoke detectors.
    - ii) activation of a duct smoke detector initiates fan shutdown as designed.
- 3) For notification appliances, including but not limited to:
- Audible notification appliances
  - Exit marking audible notification appliances
  - Textual audible notification appliances
  - Tactile notification appliances
  - Visible notification appliances
  - Textual visible notification appliances
- a) Verify installed locations are shown on the approved drawings.
  - b) Verify all appliances are operating as designed.
  - c) Confirm that notification appliances are synchronized.
    - i) Notification appliances must be synchronized with new and existing notification appliances.
- 4) For multi-sensor fire detectors, confirm that testing is conducted through each of the detection principles (e.g., smoke/heat/CO, etc.) independently.
- 5) Confirm that all special equipment is correctly installed and pretested.
- a) Abort switches, alarm verification devices, solenoid release circuits, etc.
- 6) Confirm that all supervisory signal devices are correctly installed and pretested.
- 7) Confirm that all manual fire alarm boxes are correctly installed and pretested.
- 8) Confirm that a Record of Completion will be submitted prior to requesting a Permit to Occupy.

#### Smoke Management Systems

- 1) Provide documentation detailing the operation of the system.
  - a) Provide details on procedures and methods to be used for acceptance testing.
  - b) Identify devices, flow measurements, and other items subject to inspections and tests.
  - c) Provide drawings detailing areas of operation.
    - i) Identify device locations
    - ii) Duct air leakage
    - iii)
  - d) Provide sequence of operations for system.
  - e) Identify all system components
    - i) HVAC/fans dedicated or nondedicated required for system operation.



- 2) Identify special inspector required for system approval.
  - a) Provide records of special inspections prior to final acceptance inspections.
- 3) Demonstrate procedure for weekly inspections through the automatic control system.
  - a) Provide written instructions for weekly inspections.
- 4) Confirm that construction of smoke barriers are completed.
  - a) Confirm that all opening protectives are installed and pretested.