FIRE SAFETY SYSTEMS IN NYC TRANSIT YARDS – FINAL REPORT

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I. EXECUTIVE SUMMARY

Across the sprawling service area of the Metropolitan Transportation Authority (MTA), New York City Transit (NYC Transit) maintains a network of subway yards staffed by thousands of employees. In 2020, personnel from the Office of the MTA Inspector General (OIG) observed that some yards' fire alarm and fire suppression systems were old and in poor condition; OIG then initiated an audit on the condition and maintenance of these systems in the 207th Street Yard, Corona Yard, Coney Island Yard, Westchester Yard, and two electrical substations. The 35 buildings at these sites house critical facilities, such as relay buildings, overhaul shops, and maintenance buildings, most of which are occupied by NYC Transit employees at some point during each 24-hour period.

One of the OIG's initial findings was that the fire pumps had not been tested annually as required; these pumps are needed to create sufficient water pressure and volume when fighting a fire. In April 2022, the OIG sent an interim letter (Report #2022-05) to NYC Transit leadership, alerting them to this and other urgent shortcomings. In response, the agency hired an outside contractor to test 23 fire pumps, review reports from tests the agency had performed in-house in 2020, initiate training to perform fire pump inspections, and install proper test gauges to support reliable protection in the future. In the meantime, OIG continued its work focused on fire alarms and fire suppression in the yards, the results of which are summarized in this Report.

Overall, OIG identified deficiencies in the agency's compliance with inspection, testing, and maintenance requirements as well as the adequacy of its policy instructions. OIG also found that in many instances the agency relies on aging equipment in its yards and provided insufficient training and oversight of key personnel. Separate from the fire pumps, the agency had not fully established testing requirements for the balance of the fire suppression systems prior to OIG review. Because the fire alarm and fire suppression systems in NYC Transit yards are aging and difficult to maintain, management should pay extra attention to ensure they will function properly in an emergency.

In November 2022, OIG shared its Draft Report with the NYC Transit President for comment. In his December 23, 2022, response, the President stated, "…the safety of our employees is my highest priority. We acknowledge more work needs to be done; that is why we are currently expanding our fire safety checklists, updating our policies, protocols, and instructions, and evaluating our use of vendors." The agency agreed with nine of OIG's 13 recommendations, and its response included action plans and expected 2023 implementation dates. The agency also indicated that in the case of four recommendations, it believes existing policy instructions and/or protocols suffice and stated the controls will be followed. NYC Transit's specific responses are summarized in the Recommendations section at the end of this Report.

A. Summary of Findings and Recommendations

- **Department of Subways (Subways) did not provide facility personnel proper instruction on how to perform daily safety inspections of fire alarm equipment.** Indicator lights on 10 of the 27 Fire Alarm Control Panels (FACP) in the yards' facilities were lit, meaning that an active problem existed somewhere within the fire alarm system. However, facility staff either did not know the system signaled a problem or did not know how to respond when supervisory or trouble lights were illuminated. MTA should ensure all facilities have designated individuals knowledgeable on how to perform critical daily monitoring tasks.

- Policy instructions direct staff to perform testing, inspections, and maintenance of fire pumps. However, **the NYC Transit Office of System Safety (OSS) has not defined the applicable training requirements, and the employees tasked with conducting the testing did not possess the requisite certifications or licensing.** MTA should ensure that these tasks are performed by trained individuals possessing the appropriate certifications or licensing.

- An account with New York City Fire Department (FDNY) to perform required hydrostatic testing of a combination fire suppression system at 207th Street every five years expired in 2010. **OSS was unaware of the expired account, which resulted in no tests being performed for that critical life safety equipment for 12 years**. MTA should ensure that all accounts are active, and testing is being performed at all appropriate locations.

- **NYC Transit does not have sufficient certified staff to perform fire watches**, which are required when any fire alarm or fire suppression system becomes inoperable for any reason. This shortcoming must be addressed.

- The condition and age of the buildings and equipment themselves present unique problems. **Some critical components are so old they are obsolete and spare parts are no longer available; consequently, the components require repair or remanufacture by offsite vendors.** This results in delays and triggers the need for fire watches. NYC Transit should address this shortcoming by creating an inventory of obsolete spare parts or upgrading obsolete components.

OIG's detailed suggestions for improvement appear in the Recommendations section at the end of this Report. (*See* pp. 16-20.)

II. BACKGROUND

A. Yard Facilities

NYC Transit's train yards contain many types of facilities that serve varied and significant purposes in the operation of the transit system. For example, employees repair trains in overhaul shops, which can be the size of several city blocks; relay buildings and signal towers activate the necessary signals and switches to provide safe pathways for trains; electrical substations provide traction power to third rails, and in turn power the trains; and the equipment in boiler rooms provides steam heat to all facilities in the yard. Yards also contain miles of track used for train storage. All these facilities and equipment require proper fire protection to ensure the safety of NYC Transit personnel, assets, and operations. This protection is provided by fire alarm and fire suppression systems. Because the 207th Street Yard is approximately 90 years old, it contains antiquated systems and makes maintaining these facilities a challenge.

Most fire suppression systems in various buildings throughout the yard, such as sprinklers and fire pumps, are required to be tested at least annually. Others are scheduled for testing once every five years, including the standpipes in the overhaul shop that provide water to hoses used by the FDNY. This is a hydrostatic test, observed by FDNY personnel, which entails increasing the water pressure in the pipes with water supplied from hydrants and then pumped into the pipes to ensure the pipes hold water under pressure. NYC building codes set minimum requirements for standpipe systems' water pressure (pounds per square inch) and volume (gallons per minute). Whatever requirements were in place when a system was installed dictate the minimum requirements that must be met over the life of the system. Thus, because the 207th

Street overhaul shop was constructed in the early 1900s, the 1938 NYC building code still applies for its standpipe system. Notably, the 1938 code calls for only 40% of the water volume that would be required today under current National Fire Protection Association code NFPA 14 section 7.10.1.1.1.

B. Fire Alarm Systems

A fire alarm system is a life safety system which provides early warning of fire or smoke conditions. To initiate a response to the condition, alarm systems use both automatic devices, such as smoke detectors and water flow switches,[1] and manual devices such as pull stations. Upon activation of an initiating device, the Fire Alarm Control Panel[2] (FACP) will activate local notification devices, such as audio-visual alarms, throughout the facility to alert personnel of a potential threat of a fire. (Audible alarms can be horns or speakers, while visual alarms are typically strobe lights, depending on the age of the system.) The FACP can also send fire alarm notifications to a Central Alarm Monitoring location.

Trouble and supervisory alarms also provide notifications, but only at the FACP, Fire Alarm Remote Annunciator[3], and, when equipped to do so, to Central Alarm Monitoring locations. A "trouble alarm" can be triggered by a fire alarm device malfunction, a damaged circuit board, or even an event as simple as a malfunction of the hard copy printer available for some panels. A "supervisory alarm" can be caused by an open circuit that powers initiating or notification devices, or by the shutoff of a sprinkler valve. While any of these events can set off a trouble or supervisory alarm, the cause will remain unknown until someone physically visits the site and diagnoses the problem.

In addition to providing notifications, fire alarm systems can also perform active safety functions, such as shutting down fans that could provide oxygen that would feed a fire or cutting power to the third rails at overhaul and maintenance shops during a fire alarm condition.

[1] A water flow switch is a device which closes a circuit when water flow is detected through the sprinkler pipe, initiating an alarm at the Fire Alarm Control Panel.
[2] The FACP is the "brains" of a fire alarm system: It gathers information from initiating devices and sends alarm notifications, while providing a programmed sequence of operations such as the shutdown of fans and third rail power.
[3] A remote monitoring panel typically located at a building's main entrance or at a location separate from the FACP.

C. Fire Suppression Systems

Fire suppression systems differ from fire alarm systems in that they actively initiate steps to suppress a fire. These are typically water-based sprinkler or standpipe systems controlled via an Outside Stem & Yoke (OS&Y) valve. The OS&Y valve provides pressurized water to a sprinkler system, which is automatically activated when a fusible link[4] in a sprinkler head activates and opens the head for water to flow. Standpipe systems are usually "wet systems"[5] controlled with an OS&Y valve and include a 50' hose at each standpipe location. Only FDNY personnel are authorized to use the standpipe system to extinguish fires. Both sprinklers and standpipes are used in NYC Transit facilities.

In locations where the water pressure of the source supplying a sprinkler or standpipe system is too low to contain a fire effectively, fire pumps are used to increase both the pressure and the volume of water to the system.

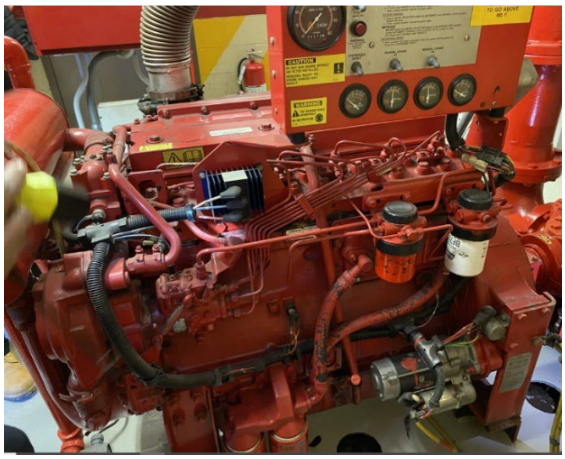

Photo #1: Diesel Fire Pump located in the Overhaul Shop at Coney Island Yard

Photo #2: Electric Fire Pump located in Storeroom #1 at 207th Street Yard

If a sprinkler system activates, a water flow switch detects the flow of water within the system and initiates a fire alarm at the FACP, which in turn activates audio-visual notification devices throughout the facility. Similarly, tamper switches located near each OS&Y valve will activate a trouble or supervisory alarm at the FACP if a valve is tampered with or closed. If a system is designed with external monitoring at a Central Alarm Monitoring System, that monitoring station will also receive each type of alarm.

[4] A fusible link is a metal element keeping the sprinkler head in a closed position; it melts at a predetermined temperature from the heat of a fire, opening the sprinkler head.

[5] A wet system contains pressurized water that is constantly maintained in sprinkler and/or standpipe piping.

D. Roles of NYC Transit Units

Two groups within NYC Transit are required to perform inspections, tests, and maintenance on their respective systems: the Fire Alarm and the Fire Suppression user groups. These responsibilities are set forth in policy instructions (P/I) developed by the OSS. The most recent instructions are P/I 10.23.1, *Inspection, Testing, & Maintenance of Existing Water Based Fire Protection Systems* (dated 7/3/2013), and P/I 10.34.2, *Inspection, Test & Maintenance of Existing Fire Alarm Systems* (dated 12/31/2013), with one exception discussed later. These instructions establish the necessary certification or licensing requirements and procedures for staff tasked with performing all required inspections, tests, and maintenance of fire suppression and fire alarm equipment respectively. The OSS policies also assign responsibilities not only to the user groups, but also to Maintenance of Way (MOW) Engineering, Operations Training, and OSS itself. The policy instructions provide the frequencies of required inspections, tests, and maintenance.

The Fire Alarm and Fire Suppression groups both fully cooperated with OIG during the audit, which included site visits; interviews of involved parties; and the review of policy instructions, databases, and records of inspections, tests, and maintenance. Both groups addressed issues found during OIG yard and facility site visits and were responsive in correcting observed non-conformities (defects), such as misused fire hydrants and obstructions to critical equipment.

III. FINDINGS

A. Daily Facility Safety Inspections Are Not Always Performed

According to Subways Bulletin 21-48, *Facility Safety Checklist* (dated 9/30/2021), all superintendents and supervisors are instructed to complete a daily facility checklist (Safety Checklist) in Subways' industrial facilities. This bulletin, enforcing the NYC Transit Safety Goal Action Plan and the System Safety Program Plan, requires that "Supervisors must observe the work environment to identify and correct unsafe conditions." Designated personnel must complete the daily Safety Checklist and maintain each completed checklist for two years. Fire Alarm Systems are to be regularly monitored as part of each daily inspection. The checklist consists of 11 sections, totaling 83 separate items of varying criticality. Section E, "Fire Safety and Fire Protection System", covers 17 life safety items, seven of which relate to the fire alarm and fire suppression systems, and specifically requires personnel to determine whether fire alarm systems are operational and being inspected. NYC Transit facility employees told OIG that they perform this monitoring when completing their daily inspections. However, in August 2022,

OIG staff visited three locations where personnel were required to perform the walkthroughs and complete the checklists. Based on OIG's reviews of the checklists and interviews of the employees and supervisors responsible for performing the inspections, OIG concluded that daily observations at two of the three locations had not been completed for months prior to OIG's visit.

In addition, during OIG's walkthrough, it found several conditions in the yards that did not comply with either the Safety Checklist requirements or the National Fire Protection Association code (NFPA-72). For example, one of the checklist items requires monthly inspections of fire extinguishers. However, OIG observed that many fire extinguishers had not been inspected for several months.

Photo #3: Access to the FACP in the Coney Island Pneumatic Shop does not have the required 3 feet of clearance per NFPA-72 code requirements.

B. Fire Alarm System Indicators Are Often Local Alarms in Remote Locations and Go Unmonitored

All fire alarm systems installed in NYC Transit yards are equipped with local alarm notification devices. OIG staff visited four train yards and observed 31 fire alarm systems. Of the 31 fire alarm systems, only four facilities included a Central Alarm Monitoring system, which sends an immediate notification of a trouble, supervisory, or fire alarm condition to the monitoring agency. Upon receiving a notification, the monitoring agency immediately informs the FDNY or the Fire Alarm group within NYC Transit's Electronics Maintenance Division.

Of the remaining 27 fire alarm systems OIG observed, 21 FACPs were in unoccupied rooms such as closets, storage rooms, or electrical rooms and were not immediately visible. Trouble and supervisory alarms at these locations generate audio-visual alarms at the FACP and, Fire Alarm Remote Annunciator locations, indicating a problem with the alarm system which must be manually reported by facility staff. OIG found that because of the devices' placement in these relatively remote locations, NYC Transit staff do not actively seek out and monitor these alarm systems. Significantly, OIG found that 10 of the 31 facilities showed current trouble conditions, but the building superintendents and other employees OIG spoke with onsite were unaware that the alarms had been activated. (*See* Photo #4.)

Photo #4: Fire alarm panel indicating both a trouble and a supervisory alarm (top row, yellow lights) at the Coney Island Yard Pneumatic Shop Electrical Room.

When facility personnel do not monitor for active trouble or supervisory conditions, the cause of the alarm goes unaddressed. For example, NYC Transit Yard boiler rooms are critical facilities, most of which are maintained by mobile groups of maintenance workers who circulate among the rooms; thus, no one is continuously present in any one boiler room. Fourteen of the rooms are in unstaffed buildings and are only visited three times per day (once per shift) during the heating season. However, the boiler rooms equipped with fire alarm systems – unlike

locations equipped with Central Alarm Monitoring systems and monitored remotely – are only provided with *local* alarms, which cannot be heard outside of the room. Because these rooms are unoccupied, there is no one present to notice the alarm until the next maintenance team arrives.

These boiler rooms provide heat to all the yards' facilities, but without an adequate fire safety monitoring system in place, these facilities are vulnerable. NYC Transit also provides other locations and equipment, such as substations and older signal towers, with local alarms, despite the difficulty of monitoring them. These facilities house critical equipment which keeps NYC Transit operations running.

C. Facility Staff and NYC Transit Security Guards Are Unaware of the Correct Fire Alarm Protocols

OIG found that the facility personnel tasked with monitoring fire safety systems did not know what to do if they noticed that an alarm had been activated. As described above, OIG observed that fire alarm control panels displayed trouble indicator lights at ten facilities, but no one was responding or was even aware the indicator lights were on. A Fire Alarm Superintendent told OIG that the Safety Checklist required the responsible staff member to determine whether the system was operational. However, when OIG asked facility superintendents about observed alarms in their jurisdictions, they said they were not aware that any active conditions had occurred.

Even staffed facilities are not typically occupied around the clock. When no facility staff are present, NYC Transit security guards are often the only personnel on those sites, but without proper training, or even instructions posted in their guard booths, they are not effective for fire safety awareness. This was the case in early 2022 when a minor fire broke out in a Transit facility.

On January 5, 2022, OIG visited the Bergen Shop after a minor fire erupted after normal work hours.[6] A trouble alarm had activated on the remote annunciator located in the security guard booth in the Bergen Shop's parking lot. During OIG's interview with the security guard, he told OIG that he had observed the trouble alarm but was unaware of the significance of the different types of indicator lights on the remote annunciator, including what the trouble and

[6] OIG found that the sprinkler system had activated as designed, suppressing the fire until the FDNY arrived to extinguish it. However, before the sprinkler system turned on, the fire had damaged the wiring serving the water flow switch, preventing the switch from sending a signal to the FACP and activating a fire alarm. The damaged wiring did, however, activate a *trouble* alarm at the FACP, indicating the fire alarm system had performed correctly.

supervisory alarms meant and what protocols he should follow if they activated. He stated that guards were not instructed on the types of alarms they might encounter or the correct protocols to follow when they observe an alarm indicator, and he only knew to call the FDNY in the event of a fire. Fortunately, on this occasion the guard's supervisor arrived at the building at the same time the trouble alarm activated. The supervisor entered the building, observed thick smoke, and instructed the guard to call the FDNY. Failure to adequately instruct security guards – or to post instructions in the guard booths for immediate guidance on what steps to take if an alarm indicator is triggered – nullifies the benefit of equipping guard booths with fire alarm remote annunciators.

D. OSS Did Not Establish Proper Fire Pump Testing Certification Requirements or Conduct Overall Fire Suppression Testing Oversight as Required

OIG learned that P/I 10.23.1, authored by OSS, has not sufficiently identified what training requirements are necessary for the staff tasked with testing/inspecting fire pumps. This issue has been under review by OSS since April 2022 without a decision. As a result, and until resolution, no weekly, monthly, quarterly, bi-annual, or annual tests of fire pumps have been, or can be, performed by agency staff. Instead of establishing training requirements, OSS also tasked MOW with finding an outside contractor to develop a training syllabus, which will then be subject to OSS's approval. In November 2022, MOW was preparing a contract with a second contractor to perform all monthly and annual fire pump inspections, tests, and maintenance because its own staff was not qualified.

As for fire suppression equipment, OSS also did not provide sufficient oversight to ensure that all required inspections, tests, and maintenance were being performed correctly as the OIG believes OSS's own policy instructions specify.[7] The OSS Director told OIG that OSS's oversight was not required except as part of the five-year hydrostatic testing and that the P/I language did not pertain to all fire suppression inspections, tests, and maintenance. However, the OIG disagrees with this interpretation of the policy instructions. The OIG notes that both the fire alarm P/I and the fire suppression P/I clearly assign OSS the responsibility for overseeing all inspections, tests, and maintenance. (*See* Exhibits 1 and 2 below.)

[7] The relevant instructions are P/I 10.23.1, which covers fire suppression, and P/I 10.34.2, which covers fire alarms.

Exhibit 1: OSS Responsibilities described in P/I 10.23.1 *(Fire Suppression)*

E. **Office of System Safety (Fire Safety group)**: Responsible for:

1. Providing technical support.
2. Witnessing all five (5) year hydrostatic tests.
3. Coordinating with the FDNY.
4. Verifying that inspections, tests, maintenance, and repairs are being performed.
5. Reviewing the Operations Training Certificate of Certification training program.

Exhibit 2: OSS Responsibilities described in P/I 10.34.2 *(Fire Alarm)*

E. **Office of System Safety (Fire Safety group)**: Responsible for:

1. Providing technical support.
2. Verifying that inspections, tests, maintenance, and repairs are being performed.
3. Reviewing the Operations Training Certificate of Certification training program.

The Director also told OIG that the Fire Alarm and Fire Suppression groups should conduct their own internal audits of the inspections, tests, and maintenance work they complete. OIG believes that any internal quality control done by the two groups does not relieve OSS from its responsibility to verify that the work was completed as required. OSS personnel agreed to review and audit their P/Is to clarify what is expected of OSS and the Fire Alarm and Fire Suppression groups and to ensure that the assigned responsibilities are appropriate.

Because the only required testing of the standpipes and sprinklers (combined system) at 207th Street is the five-year hydrostatic test, OIG requested test results to verify that FDNY had not identified issues with the system. All testing witnessed by the FDNY is scheduled by OSS who tracks the systems requiring testing, maintains a unique account number with the FDNY for each separate system to be tested, and contacts the FDNY to schedule the tests. FDNY records showed, however, that the account number for the combined system has not been active to test the system for 30 years, since 1990. Additionally, as well as generating a new account number

with the FDNY, the expired account did not include all five of the Siamese connections that the FDNY uses to hook up hoses and are currently active. These connections will also have to be added to the new account. OSS should have been aware that the existing account had expired, and that a new account needed to be established with the FDNY. After OIG's review, NYC Transit began generating a new account to include all five FDNY Siamese connections.

E. Aging Fire Alarm and Suppression Systems Require Significant Managerial Attention to Adequately Protect Personnel and Assets

Many facilities in NYC Transit yards have antiquated fire alarm systems, and replacement parts are difficult to obtain. The Fire Alarm Superintendent told OIG that parts for some fire alarm systems, such as circuit boards, were no longer available, and at times NYC Transit personnel could not repair the existing parts. When this happened, NYC Transit was required to outsource the repairs. OIG confirmed this situation with a fire alarm vendor. When outside work becomes necessary, long lead times and uncontrollable delays prevent the completion of fire alarm system work orders and leave the systems impaired. Antiquated systems also require more frequent repairs, which prevents fire alarm staff from performing other critical tasks, such as required inspections, tests, and maintenance.

Most of the fire alarm and suppression systems in the yards were installed decades ago and have not been updated. Thus, the yards' fire alarm and fire suppression systems do not provide the same level of protection that updated equipment would provide. NYC Transit needs to better understand the current system's limitations and mitigate any weaknesses where possible.

IV. CASE STUDY: 207th Street Yard Relay Building

During OIG's audit, the Superintendent of the Fire Suppression group informed OIG that a post-Hurricane Sandy resiliency project to construct a new relay building[8] at the 207th Street Yard needed a water supply for fire suppression. The effort to find a useable water supply highlights many of the weaknesses and concerns described above, specifically that the infrastructure in the yard is over 90 years old. This project also illustrates the complexities that NYC Transit employees with fire safety responsibilities face in maintaining these systems.

[8] A relay building provides controls and monitoring of track signal and switching systems via relays controlled by personnel in the signal tower overlooking the rail system.

OIG found that NYC Transit personnel were not aware of several significant issues with the systems, nor were they prepared to resolve them. The MOW Fire Suppression group made a significant effort to ensure that all necessary protocols were followed, and the system was functional; however, they were severely hampered in testing the fire pumps by a lack of proper direction and clearly identified testing procedures.

The 207th Street Yard's 90-year-old underground fire suppression piping is configured as a loop (aka a fire loop) running below ground. This loop provides water from two redundant NYC water supplies in the street leading to NYC Transit facilities in the yard to suppress fires and protect personnel and assets. The original plan for a water supply to the new relay building called for the supply to come directly from the street's NYC water supply. However, due to previously unidentified underground obstructions, this approach was not feasible, and the superintendent requested that the new building's water supply come via the existing fire loop instead. In September 2021, the superintendent called for testing of the loop's water flow to ensure it could support the additional demand. On October 4, 2021, the loop test failed. Personnel from OIG, MOW Engineering, the Fire Suppression group, and MTA Construction & Development (C&D) all observed these tests, which measured the pounds per square inch (PSI) of the water pressure within the loop. As part of the test procedure, the fire pump in Storeroom #1 was started, and the pressure in a local hydrant dropped to 0 PSI. The rest of the loop also dropped significantly in pressure. These results, provided by the project Consultant Construction Manager, indicated that the loop might not be able to provide the required protection for the relay building.

As an alternative to connecting directly to the fire loop, C&D submitted calculations to MOW Engineering, for MOW's review and approval, proposing a connection directly to a 12" water pipe from the city water supply in the street. This 12" supply line enters the yard and then splits into two service lines, one serving the fire loop and the other supplying water for all other needs within the yard. However, these calculations did not account for the simultaneous water demand for other usage during peak times, such as the planned car wash facility on the property, bathrooms, and similar needs which would compete with the fire loop for the same water source.

Despite these omissions, an Associate Project Manager in MOW Engineering approved the PSI calculations on January 5, 2022, after only verifying the math and without accounting for these other critical factors. The Director of OSS then approved the calculations based solely on MOW Engineering's sign-off. When the validity of this analysis was questioned by OIG staff, the plan was discontinued; the Chief Officer of MOW Engineering rescinded MOW Engineering's approval and issued a new protocol memorandum, dated May 2, 2022, describing

how such analyses should be conducted in the future. This new protocol ensures that upper management will be accountable for reviewing and signing off on critical calculations and other test procedures.

Based on the low-pressure readings at fire hydrants and on the incoming water supply side (aka the suction side) of the fire pump during the flow tests, OIG asked NYC Transit to conduct a stand-alone test of the Storeroom #1 fire pump – which had been installed in the 1980s – to determine whether the fire pump functioned as designed. Fire Suppression group personnel performed a test on March 9, 2022. Based on observations during the test, OIG raised concerns that the personnel who performed the test may not have received the proper training. As a result, the MOW General Superintendent retained an outside contractor to re-test the fire pump on March 18, 2022.

The fire pump failed the independent contractor's test immediately due to insufficient waterflow, as measured by Gallons Per Minute (GPM) readings. The fire pump bears an identification plate stating that readings from three outlet ports must total 750 GPM for the pump to meet requirements; however, the test results only recorded 400 GPM. The volume of water supplied to the fire pump was therefore too low to support adequate fire suppression. Notably, Fire Suppression personnel had not tested the GPM during their March 9 test; instead, they tested only the *pressure* (PSI) of the water supply, being unaware of the GPM requirements necessary for the pump to pass the test. While the identification plate clearly states the GPM requirements, Fire Suppression personnel were never instructed to refer to that information during their tests.

Next, the contractor checked the GPM at a fire hydrant outside the yard property to determine whether the insufficient flow stemmed directly from the NYC water supply or was caused by an issue within the yard's fire loop. The contractor found that the GPM at the street hydrant met requirements; however, two additional hydrants in the yard were tested and found to also have extremely low GPM levels. The contractor therefore suspected an impairment in the loop piping.

To identify the suspected impairment, MOW immediately hired a second contractor, who utilized cameras to probe the section of the fire loop feeding the fire pump. The contractor reported observing severe tuberculation (calcification and mineralization) of the pipe, a condition typically found in pipe of this age and type. Specifically, the contractor found that the pipe was so restricted that only 1.25 inches of the 6-inch diameter pipe was available for water flow. The contractor's report also indicated that due to the age of all the piping, this condition may exist in other sections of the fire loop as well.

Once the outside contractor determined that a portion of Storeroom #1 at the 207th Street Yard was not sufficiently protected by the fire suppression system, this system was considered impaired. According to P/I 10.23.1 and P/I 10.34.2, fire watches are required whenever fire suppression or fire alarm systems are impaired or out of service. As a result of the contractor's findings, NYC Transit had to quickly train and certify enough employees to participate in fire watches. This last-minute scramble should not have been necessary. NYC Transit should ensure that enough qualified personnel are available to cover fire watches as the need arises.

Since the contractor issued its report, NYC Transit has had the section of pipe feeding the fire pump replaced. Based on discussions with OIG, the Vice President and Chief Maintenance Officer of MOW then directed personnel to test the volume (GPM) as well as the pressure (PSI) of the incoming water flow at all buildings within the 207th Street Yard. MOW personnel first started testing the overhaul shop's standpipes, which provide hose connections for FDNY to use in the event of a fire, in accordance with the building codes in effect at the time the system was installed. Because the overhaul shop was built in the early 1900s, NYC Transit determined that its system falls under 1938 building codes, which only requires that the fixtures maintain 15 PSI when the nearest New York City hydrant is opened to 500 GPM. MOW Engineering also agreed to take GPM readings, but indicated it was for informational purposes only and would have no bearing on the pass/fail status of each standpipe tested. A test was performed on August 18, 2022, and OIG observed GPM measurements ranging from 220 to 300 GPM, which is well below the current NFPA code requirements but complies with 1938 code. OIG also observed one PSI reading at Storeroom #1 below the 1938 code, but at this time, an official test report is still pending from MOW Engineering.

V. RECOMMENDATIONS

To provide better fire safety protection to NYC Transit assets and employees working at its yards, NYC Transit should:

1. Create a separate fire alarm and fire protection systems checklist for critical fire safety items including all steps from Section E of Bulletin 21.48 related to fire alarm and fire protection systems. The new fire safety checklist should be expanded to include new fire safety steps including, but not limited to, fire alarm and suppression equipment clearances; fire extinguisher card expiration; the status of trouble and supervisory alarms; and clear path of egress.

   Agency Response: Agree. According to the agency's written response, "Under the direction of the Office of the President, the Department of Safety & Security's Office of System Safety (OSS) and the Department of Subways (DOS) will collaborate in the development of a new 'Fire Safety Checklist' that incorporates the relevant content from DOS Bulletin 21-48: Facility Safety Checklist and expands upon it to include fire alarm and fire suppression equipment clearances, fire extinguisher card expiration, the status of trouble and supervisory alarms, and the maintenance of a clear path of egress." The agency's estimated implementation date is Q2 2023.

2. Only knowledgeable individuals should be designated to perform both the existing daily inspection check lists, and the new fire safety checklists. Assigned individuals should know the correct protocols for checking indicators and responding to trouble and supervisory alarms.

   Agency Response: Agree. The agency's response states, "Following the implementation of the new safety checklist (Rec. 1), the personnel assigned to complete the new action(s) will be provided with the information needed to do so in a knowledgeable manner (i.e., the correct protocols for checking indicators [and] how to respond to trouble and supervisory alarms)." The estimated implementation date is Q3 2023.

3. Ensure all daily safety checklists are completed. Daily inspection, and fire safety checklists should be maintained on each site for a minimum of one year and reviewed periodically by facility management.

   Agency Response: The agency's response states, "In accordance with DOS Bulletin 21-48: Facility Safety Checklist, Subways management will continue to ensure that daily facility safety checklists are completed and maintained onsite for a minimum of one year and reviewed periodically by management."

4. Ensure that instructions are posted in each guard booth near the monitoring equipment explaining what protocols to follow once a trouble, supervisory, or fire alarm indicator is observed.

   Agency Response: Agree. According to the written response, the responsible departments will ensure that instructions are posted in the guard booths that have fire alarm annunciators, and "[t]he instructions will provide direction on whom to call in the event of an alarm condition and [whom] to call for a trouble/supervisory indication." The estimated implementation date is Q1 2023.

5. Ensure that only qualified personnel perform all fire alarm inspections, tests, and maintenance.

   Agency Response: The agency's response states that the Department of Subways' Electronic Maintenance Division (EMD) "already follows OSS Policy Instruction 10.34.2, which states that EMD is responsible for the assignment of personnel to perform fire-alarm system inspection, testing and maintenance (and/or oversee outside contractors doing so) and for ensuring that the assigned personnel have all required Certificates of Certifications and training."

6. Ensure that only qualified personnel perform all fire suppression inspections, tests, and maintenance.

   Agency Response: Agree. The agency's response states, "Maintenance of Way (MOW) – Infrastructure is exploring different possible avenues for meeting this recommendation (e.g., training of internal personnel, contracting of an external vendor)." The estimated implementation date is Q2 2023.

7. Ensure that an adequate number of fire watch certified personnel are available to perform fire watch duties when a fire alarm or fire suppression system is deemed impaired.

   Agency Response: Agree. The response states that under the direction of the Office of the President, the "Department of Safety & Security and Department of Subways will explore whether the current security contractor provides an avenue for meeting this recommendation." If so, the estimated implementation date is Q1 2023. "If not, then DOS will further explore contracting with a different vendor that can provide certified fire-watch resources." The estimated completion date for this course of action is Q2 2023.

8. Ensure that OSS perform their mandated responsibilities to monitor and provide oversight; update policy instructions pertaining to fire alarm maintenance, inspections, and testing requirements; and review all certification and/or licensing

   Agency Response: Agree. "The Policy Instruction [P/I] managed by OSS relating to fire alarm systems (P/I 10.34.2) is currently being reviewed and revised. The P/I is being brought up to date to be aligned with the current applicable standards. The required training and certifications are also being revised to be aligned with the current applicable standards. OSS has been seeking alternatives to expand available resources for oversight of P/I conformance including requesting additional staff, third party contracts, and temporary reassignments." The estimated completion date is Q2 2023.

9. Ensure that OSS perform their mandated responsibilities to monitor and provide oversight; update policy instructions pertaining to fire suppression maintenance, inspections, and testing requirements; and review all certification and/or licensing requirements necessary for anyone tasked to perform these functions.

   Agency Response: Agree. The agency's response states, "The Policy Instruction [P/I] managed by OSS relating to fire suppression (P/I 10.23.1) is currently being reviewed and revised. The P/I is being brought up to date to be aligned with the current applicable standards. The required training and certifications are also being revised to be aligned with the current applicable standards. OSS has been seeking alternatives to expand available resources for oversight of P/I conformance including requesting additional staff, third party contracts, and temporary reassignments." The estimated implementation date is Q2 2023.

10. Address the obsolescence of equipment issue by identifying and creating a list of Fire Alarm equipment and spare parts that can no longer be procured. Establish a spare parts inventory or create an alternate plan to prevent the lead time delays when replacement parts must be reconditioned or manufactured.

    Agency Response: The response states that the Electronic Maintenance Division "already maintains an inventory of parts and, where required, has a contract in place in the event emergency parts (or repairs) are needed for fire alarm systems. That contract provides EMD the ability to utilize sub-vendors who can reach inventories of proprietary parts."

11. Address the obsolescence of equipment issue by identifying and creating a list of Fire Suppression equipment and spare parts that can no longer be procured. Establish a spare parts inventory or create an alternate plan to prevent the lead time delays when replacement parts must be reconditioned or manufactured.

    Agency Response: Agree. The response states that Maintenance of Way – Infrastructure "will create a list of equipment and spare parts that can no longer be procured for their respective fire suppression systems/equipment and establish a spare parts inventory." The estimated implementation date is Q1 2023.

12. Ensure fire watches are provided whenever required, i.e., during outages, repairs, or replacements of existing fire alarm and fire suppression systems.

    Agency Response: For fire alarm systems, the agency's response states, "Fire watches will continue to be provided in accordance with the requirements set forth in Office of System Safety Policy Instruction 10.34.2: Inspection, Test, and Maintenance of Existing Fire Alarm Systems (issued December 31, 2013)," specifically Sec. IV.A.3., Fire Alarm Out of Service (Impairment) Procedures.

    For fire suppression systems, the response states, "Fire watches will continue to be provided in accordance with the requirements set forth in DOS Bulletin 22-20: Fire Watch for Impaired Fire Protection Systems (issued April 27, 2022)."

13. Ensure that OSS verify all systems with FDNY testing requirements, i.e., that all systems have current accounts, and that required tests are scheduled and performed.

Agency Response: Agree. According to the agency's response, OSS will verify that the current list of fire suppression systems has account numbers, and that testing is current, and that OSS personnel review the NYCT fire suppression system testing requirements with FDNY; schedule tests which require their oversight; and provide technical assistance while witnessing the tests. OSS maintains a list of most of the fire suppression systems with the FDNY account numbers and periodically reviews [it] with MOW and FDNY to correct inconsistencies and validate." The estimated implementation date is Q2 2023.