CITY OF NEW YORK
OFFICE OF THE COMPTROLLER

John C. Liu
COMPTROLLER

MANAGEMENT AUDIT

H. Tina Kim
Deputy Comptroller for Audit

Audit Report on the Efforts of the New York City Housing Authority to Inspect, Maintain, and Repair Passenger Elevators

MJ10-064A

October 21, 2010

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THE CITY OF NEW YORK
OFFICE OF THE COMPTROLLER
1 CENTRE STREET
NEW YORK, N.Y. 10007-2341

John C. Liu
COMPTROLLER

October 21, 2010

To the Residents of the City of New York:

My office has audited the adequacy of the efforts of the New York City Housing Authority (NYCHA) to inspect, maintain, and repair passenger elevators in its developments. We audit entities such as NYCHA as a means of ensuring that housing in New York City is adequately maintained.

The audit determined that NYCHA's efforts to carry out elevator inspections are generally adequate; however, its efforts to address elevator maintenance and repairs need improvement. The audit found that NYCHA's preventive maintenance (PM) of elevators is inadequate–more than 40 percent of PM tasks were not performed on sampled elevators during the test period. With regard to repairs, the audit's time study of outages for sampled elevators during the period July 2009 through December 2009 showed that NYCHA took an average of 13.8 hours to resolve these outages, exceeding its performance goal of 10 hours on average. In fact, almost one-third (32%) of the outages for the sampled elevators were not resolved within 10 hours. Further, based on a number of weaknesses in how data is collected and reported, NYCHA management cannot directly rely on its primary reports to assess elevator performance and outages or to measure the effectiveness of its repair and maintenance activities.

The audit made eight recommendations to address these issues, including that NYCHA should ensure that required preventive maintenance (PM) work is performed and track instances when such work is not performed; continue to assess and identify areas where efficiencies and improvements can made in responding to and resolving elevator outages; and continue to work to correct and enhance management reporting deficiencies to ensure that internal and published performance indicators and measures are accurately reported.

The results of the audit have been discussed with NYCHA officials, and their comments have been considered in preparing this report. Their complete written response is attached to this report.

If you have any questions concerning this report, please email my audit bureau at audit@comptroller.nyc.gov.

Sincerely,

John C. Liu

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Office of the Comptroller
Management Audit

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AUDIT REPORT IN BRIEF

This audit determined the adequacy of the New York City Housing Authority's (NYCHA) efforts to inspect, maintain, and repair passenger elevators.

NYCHA is the largest public housing authority in the United States. Its mission is to provide decent and affordable housing in a safe and secure living environment for low- and moderate-income City residents. NYCHA manages and maintains 334 housing developments consisting of 2,604 residential buildings with nearly 179,000 apartment units that house more than 403,000 authorized residents. It operates more than 3,300 elevators in 283 of its developments citywide, 40 of which are developments only for senior citizens. The elevators are installed in approximately 1,700 buildings of generally five or more stories.

Audit Findings and Conclusions

The audit determined that NYCHA's efforts to carry out elevator inspections are generally adequate; however, its efforts to address elevator maintenance and repairs need improvement.

NYCHA performed all required elevator inspections and tests for all 57 elevators observed at the sampled developments. Nevertheless, certain weaknesses were disclosed, including that NYCHA needs to ensure that all inspections and tests are performed promptly and appropriately documented, and that cited deficiencies are promptly addressed.

NYCHA's preventive maintenance of elevators is inadequate. The audit disclosed that more than 40 percent of PM tasks scheduled for the sampled elevators during the period November 2008 through October 2009 were not performed, based on preventive maintenance (PM) checklists maintained by each development. With regard to repairs, NYCHA reported that in fiscal year 2009 it fell a little short of its performance indicator of "10 average hours to resolve elevator outages." Our time study of outages for sampled elevators during the first six months of fiscal year 2010 (July 2009 through December 2009) showed that NYCHA took an average of 13.8 hours to resolve these outages. When looking at the actual time to resolve them, we found

that almost one-third (32%) of these outages were not resolved within 10 hours. Further, based on a number of weaknesses in how data is collected and reported, NYCHA management cannot directly rely on its primary reports to assess elevator performance and outages or to measure the effectiveness of its repair and maintenance activities.

Audit Recommendations

To address these weaknesses the audit made eight recommendations, including that NYCHA should:

- Continue to assess and identify areas where efficiencies and improvements can made in responding to and resolving elevator outages.

- Ensure that required PM work is performed and that all such work is appropriately supported by PM schedules (checklists) that are completed by the work teams and kept on file at each development as required and recorded in Maximo (computer system).

- Document instances of and justifications for not performing scheduled PM work. These reports should be approved by a supervisor and communicated to the Elevator Bureau Borough Administrators, who should also be notified of all instances in which PM work is not performed. Repeated periods of PM nonperformance should be investigated and corrective action taken.

- Continue to work to correct and enhance management reporting deficiencies to ensure that internal and published performance indicators and measures are accurately reported.

In their response, NYCHA officials generally agreed with the audit's recommendations but argued that one of them could not be implemented at this time.

INTRODUCTION

Background

The New York City Housing Authority (NYCHA) is the largest public housing authority in the United States. Its mission is to provide decent and affordable housing in a safe and secure living environment for low- and moderate-income City residents. NYCHA manages and maintains 334 housing developments consisting of 2,604 residential buildings with nearly 179,000 apartment units that house more than 403,000 authorized residents. NYCHA also operates senior centers, community centers, youth programs, and centers for tenants with special needs. It employs a workforce of approximately 12,000 employees.

NYCHA operates more than 3,300 elevators in 283 of its developments citywide, 40 of which are developments only for senior citizens. The elevators are installed in approximately 1,700 buildings of generally five or more stories. In early 2009, NYCHA announced the roll-out of a new Elevator Service and Safety Plan (ESSP) with short- and long-term objectives to improve service, reduce outages, and enhance the safety of its elevators. The plan includes four key areas for improving service, including improving elevator maintenance, modernizing elevators, increasing public awareness through resident participation, and collaborating with the Department of Buildings (DOB) and other oversight agencies.

As part of its plan to improve elevator maintenance, in March 2009 NYCHA reported increasing funding by $12 million for additional staff, technical training, and improved security and oversight. NYCHA created a new Agency Elevator Director position to oversee all elevator support services. It also expanded the head count for elevator personnel by 75 positions, including elevator mechanics and mechanic helpers. Any relevant changes that had been implemented before the initiation of this audit were considered in our evaluation of NYCHA's efforts to address elevator inspections, maintenance, and repairs.

Effective June 1, 2009, NYCHA reorganized and centralized all elevator operations under its Technical Services Department (TSD). Specifically, the TSD Elevator Bureau became responsible for all elevator operations. As of October 2, 2009, the Elevator Bureau had a total workforce of 487 employees, including deputy directors, administrators, supervisors, elevator mechanics, mechanic helpers, and staff to support the elevators in NYCHA developments.

The TSD Elevator Bureau, which is headquartered in Long Island City, is composed of the Emergency Services Unit, Training Center, Administration, Central Elevator Dispatch, and Contract Administration. Moreover, it includes four Elevator Bureau Field Offices situated at NYCHA's Borough Management Offices and two Elevator Repair Offices that are staffed with special elevator repair teams.

Complaints or reports of elevator outages come from three general sources: (1) resident complaints received by NYCHA's Customer Contact Center (CCC) in Long Island City, which operates 24 hours a day, 7 days a week; (2) reports from general maintenance workers at the developments who are responsible for daily inspections of elevators for cleanliness and

operability; or (3) automated reports generated from NYCHA's Remote Elevator Monitoring System (REMS).

Approximately one-third of NYCHA elevators are equipped to interact with REMS via a wireless communication system. REMS-equipped elevators perform automated diagnostics and report detected problems to the application, which logs and tracks reported elevator malfunctions, the time of each event, and the specifics of the problems. REMS sends e-mail notifications to relevant elevator personnel depending on the nature of the malfunctions.

A work order is generated for each reported elevator outage by Maximo, NYCHA's new asset management system. Fully implemented in July 2009, Maximo incorporates all NYCHA housing developments and automates all aspects of NYCHA's maintenance operations, including equipment history, scheduling, preventive maintenance, work orders, labor tracking, and related reporting functions. Various components of the application were still under development at the time of our audit.

During regular business hours, Development Management and the Elevator Bureau's Central Dispatch Unit monitor elevator outages based on work orders generated in Maximo and distribute the work to appropriate personnel. During off hours (i.e., the night, weekends, and holidays), elevator outages are monitored and administered by NYCHA's Emergency Service Department and the Elevator Bureau's Emergency Services Unit.

If an outage is reported for a REMS-equipped elevator, the Elevator Bureau dispatchers will review the REMS data to determine whether the elevator is running and responding. If the elevator is determined not to be functioning properly, the dispatcher will assign appropriate staff—either a maintenance worker or an elevator service team to respond to the outage. If the outage is reported by a resident, a work order is created, and the call dispatched to the development maintenance workers, who, as the first responders, determine whether an outage exists. If the elevator is found to be running properly when a service team or maintenance worker arrives, or if the problem is remedied, the Central Elevator Dispatch Unit is notified and the work order closed out. If a maintenance worker is unable to remedy the problem, the worker notifies the housing development office, which in turn notifies the Borough Elevator Dispatcher who refers the outage to an elevator repair team or contractor, as appropriate.[1]

Elevator Mechanics must call the Central Dispatch Unit each morning to find out if any outages were reported at their assigned developments and must respond accordingly. If there are no reported outages, the service teams either perform preventive maintenance (PM) on the elevators or address open work orders (e.g., perform corrective maintenance). At the end of the day, the teams must document all of their work in a log book kept at the development as well as on handwritten work tickets. A work ticket must be prepared for every task performed. In addition, any PM work performed must be documented on the PM schedules. All completed tasks must be called into the Central Dispatch Unit so they can be recorded in Maximo.

[1] Certain elevators within NYCHA developments, such as a new or recent installation, are under service contracts therefore, if problems arise, the contractor is called in to correct any deficiencies.

The Elevator Bureau's Emergency Services Unit responds to emergencies, including elevator emergencies and priority outages, after normal business hours, on weekends, and on holidays. NYCHA considers an emergency situation to exist when a building is without elevator service or when an accident, entrapment, or serious safety condition is reported. For these situations, NYCHA attempts to respond within two hours. If there is a partial outage (two-car building with one car out of service) the malfunctioning elevator will be taken out of service until normal business hours when an elevator repair team can respond to the outage, based on available resources. NYCHA's goal is to resolve outages and restore service, emergency or not, within 10 hours. NYCHA uses "10 average hours to restore service" as its performance indicator against which it measures performance outcomes.

In accordance with revisions to the City's Administrative Code, effective January 1, 2009, elevators in New York City must undergo an annual (periodic) inspection and a "no-load" (Category 1) safety test once each calendar year; the performance of which are to be separated by at least four months. In addition, a "full-load" (Category 5) safety test must be performed once every five years. Category 1 tests involve the visual inspection of systems and tests of safeties[2] and components while the elevator is run without a load at inspection speed. Category 5 tests involve inspections of systems and test of safeties while the elevator is run at its full (or maximum) load capacity at its rated speed. Both types of tests must be witnessed by an independent, third-party inspector who is duly licensed by DOB or accredited as a Qualified Elevator Inspector (QEI) by an organization recognized by the American Society of Mechanical Engineers[3] (ASME). Work orders are generated in Maximo for each scheduled elevator inspection, which serves as the "parent" for any "child" or related work orders. NYCHA's elevator inspectors use handheld computers to record the results of inspections, including observed deficiencies. Results are uploaded into the Maximo computer system.

In accordance with its April 21, 2009 Memorandum of Understanding (MOU) with the Department of Buildings (DOB), NYCHA conducts elevator inspections and tests using in-house inspectors who hold a valid DOB-issued Certified Elevator Inspector License. Accordingly, NYCHA's Elevator Bureau has a separate Inspection Unit that is responsible for performing safety inspections and tests of all NYCHA elevators to determine compliance with the City Administrative Code and ASME, Standard §A17.1, "Safety Code for Elevators and Escalators."

Audit Objective

The objective of this audit was to determine the adequacy of the NYCHA's efforts to inspect, maintain, and repair passenger elevators.

[2] Safeties are braking systems on an elevator car that grab onto the rails running up and down the elevator shaft. Some safeties clamp the rails, while others drive a wedge into notches in the rails. Typically, safeties are activated by a mechanical speed governor (or pulley) that rotates when the elevator moves.

[3] ASME is a nationally-recognized organization that establishes standards for elevator and escalator inspections and testing

Scope and Methodology

We conducted this performance audit in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions, based on our audit objectives. This audit was conducted in accordance with the audit responsibilities of the City Comptroller as set forth in Chapter 5, §93, of the New York City Charter.

The scope of this audit covered November 2008 through April 2010. For certain tests involving Category 5 safety tests, we expanded the audit scope to include January 1, 2005 through October 31, 2008.

This audit evaluated NYCHA's adequacy in addressing elevator maintenance and repairs. Our tests focused on NYCHA's activities related to preventive maintenance, repairs, and inspections performed on passenger elevators in NYCHA buildings; the audit did not address freight elevators, elevators in community centers, or those in NYCHA-owned facilities that are privately managed. Further, we did not review inventory and procurement of related parts and components. To accomplish our objective we performed the following procedures.

To identify applicable criteria we reviewed relevant provisions of the City's Administrative Code, Local Laws, and City Rules that address elevator safety requirements. To gain an understanding of the NYCHA departments involved in the inspection, repair, and maintenance of development elevators we reviewed organization charts and various reports, publications, memoranda, and other relevant materials obtained from NYCHA officials, the NYCHA Web site, and other sources. We also reviewed NYCHA's Comprehensive Annual Financial Report for the Year Ended December 31, 2008, along with available budget data to ascertain financial and personnel resources available with regard to the above.

Evaluation of Controls

As part of our review of NYCHA's control environment, we reviewed the agency's self-assessment of its internal controls covering calendar year 2009, performed in compliance with New York City Comptroller's Directive #1. We also reviewed NYCHA's "Standard Procedures for Elevator Service, Maintenance and Repair (revised October 26, 2007)" pertaining to service, maintenance, and repairs of NYCHA elevators.

To understand and evaluate the processes and controls pertaining to the Elevator Bureau's activities, we interviewed key officials of the Technical Services Division and the Elevator Bureau along with supervisory and support personnel of relevant support units, and conducted walkthroughs of the units and their procedures. We also interviewed Borough Administrators, along with inspectors, elevator mechanics, and helpers. As part of our audit survey, accompanied by the Deputy Assistant Director, Elevator Bureau Borough Administrator, and Supervisor of Elevator Mechanics, we also visited one development, Smith Houses in Lower

Manhattan on November 5, 2009, where we observed the elevators, toured motor rooms, reviewed samples of elevator inspection certificates and test tags, and other pertinent documentation maintained at the development.

To supplement our understanding of procedural changes resulting from the June 2009 TSD reorganization, we ascertained procedures through observations, walkthroughs, and interviews with various personnel, and confirmed our understanding with NYCHA officials.

In addition to available operating procedures, we reviewed provisions of applicable rules and regulations, which were also used as criteria, including:

- New York City Administrative Code, Title 27, Chapter 1, Subchapter 18 and Reference Standard 18, "Elevators and Conveyors."
- New York City Building Code, Chapter 30 "Elevators and Conveying Systems" and Appendix K, "Modified Industry Standards for Elevators and Conveying Systems."
- Rules of the City of New York, Title 1, Chapter 11, "Elevators, Escalators, Personnel Hoists and Moving Walks."
- Local Law 10 of 1981.
- Comptroller's Directive #1, "Principles of Internal Control."
- Memorandum of Understanding between New York City of Department of Buildings and New York City Housing Authority Regarding the Periodic Inspections and Test of Elevators in Public Housing Developments (dated April 21, 2009).
- Department of Buildings "Elevator Inspection/Test Report" (ELV3 form) and Instructions.

We tested compliance with the Bureau's operating procedures and determined whether supervisory oversight and segregation of duties were adequate.

Selection of Sampled Developments

Exclusive of NYCHA developments under private management and unoccupied developments undergoing renovation, we defined a population of 283 developments with elevators, of which 40 are senior citizen developments. These developments, based on NYCHA Web site data, consist of approximately 1,700 residential buildings with 3,317 elevators.

From the defined population, we judgmentally selected for audit testing a sample of 14 developments, including four each in Manhattan, Brooklyn, and Bronx, and one each in Queens and Staten Island. The Smith Houses development, which we observed during our audit survey, was included as one of the 14 developments. These 14 developments have a total of 52 residential buildings (including two for senior citizens) containing 104 elevators; seven developments have 9 or fewer elevators and seven have 10 or more elevators. The sample includes two developments for each of the seven area administrators and at least one development for 12 of NYCHA's 15 elevator supervisors on staff as of December 2009. Source documentation (preventive maintenance schedules, test reports, work orders, etc.) and other relevant records and data associated with the sampled elevators were used in audit tests, as discussed below.

Evaluation of Data Reliability

To gain an overview of the capabilities and uses of NYCHA's Maximo system, we interviewed key officials from NYCHA's Business Solution Technology and Information Technology Infrastructure departments, as well as various users of the system. In the absence of a user manual, we obtained read-only access to the application, reviewed its basic features, and attended a Maximo orientation session.

Using our read-only access to Maximo, we generated various reports and work orders relevant to our audit tests. In addition, we obtained a copy of Maximo work order data for the period July 1, 2009–December 31, 2009, and generated various queries to evaluate the data and assess its reliability and completeness. We also compared data gleaned from NYCHA's Web site for each of the 14 sampled developments (e.g., number of buildings and elevators) to other NYCHA-provided data and reports.

On a limited basis, we evaluated the reliability of Maximo's work order system and its ability to track work orders related to the sampled developments. Specifically, we selected five work orders related to sampled developments, examined all their child work orders, and determined whether the work order creation and completion dates reported were logical. Further, we assessed the reliability of elevator outage data.

We were reasonably assured that Maximo data was reliable for audit test purposes. Since July 2009, NYCHA had used the Maximo work order system to record, communicate, track, and report outages and repair work throughout the developments; therefore, we relied on Maximo work order data to evaluate NYCHA's responsiveness to elevator outages and needed repairs. However, we encountered certain processing inefficiencies that limited our testing of work orders associated with sampled elevators. Specifically, it took an unreasonable amount of time to access and print work orders and related reports from Maximo; therefore, we limited our testing to a small number of work orders. Other limitations we encountered included that at the time of our audit NYCHA did not use Maximo to track certain functions, such as preventive maintenance. Further, Maximo was still being customized and enhanced to NYCHA specifications, and its business rules were being refined. Based on these constraints, we generally relied on source documentation and observations to perform our audit tests related to inspections and preventive maintenance.

Evaluation of Inspection, Repair and Maintenance Efforts

As detailed below, we tested NYCHA's general efforts to comply with applicable standards for elevator inspections, maintenance, and repair for consistency of performance. However, we did not address the technical aspects of inspection and maintenance tasks or the procurement and inventory of related parts and components, nor did we review the qualifications or training of Elevator Bureau maintenance personnel. These were considered outside the scope of this audit.

To test for evidence of regular elevator maintenance and inspections, we visited the 14 sampled developments between November 5, 2009, and February 9, 2010. We obtained copies of available inspection certificates for the elevators in each development. During our visits, while accompanied by the Elevator Bureau's Deputy Assistant Director, the Supervisor of Elevator Mechanics, and/or the development's elevator repair team, we visually inspected 57 of the 104 elevators and 29 associated motor rooms.

We observed the operation of the elevators, checked for adequate lighting, trip hazards, and general cleanliness, and determined whether emergency stop switches worked properly. In the motor rooms, we examined the floors for general cleanliness and checked for the existence of metal inspection/test tags punched with the inspection month and date. We also examined the motor room logs for the recording of signatures by visitors to the motor rooms and their appropriate dates. We documented the results of our observations and shared our findings with NYCHA personnel who accompanied us on the visits.

For the 104 passenger elevators in the 14 sampled developments, we assessed Maximo data relevant to elevator outages and applicable work orders generated and completed from July 1, 2009, through December 31, 2009. Using the population of 2,135 work orders suitable for testing,[4] we calculated the time it took NYCHA to put an elevator back into service, measured from the time a work order was created to the time the necessary work was completed, as reflected in the Maximo data.

To ascertain whether required PM tasks were performed according to NYCHA Standard Procedures for Elevator Service, Maintenance and Repair, we obtained and analyzed completed PM schedules (checklists) for all 104 elevators at the 14 sampled developments for the 12 months of November 2008 through October 2009. We assessed whether all monthly, semi-monthly, quarterly, semi-annually, and annually required PM tasks were performed for each of the 104 elevators. Based on the results of this analysis, we calculated the frequency of PM nonperformance across the sampled developments.

For the 57 elevators we observed at the sampled developments between November 5, 2009, and February 9, 2010, we determined whether periodic inspections and Category 1 tests were performed in 2009, and whether Category 5 tests were performed between 2005 and 2009. We examined copies of the inspection certificates obtained at the time of our visits for evidence of required inspections and tests, based on the entries on each certificate. For Category 1 and Category 5 tests, we also examined available inspection/test tags for evidence that the tests were performed, based on the existence of such tags and the dates punched on them. Subsequently, in February 2010, we accessed the DOB Building Information System on the Internet (BIS Web) for evidence of the performance of inspections and tests of the 57 elevators. For our test purposes, we considered that an inspection or test was performed if the certificate was signed and/or if the inspection was recorded on the BIS Web. However, if the inspection certificate was unsigned and no inspection was recorded in BIS Web, we concluded that a required inspection or test was not performed.

[4] There was a total of 2,419 work orders records, of which 282 were omitted, including 94 that fell outside the range of the test period, 43 that were cancelled, 2 that were for freight elevators, and 145 that had dating anomalies were not suitable for testing.

To assess NYCHA's compliance with DOB's Category 1 test filing requirements, we selected 8 (26%) inspections from a population of 31 inspections that were performed between April 1, 2009, and December 31, 2009, on the 57 elevators we observed. These inspections represented one elevator from 8 of the 14 sampled developments. From NYCHA we obtained copies of the Category 1 Test Reports (ELV3 forms) filed with DOB for the 8 elevators. We calculated the time it took NYCHA to file the ELV3 forms with DOB, measured from the Category 1 test date to the filing date. Further, we ascertained the results of the tests (satisfactory or unsatisfactory) from the test reports and determined the time it took NYCHA to address reported deficiencies where applicable and to file the required correction reports with DOB.

To confirm that NYCHA's in-house inspectors were licensed by DOB to perform elevator inspections, we examined copies of the inspectors' licenses provided by NYCHA and verified that the inspections and tests we reviewed were performed by DOB-licensed inspectors. Further, to gain assurance that the contractors hired by NYCHA to witness elevator tests were appropriately qualified, we checked the names and license numbers of the signatories on the ELV3 forms against the valid licenses on the DOB BIS Web.

Lastly, we reviewed NYCHA's outage statistics and management reports to assess the benchmarks and metrics used to measure and track elevator outages and NYCHA efforts to address those outages.

Our audit samples were not selected in a manner to enable the projection of test results to the respective populations. Nevertheless, the sample test results provided a reasonable basis for us to assess the adequacy of NYCHA's efforts to inspect, maintain, and repair elevators in its developments.

Discussion of Audit Results

The matters covered in this report were discussed with NYCHA officials during and at the conclusion of this audit. A preliminary draft report was sent to NYCHA officials and discussed at an exit conference held on August 5, 2010. At the exit conference, NYCHA officials disagreed with our findings pertaining to the nonperformance of PM tasks and subsequently submitted documentation (copies of mechanic work tickets, logbooks, etc.) to support their various assertions. We reviewed this documentation and concluded that there was insufficient evidence to refute our initial findings and conclusions. On September 8, 2010, we submitted a draft report to NYCHA officials with a request for comments. We received a written response from NYCHA officials on September 22, 2010. In their response, NYCHA officials generally agreed with the audit's recommendations but argued that one of them could not be implemented at this time.

The full text of the NYCHA response is included as an addendum to this report.

FINDINGS AND RECOMMENDATIONS

NYCHA's efforts to carry out elevator inspections are generally adequate; however, its efforts to address elevator maintenance and repairs need improvement.

We determined that NYCHA performed all required inspections and Categories 1 and 5 tests for all of 57 elevators we observed at the sampled developments. Nevertheless, certain weaknesses were disclosed, including that NYCHA needs to ensure that all inspections and tests are performed promptly and appropriately documented, and that cited deficiencies are promptly addressed.

We also found that NYCHA's preventive maintenance of elevators is inadequate. Based on PM checklists maintained by each development, we found that more than 40 percent of PM tasks scheduled for the sampled elevators during the period reviewed were not carried out. With regard to repairs, NYCHA reported that in fiscal year 2009 it fell a little short of its performance indicator of "10 average hours to resolve elevator outages." Our time study of outages for sampled elevators during the first six months of fiscal year 2010 (July 2009 through December 2009) showed that NYCHA took an average of 13.8 hours to resolve these outages. When looking at the actual time to resolve them, we found that almost one-third (32%) of these outages were not resolved within 10 hours. Further, based on a number of weaknesses in how data is collected and reported, NYCHA management cannot directly rely on its primary reports to assess elevator performance and outages or to measure the effectiveness of its repair and maintenance activities.

During our visits to the sampled developments, we observed 57 of the 104 elevators and found that all of them were in working order, were well lighted, free of trip hazards, and generally clean. We also observed that the motor rooms for these elevators were generally clean, well lighted and free of debris, and the motor room logs were signed as required. However, we observed that the emergency stop switches on 4 of the 57 elevators were not working. We followed up with NYCHA officials who provided information that the defective switches were repaired immediately on the days of our visits.

The deficiencies identified above are discussed in greater detail in the following sections of this report.

Response to Reported Outages Needs Improvement

According to NYCHA officials, when an elevator is out of service the Elevator Bureau's goal is to make the necessary repairs and resolve the outage within 10 hours. NYCHA measures its performance in terms of average hours to restore elevator service over a period of time. Specifically, NYCHA uses "10 average hours to restore service" as its performance indicator against which it measures outcomes. According to NYCHA, however, the actual resolution time for elevator outages during fiscal year 2009 was 11.4 hours, slightly short of its 10 hour goal.

As reflected in Table I below, our assessment of the 2,135 work orders associated with the 104 elevators in the 14 sampled developments for the period of July 1, through December 31, 2009, (after full implementation of Maximo) disclosed that only 1,461 (68%) of the work orders were addressed (completed) within 10 (actual) hours of being created in Maximo.

Table I

Time Elapsed (in Hours) between the Creation and Completion of
2,135 Work Orders Associated with 104 Sampled Elevators
July 2009 through December 2009

Time Elapsed (in Hours)	Number of Work Orders	Percentage	Cumulative Percentage
Less than 2 hours	476	22%	22%
2 hours to 5 hours	598	28%	50%
5 hours to 8 hours	302	14%	64%
8 hours to 10 hours	85	4%	**68%**
Subtotal (0 to 10 hours)	*1,461*	*68%*	
10 hours to 24 hours	409	19%	88%
24 hours to 36 hours	125	6%	93%
Over 36 hours	140	7%	100%
Subtotal (10 hours and more)	*674*	*32%*	
Grand Total	2,135	100%	

Note: This analysis considers the time that a parent work order was initially generated for a reported outage and the completion time of the last child work order, if any.

For the period reviewed, NYCHA took an average of 13.8 hours to resolve outages for the sampled elevators. As shown in Table I, when looking at the actual time to resolve these outages, almost one-third (32%) of them were not resolved within 10 (actual) hours.

In its calendar year 2009 Directive #1 submission, NYCHA stated, "The resolution time showed a significant reduction during the first four months of CFY 2010 (8 hours)." NYCHA credits a number of innovations for the improvement, including the expansion of REMS, the centralization of all elevator operations, the hiring of additional elevator staff, and increased overtime for weekends and holidays.

Even with the improvements reported by NYCHA there still remains room for improvement. As shown in NYCHA's own data, nearly one-third of outages took greater than 10 hours to resolve, and 13 percent of outages were not resolved within 24 hours. The longer an elevator is out of service, the greater the inconvenience to NYCHA residents.

NYCHA Response: "The report states that the longer an elevator is out of service the greater the inconvenience to NYCHA residents. It needs to be noted that although an elevator is out of service, oftentimes there is a second or third elevator that is used to service the building. It is considered an emergency if a building is without elevator service and NYCHA responds expeditiously to make repairs to restore at least one elevator. During non-business hours, staff responds primarily to emergencies. On occasion, buildings with limited service (when at least one elevator is in operation in the

building, but another is out of service) are not addressed until the next business day. This policy will inflate the time to restore elevator service, but is not indicative of buildings that do not have elevator service at all."

Auditor Comment: Based upon NYCHA statistics as reflected in Appendix A, 11 of the 14 elevator-equipped developments that we sampled had two or three elevators per building (10 developments had two cars per building and 1 development had three cars). Considering that buildings in those developments are between 6 and 27 stories high and each has an average population of 326 residents, even having only one elevator in a building out of service poses a major inconvenience. Furthermore, the longer an elevator is out of service, the greater the risk that the remaining elevators in that building—in compensating for the loss of the out-of-service elevator—may also go out of service due to excessive wear and tear.

NYCHA Response: "The sample set of elevators chosen for this report are almost exclusively buildings with multiple elevators (i.e., 103 of the 104 elevators in the Audit are in multiple-car buildings). This is where the procedure described above would be used. Approximately 51% of NYCHA elevators are in single car buildings (i.e. the building has only 1 elevator). Thus the sample set is not a true representation of the distribution of NYCHA elevators and the time to restore service cannot be considered typical for NYCHA."

***Auditor Comment*:** The sample of developments which contained the elevators used for audit testing were not selected merely to evaluate NYCHA's repair (i.e., service restoration) efforts, but to evaluate its overall inspection and maintenance efforts. As discussed in the *Scope and Methodology* section of this report, our sample was judgmentally selected to ensure that developments of varying sizes, as well as developments within each borough, were represented. (As a minor point of correction, 101 of the 104 elevators reviewed in this audit were in multiple-car buildings, based on NYCHA statistics.) As such, we did not project the results of our tests to the entire population of elevators. Regardless of the concentration of elevators per building, we believe that the sample test results provide a reasonable basis for us to assess the adequacy of NYCHA's inspection, maintenance and repair efforts. It is worth noting that although NYCHA states that the audit's finding that the average time of 13.8 hours to repair outages for the sampled elevators for the first half of Fiscal Year 2010 (July – December 2009) cannot be considered typical, this figure is only slightly higher than the average repair time of 13.1 hours in Fiscal Year 2010 for *all* elevators that *NYCHA itself* reports for inclusion in the City's Mayor's Management Report.

Recommendation

1. NYCHA should, as part of its reorganization of its elevator operations, continue to assess and identify areas where efficiencies and improvements can made in responding to and resolving elevator outages.

NYCHA Response: NYCHA agreed, stating: "This recommendation is acceptable and ongoing. NYCHA is continually assessing its operations and identifying areas where improvements can be made in responding to and resolving elevator outages."

Preventive Maintenance Not Consistently Performed

Our analysis of PM tasks to be performed at varied time intervals for all 104 elevators at the 14 sampled developments showed that the developments' repair teams did not perform at least 40 percent of scheduled PM tasks between November 1, 2008, and October 31, 2009, based on the PM monthly and annual checklists maintained by each development.

NYCHA requires that various PM tasks be performed at semi-monthly, monthly, quarterly, semi-annual, and annual intervals. The development elevator mechanics are required to record performance of these tasks on "Elevator Preventive Maintenance Schedules" (or checklists), one for "Semi-Monthly and Monthly" tasks and one for "Quarterly/Semi-Annually/Annually" tasks. Upon completing each PM item (task), the elevator mechanic is required to record the results on the checklists. As with all of their work, the teams must also document PM work in a log book kept at the development as well as on handwritten work tickets.

Based solely on the PM checklists, we found that none of the sampled elevators were consistently serviced for preventive maintenance according to NYCHA procedures; more than half (55 of the 104 elevators) went from at least one month up to six months without any PM work. Further, we noted that the checklists did not provide evidence that the elevator mechanics performed semi-monthly and semi-annual PM tasks twice a month or twice a year, respectively, as required.

At the exit conference, NYCHA officials contended that mechanics' work tickets and log book entries also provided evidence of PM work performed. Accordingly, *from* the PM checklists we attempted to trace 136 monthly periods (associated with 55 elevators at 10 of the sampled developments) for which no PM work was indicated *to* copies of mechanic work tickets and logbooks subsequently provided by NYCHA. We found evidence in the work tickets and/or logbooks that some PM work was performed for 15 (11%) of the 136 monthly periods reviewed. Additionally, the work tickets and logbooks did not indicate the specific PM tasks that were performed. Instead, these documents merely noted that PM work was done. Consequently, we were unable to use the work tickets and logbooks to determine the extent of tasks performed.

We assessed the total number of tasks required to be performed for all time intervals (semi-monthly, monthly, quarterly, semi-annually, and annually) and, based on the actual schedules we were provided, found that of the total 22,307 tasks required to be performed, NYCHA's repair teams did not perform 9,464 (42%). (See Appendix B for a detailed analysis.)

The required PM tasks were performed with differing frequency among the developments. However, as shown in Table II below, for the majority of the sampled

developments (12 out of 14) the percentage of required semi-monthly PM tasks not performed fell between 41 percent and 80 percent.

Table II

Nonperformance of Semi-Monthly and Monthly PM Tasks
November 1, 2008–October 31, 2009

Percentage Range of Required PM Tasks Not Performed	Semi-Monthly Tasks				Monthly Tasks			
	Number of Developments	*Pct (%)*	Number of Elevators	*Pct (%)*	Number of Developments	*Pct (%)*	Number of Elevators	*Pct (%)*
0%-All Tasks Performed	0	*0%*	0	*0%*	0	*0%*	0	*0%*
1%-20%	1	*7%*	1	*1%*	7	*50%*	49	*47%*
21%-40%	0	*0%*	0	*0%*	4	*29%*	19	*18%*
41%-60%	**7**	***50%***	**54**	***52%***	**2**	***14%***	**34**	***33%***
61%-80%	**5**	***36%***	**47**	***45%***	0	*0%*	0	*0%*
81%-100%	1	*7%*	2	*2%*	1	*7%*	2	*2%*
Total	14	*100%*	104	*100%*	14	*100%*	104	*100%*

Four developments did not have on file a total of 14 Semi-monthly/Monthly schedules of the required 168 schedules for the test period: Carey Gardens, Manhattanville, and Marshall Plaza, each lacked 4 of the required 12 schedules, and Wyckoff Gardens lacked 2 of the required 12 schedules.

As reflected in Table III below, we also examined the PM schedules for Quarterly, Semi-Annual, and Annual PM Tasks and found varied levels of nonperformance across the 14 sampled developments. Two developments did not have the required checklists available for our review; therefore, there was no record of quarterly, semi-annual, and annual PM tasks performed. For the remaining 12 developments, the percentage of required PM tasks that were not performed fell between 21 and 80 percent.

Table III

Nonperformance of Quarterly, Semi-Annual, and Annual PM Tasks
November 1, 2008–October 31, 2009

Percentage Range of Required PM Tasks Not Performed	Quarterly Tasks				Semi-Annual Tasks				Annual Tasks			
	# Dev	%	# Elevators	%	# Dev	%	# Elevators	%	# Dev	%	# Elevators	%
0%-All Tasks Performed	0	*0%*	0	*0%*	6	*43%*	37	*35%*	11	*79%*	92	*88%*
1%-20%	0	*0%*	0	*0%*	1	*7%*	12	*12%*	0	*0%*	0	*0%*
21%-40%	5	*36%*	32	*31%*	1	*7%*	2	*2%*	0	*0%*	0	*0%*
41%-60%	1	*7%*	10	*10%*	4	*29%*	42	*40%*	0	*0%*	0	*0%*
61%-80%	6	*43%*	51	*48%*	0	*0%*	0	*0%*	0	*0%*	0	*0%*
81%-100%	0	*0%*	0	*0%*	0	*0%*	0	*0%*	1	*7%*	1	*1%*
PM Checklists Not Available	2	*14%*	11	*11%*	2	*14%*	11	*11%*	2	*14%*	11	*11%*
Total	14	*100%*	104	*100%*	14	*100%*	104	*100%*	14	*100%*	104	*100%*

On a more positive note, the development repair teams performed all semi-annual PM tasks at more than half of the 12 developments for which we were provided checklists. Moreover, 11 of the 12 developments for which we were provided checklists recorded that all annual PM tasks were performed for 92 (88%) of all 104 elevators reviewed at the 14 sampled developments.

During the audit, NYCHA officials stated that elevator repair teams may be assigned to address elevator outages instead of scheduled PM work. Therefore, required PM work may go uncompleted. However, they also noted that there is an inverse relationship between the level of PM work carried out and the frequency of elevator malfunctions and outages. Therefore, if PM work is not carried out regularly as scheduled, there is a greater likelihood of deficient conditions arising and service outages occurring due to mechanical failure. This premise is supported by the fact that 45 (79%) of the 57[5] elevators we observed at 14 sampled developments had unsatisfactory results for Category 1 Tests performed in 2009. We reviewed the level of nonperformance of PM tasks for these 45 elevators and found that for the audit test period an average of 61 percent of semi-monthly PM tasks were not performed. Similarly, 30 percent, 53 percent, and 25 percent of the required monthly, quarterly, and semi-annual PM tasks, respectively, were not performed. If the PM tasks had been performed at the different intervals as required, these 45 elevators may have had different inspection results.

NYCHA officials have attributed elevator outages to aging equipment, heavy use, and vandalism. Others have attributed breakdowns to overcrowding by residents and sometimes by contractors who have heavy equipment. While we agree that there are several factors that contribute to elevator outages, PM activities are critical for maintaining the equipment in good

[5] One of the sampled elevators was a new installation; therefore, NYCHA did not have to file a Test Correction Report with DOB for deficiencies discovered during a Category 1 test performed in 2009.

repair, reducing outages, and maximizing equipment life. Accordingly, failure to perform scheduled PM tasks consistently increases the risk that more frequent breakdowns may occur.

At the exit conference, NYCHA officials also contended that only 17,244 PM tasks were required for the sampled elevators for the audit test period. Our review of the available PM checklists for the audit test period revealed that 22,307 tasks were required, 5,063 more than the number claimed by NYCHA. Officials argued that not all PM tasks were required for all elevators and that semi-monthly PM tasks were "stopped prior to 2008."

Based on our review of documentation subsequently submitted by NYCHA officials in support of their argument, we determined there was insufficient evidence to either refute or modify our findings. First, NYCHA's figure included monthly PM tasks only; 2,787 quarterly, semi-annual, and annual PM tasks were omitted. Second, of the PM tasks that NYCHA officials considered not applicable for certain elevators, we found that 8 of the 14 sampled developments had nonetheless performed some of those tasks during the period reviewed. Conversely, we found that two of the developments did not perform (nor did we include in our count) certain PM tasks that NYCHA officials claimed should have been performed.

Finally, NYCHA official's contention that semi-monthly tasks had ceased being performed twice monthly prior to the audit test period is contradicted by evidence we obtained during audit testing. NYCHA provided us with its Administrative Procedures for Elevator Personnel (Training Manual), effective January 2010, in which there is no requirement that semi-monthly PM tasks were required. These procedures were not in effect during the audit period tested, however. The procedures in effect during that period—NYCHA's Standard Procedure Manual (effective October 26, 2007)—indicated that semi-monthly PM tasks *were* required. Further, we found that all of the PM checklists that we obtained at the developments for the 12 months of November 2008 through October 2009 included semi-monthly tasks. Accordingly, our finding remains unchanged.

Recommendations

NYCHA should:

2. Ensure that required PM work is performed and that all such work is appropriately supported by PM schedules (checklists) that are completed by the work teams and kept on file at each development as required and recorded in Maximo.

NYCHA Response: "We agree with this recommendation and have implemented it. However we will phase out the use of the checklist as we orientate to the new process since the PM schedules are now automated. This provides greater transparency and the ability to review PM status from remote locations. Additionally, it was identified that PM work done by other units within the Elevator Bureau was being entered into Maximo but not counted toward PM. We have made changes to the data entry to more accurately reflect the PM being completed."

3. Document instances of and justifications for not performing scheduled PM work. These reports should be approved by a supervisor and communicated to the Elevator Bureau Borough Administrators, who should also be notified of all instances in which PM work is not performed. Repeated periods of PM nonperformance should be investigated and corrective action taken.

NYCHA Response: "We agree with this recommendation. The implementation will take place during the fourth quarter of this year."

Weaknesses in Safety Inspections and Tests

Our review determined that NYCHA had performed all required periodic inspections along with Category 1 and Category 5 tests for all of the 57 elevators we observed at the 14 sampled developments. However, certain weaknesses were disclosed that NYCHA needs to address to ensure that all inspections and tests are performed promptly and appropriately documented, and that cited deficiencies are promptly addressed.

As stated previously, elevators in the City are required to undergo a periodic inspection and a "no-load" (Category 1) test every year, and a "full-load" (Category 5) safety test once every five years. Further, staff must have a valid DOB license to perform the inspections and tests. Finally, inspectors are required to sign, date, and list his/her license number on the elevator inspection certificates maintained at each development.

Periodic Inspections

Based on our review of elevator inspection certificates and DOB elevator inspection records obtained from DOB's BIS Web, we initially determined that for calendar year 2009, of the 57 sampled elevators that we observed, NYCHA inspectors performed periodic inspections on 51 (89%) elevators.

After we advised NYCHA officials of these findings, they subsequently submitted copies of replacement inspection certificates and Periodic Elevator Inspection Deficiency Notices for each of the remaining six elevators showing that they had been inspected in 2009. Based on our review of DOB's BIS Web elevator inspection records, we concluded that the inspections had been performed and resulted in unsatisfactory ratings with cited deficiencies. According to NYCHA officials, DOB was notified of the inspection results within the prescribed timeframes for four of the six inspections; the two others were filed late because they were miscoded in NYCHA's database.

However, we had concerns about the replacement inspection certificates that NYCHA provided for the six elevators. The Building Code requires that after each inspection or test, the inspector affix the inspection date and his or her signature over a stamp identifying his or her approved agency name and approval number on the Inspection Certificate, personally certifying that an inspection or test was performed. Without the original certificates completed by the

inspectors who performed the inspection or test, the level of assurance that they were conducted in accordance with regulations is diminished.

> ***NYCHA Response:*** "We disagree with the statement 'Without the original certificates completed by the inspectors who performed the inspection or test, the level of assurance that they were conducted in accordance with regulations is diminished.' Replacement certificates are used when historical documentation is not present at the development. The replacement certificate is signed by the person who performed the inspection and the source document for the replacement certificate is the inspection report, which was available for all of the inspections."
>
> ***Auditor Comment***: Contrary to NYCHA's assertions, the original inspection certificates (i.e., historical documentation) were present at the developments for all six inspections for which NYCHA submitted replacement certificates to us. Furthermore, the replacement certificates, representing inspections performed by different persons, all appeared to be signed by the same person.

Category 1 and Category 5 Tests

Our analysis of elevator inspection certificates, test tags, and DOB BIS data provided reasonable assurance that Category 1 tests for 2009 were performed on all 57 observed elevators. However, we noted that 30 of the inspection certificates were not signed and dated by the inspectors. Further, we found that only 47 of the 57 elevators had the required test tags to show that the Category 1 tests were performed.

For Category 5 Tests, our review of inspection certificates, test tags, and BIS data determined whether the tests were performed on the 57 observed elevators between 2005 and 2009. Overall, we found that all of the 57 elevators had received a Category 5 test within the 60 months of January 1, 2005, through December 31, 2009. However, only 31 (54%) of the 57 observed elevators had the required metal inspection/test tags for Category 5 tests affixed to machine apparatus in the motor room; no tags existed for the remaining 26 (46%) elevators. The absence of elevator inspection/test tags is not only a violation of the City's Administrative Code, but also results in the lack of corroborating evidence to show that the tests were in fact performed.

Deficiencies Cited During Elevator Tests Not Promptly Addressed

NYCHA did not promptly address deficiencies cited during Category 1 tests of sampled elevators. Further, we noted that NYCHA did not promptly communicate to DOB the results of Category 1 tests and the correction of cited deficiencies.

The MOU between NYCHA and DOB states that NYCHA must submit to DOB a test report on an ELV3 form with the results of the test *within 45 days* of the inspection being performed. If the Category 1 test report reveals unsatisfactory conditions, NYCHA must make the necessary repairs and submit a Category 1 Test Correction Report to DOB *within 45 days of*

completing the repairs and submitting the Category 1 test report to DOB. Therefore, NYCHA has a maximum of 90 (45 + 45) days from the Category 1 test date to correct any deficient conditions cited during the test *and* to submit a Category 1 Test Report to DOB listing the correction of any deficient conditions to DOB.

Deficient Conditions Remained Unaddressed

We found that five of the eight elevators for which we reviewed Category 1 tests had unsatisfactory test results and cited deficiencies. NYCHA created 27 child work orders to address those deficiencies. However, NYCHA took an average of 78 days (ranging from 44 to 125 days) from the Category 1 test date to the work order creation dates to generate the child work orders for the cited deficiencies. Moreover, as of April 21, 2010, 25 of the 27 child work orders remained open and unaddressed. Two others were closed on April 5, 2010. Overall, the 27 deficiencies went unaddressed for an average of 148 days (ranging from 112 to 180 days), measured from the Category 1 test date and the earlier of either our April 21, 2010, audit test date or the work order close date.

According to NYCHA officials, work orders for cited deficiencies will not be generated until the results of the Category 1 tests recorded by the performing and witnessing inspectors are reconciled. Subsequent to a Category 1 test, the witnessing inspectors are to complete an ELV3 report form listing the results of the test (satisfactory or unsatisfactory), any observed deficiencies, and actions required to remedy those deficiencies. The witnessing inspector and witnessing agency director sign the ELV3 form and forward it to NYCHA. Inspection Unit personnel reconcile the in-house (performing inspector) Category 1 test results that have been entered in Maximo to those recorded by the witnessing inspector on the ELV3 form, and generates child work orders for each of the cited deficiencies. Only when those work orders have been generated can the orders be assigned to repair teams at the developments for correction. However, NYCHA does not generate a work order until the results of the Category 1 tests have been reconciled, which, as discussed above, could take from several weeks to several months. Therefore, cited deficiencies may not be addressed within 90 days of the inspection date, and may continue to remain uncorrected for even longer.

Even though our test was limited, it provided sufficient evidence to show that NYCHA needs to improve its efforts to address deficiencies identified during inspections and tests. The longer deficiencies go unaddressed, the greater the likelihood that those deficiencies will worsen and lead to equipment failures and service outages.

In addition, audit tests results disclosed that NYCHA did not promptly communicate to DOB the results of Category 1 tests and the corrections completed for any cited deficiencies. Specifically, NYCHA filed ELV3 forms within 45 days for only three of the eight Category 1 tests we reviewed; overall, it took NYCHA an average of 53 days (ranging from 35 to 71 days) to file Category 1 ELV3 forms with DOB. Further, it took NYCHA an average of 106 days (ranging from 80 to 149) to file Category 1 Test Correction Reports with DOB for four of the five elevators that were cited for deficiencies.

Even though it is important that DOB be notified of cited deficiencies and their subsequent corrections, it is just as important that NYCHA ensure that identified elevator deficiencies are addressed promptly.

Recommendations

NYCHA should:

4. Formally notify and remind all NYCHA elevator inspectors and related personnel of the City's requirement that elevator inspection certificates must be signed, dated, and stamped by the inspector upon completing a periodic inspection, a Category 1, or a Category 5 test. Follow-up reminders of these and other requirements should also be made. Further, the inspection supervisor should periodically sample inspection certificates to ensure compliance.

NYCHA Response: NYCHA agreed, stating: "This recommendation is acceptable and has already been implemented with the exception that for Category 1 and Category 5 tests the inspection certificate is signed by the third party witness, not the performing inspector."

5. Require that work orders to correct the cited deficiencies be created immediately after the results of the inspection are recorded in Maximo.

NYCHA Response: "We agree with the intent of this recommendation, but we cannot implement as written. The inspection work orders are created immediately in Maximo; however they are not finalized until they are reviewed. Our MOU with DOB allows 15 days to finalize and file the reports that document the deficiencies and the DOB code allows up to 45 days to finalize and file the Category 1 and Category 5 reports since the inspection of record is the responsibility of the Witnessing Firm. We did experience technical issues with the handheld device that we use for inspections and the Maximo program, which contributed to delays and we also experienced issues with witnessing firms meeting the timeframes of the New DOB elevator code. We are working to resolve these issues and plan to meet the mandated timeframes within the 4th quarter of 2010. Please be aware that potential hazardous deficiencies that were identified during inspections require NYCHA to remove the car from service and complete the repairs immediately. All other deficiencies are required to be corrected within 45 days of the filing date."

Auditor Comment: NYCHA's current procedures do not ensure that elevator deficiencies identified during a Category 1 test are addressed promptly. While NYCHA's MOU with DOB allows a delay in finalizing inspection results, this does not preclude NYCHA from correcting cited deficiencies before those results are finalized. Therefore, with a focus on addressing deficiencies and the safe and continuous operation of elevators, we maintain that NYCHA should generate work orders for cited deficiencies once the inspection results are recorded in Maximo, instead of waiting to reconcile the

performing and witnessing inspectors' inspection results, which as noted earlier may take from several weeks to several months.

6. Ensure that Inspection/Test ELV3 report forms and Test Correction Reports are filed with DOB within the established time requirements.

NYCHA Response: "We agree with this recommendation and plan to implement it in the 4th quarter of 2010 (Please see explanation for Recommendation 5)."

Weaknesses in Reporting of Outage Data and Performance Measures

Based on our review of NYCHA reports of elevator outages and related statistics, we found weaknesses in the collection and reporting of data that diminishes the ability of NYCHA management to directly rely on its primary reports to assess elevator performance and outages or to measure the effectiveness of its repair and maintenance activities. Further, considering some of the inaccuracies in certain computer reporting functions, we have limited assurance about the reliability of reported performance data.

NYCHA uses various management reports to track elevator outages. Maximo is the primary system from which data are compiled to generate these reports. However, because of a lag in closing work orders in Maximo, we determined that the accuracy and completeness of outages reflected in the management reports may be inaccurate and incomplete, depending on when reports are generated and for what period. The lag also affects the accuracy of reporting and tracking work orders that are truly "open."

Only those work orders that are "closed" in Maximo are captured in the outage reports. A work order is coded as "completed" in Maximo when the related task or repair is completed, reported to the Central Elevator Dispatch Unit, and entered in Maximo by a clerk. For a work order to be closed requires that certain information be entered in specific Maximo data fields, such as the name of the mechanic, comments on the repair, etc. If any of this information is unavailable or not made known to the clerk, the work order cannot be closed. Consequently, the reports generated by NYCHA for a specific month may not contain complete and relevant data needed for management to be adequately informed of elevator operations.

We found this condition upon evaluating various management reports and data for individual elevators. For example, as shown in Table IV below, we printed two types of management outage reports for one elevator (car A) at the Shelton House development for the month of December 2009. We printed these reports on January 12, 2010, February 4, 2010, and March 8, 2010, respectively, and found that the number of outages reflected in each type of report differed for each of the three print dates, even though the reports covered the same period, December 2009.

Table IV

Comparison of Elevator Outages Appearing in Management Reports
For the Month of December 2009

	Number of Reported Outages	
Report Print Date	*Report A Executive Management Statistical Outage Report*	*Report B Elevator Service Interruptions Report*
January 12, 2010	6	1
February 4, 2010	n/a	6
March 8, 2010	10	8

Note: Data reflected in Report A and Report B are not comparable, since by design they capture and report different information.

According to NYCHA officials, these reports are accessed and used by NYCHA's Elevator Bureau as well as its Executive, Management Operations, and Law Departments. NYCHA describes the information contained in these reports as "key performance metrics that are used for analytics and improvement strategies." Consequently, if NYCHA management wants to assess the performance of NYCHA elevators accurately, they cannot immediately and directly rely on reported outage data reflected in management reports to obtain a true and complete report of outages, which is inefficient.

NYCHA officials informed us that regular reports are sent to Management Operations and Elevator Bureau personnel that list completed but not closed elevator work orders so that NYCHA staff can obtain the information needed to close out the work orders. However, this procedure does not ensure that completed work orders are closed promptly.

In response to our queries regarding the inconsistencies of reported elevator outages, NYCHA officials asserted,

> The Maximo system is new and requires some necessary enhancements that have to be deployed and we are still debugging the application. Each week we launch enhancements that change the system in order to improve performance and the accuracy of information. The Maximo System provides NYCHA with numerous ways of collecting and viewing data. Because the System is new, we are still learning the best ways to utilize its vast capabilities. The underlying issues . . . are the data lag for completed but not closed work orders and data problems related to the integration between Maximo and the Executive Information System. We previously identified these issues and will deploy enhancements to Maximo in the near future that will correct them.

In addition to the lag in closing work orders, we also found that Maximo did not have adequate edit checks in certain date fields. For the 2,419 work order records contained in the data provided to us, 104 had work order completion dates earlier than the work order creation dates and 41 had no creation date at all. The lack of appropriate edit checks in date fields only increases the inaccuracy of the data reflected in Maximo performance reports.

Further, since NYCHA primarily uses Maximo data to compile and report performance and productivity measures, concerns exist about the accuracy of four elevator-related performance indicators reported in the Mayor's Management Report, two of which are critical indicators (*): (1) average time to resolve elevator outages (hours)*, (2) average outage per elevator per month*, (3) elevator service uptime (%), and (4) percent of elevator outages due to vandalism (%).

We acknowledge that Maximo is a new system and may require further enhancements to fully operate as intended. Nevertheless, in implementing the system agency wide in July 2009, NYCHA management made the determination that Maximo was sufficiently reliable for the purpose of recording and tracking the agency's elevator repair and maintenance performance. According to NYCHA officials, the data in periodic reports generated from Maximo is relied upon by various NYCHA management and elevator personnel for forming maintenance strategies, measuring performance in various areas, and possibly even for allocating limited resources and determining equipment to be replaced or rehabilitated. Consequently, NYCHA management needs to be assured that elevator outage data is complete, relevant, and accurately presented in management reports.

Recommendations

NYCHA should:

7. Continue to work to correct and enhance management reporting deficiencies to ensure that internal and published performance indicators and measures are accurately reported.

NYCHA Response: NYCHA agreed, stating: "This recommendation is acceptable, has been implemented and is ongoing."

8. Review the date fields in the Maximo work order system to determine whether edit checks are in place and functioning properly; remedy any problems found.

NYCHA Response: NYCHA agreed, stating: "This recommendation is acceptable, has been implemented and is ongoing. . . . Although we are still performing needed upgrades to Maximo, it is more accurate and user friendly tha[n] when the audit was first conducted."

Appendix A

Details of 14 Sampled NYCHA Developments

Borough	Development Name	Number of Residential Buildings with Elevators	Stories	Total Number of Elevators in Elevator-Equipped Buildings	Average Elevators per Building	Number of Apartments	Resident Population	Senior Residence
BRX	1162-1176 Washington Ave.	1	6	1	1	64	185	
BRX	Boynton Ave Rehab	1	3 & 6	1	1	82	203	
BRX	Highbridge Gardens	6	13 & 14	12	2	699	1,688	
BRX	McKinley	5	16	10	2	616	1,530	
BKN	Rutland Towers	1	6	1	1	61	94	
BKN	Wyckoff Gardens	3	21	6	2	527	1,173	
BKN	Carey Gardens	3	15 & 17	9	3	682	1,704	
BKN	Williams Plaza	5	14 & 21	10	2	577	1334	
MAN	Amsterdam Addition	1	27	2	2	174	347	
MAN	Smith Houses	12	15, 16 & 17	24	2	1,933	4,314	
MAN	Manhattanville	6	20	12	2	1,272	2,958	
MAN	Marshall Plaza	1	13	2	2	180	195	Y
QNS	Shelton House	1	12	2	2	153	167	Y
STI	Richmond Terrace	6	8	12	2	488	1,296	
14	Totals	52		104		7,508	17,188	

*The Boyton Ave Rehab development consists of three buildings, only one of which contains an elevator.

Appendix B

Analysis of the Performance of
Preventive Maintenance Tasks for All Service Frequencies
For 104 Elevators in 14 Sampled Developments
November 2008–October 2009

Development	Number of Elevators	Summary of ALL PM Tasks				
		Total Required Tasks All Elevators	Total Tasks **NOT** Performed on All Elevators	Percentage of Tasks **NOT** Performed	Total Tasks Performed on All Elevators	Percentage of Tasks Performed
1162-76 Washington Ave	1	271	143	*53%*	128	*47%*
Boynton Ave Rehab	1	259	55	*21%*	204	*79%*
Highbridge Gardens	12	2,580	725	*28%*	1,855	*72%*
McKinley	10	2,350	1,293	*55%*	1057	*45%*
Rutland Towers	1	259	81	*31%*	178	*69%*
Wyckoff Gardens	6	1,266	427	*34%*	839	*66%*
Carey Gardens	9	1,152	318	*28%*	834	*72%*
Williams Plaza	10	2,590	1,370	*53%*	1,220	*47%*
Amsterdam Addition	2	470	154	*33%*	316	*67%*
Smith Houses	24	5,352	2,922	*55%*	2,430	*45%*
Manhattanville	12	1,908	643	*34%*	1,265	*66%*
Marshall Plaza	2	334	280	*84%*	54	*16%*
Shelton House	2	408	198	*49%*	210	*51%*
Richmond Terrace	12	3,108	855	*28%*	2,253	*72%*
Totals	104	22,307	9,464	*42%*	12,843	*58%*

NEW YORK CITY HOUSING AUTHORITY

NEW YORK CITY HOUSING AUTHORITY
250 BROADWAY • NEW YORK, NY 10007
TEL: (212) 306-3000 • http://nyc.gov/nycha

JOHN B. RHEA
CHAIRMAN
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MEMBER
VILMA HUERTAS
SECRETARY

Date: September 22, 2010

Ms. Tina Kim
Deputy Comptroller for Audits, Accountancy & Contracts
The City of New York, Office of the Comptroller
Municipal Building
One Centre Street, Rm. 1100 North
New York, N.Y. 10007-2341

Re: Response to Audit Report on the Efforts of the New York City Housing Authority to Inspect, Maintain and Repair Passenger Elevators
MJ10-064A

Dear Ms Kim:

Thank you for the opportunity to comment on your audit report regarding our elevator inspection, maintenance and repair processes. Before we respond to the report's recommendations, we believe it is important to clarify a number of areas related to the New York City Housing Authority's (NYCHA) Elevator Management processes that a reader of this report should know.

First and foremost, elevators are an essential service in a vertical City such as New York, and we at NYCHA are committed to providing safe and reliable elevator service to our residents and the riding public. We demonstrate our commitment through our Elevator Safety and Service Plan (ESSP), which we were implementing during the course of this Audit. The following is a brief overview and update of the Plan.

NYCHA's 3,324 elevators represent one of the largest elevator fleets in the nation and comprise five percent of all the elevators in New York City. The average age of NYCHA elevators is 12 years old and they perform an astounding 3.2 million trips each day and 1.2 billion trips annually. We provide 24 hour service 365 days per year.

There are four key components to our plan:

- Improve Elevator Maintenance
- Modernize Elevators
- Increase Public Awareness Through Resident Participation
- Working With Other Agencies

Improving Elevator Maintenance

- Hired Elevator Agency Director
- Formed and centralized Dispatching Unit
- Provided QEI training and certification to all supervisor and inspectors and some additional staff members Implemented a new asset/work order management program with expanded reporting capabilities
- Revamped weekend shifts by adding staff
- Increased Head Count by 75 positions.
- Hired 20 Additional Maintenance Teams and formed the Elevator Maintenance Support Unit
- Enhanced Training for Supervisors
- Centralized Elevator Operations to Promote Singular Focus, Consistent Standards & Flexibility with Resources – June 1, 2009
- Established Emergency Parts Inventory
- Upgraded parts (e.g. new type of door gibs)
- Kick off blocks installed on all elevators: not required by code but a safety enhancement that protects passengers
- Established quality control program
- Presently undergoing a comprehensive review of NYCHA's elevator operations by a vertical transportation consultant firm

Modernize Elevators (complete replacement of elevators as listed)

- Funding Year 2009: 25 Developments & 251 Elevators
- Funding Year 2010: 16 Developments & 129 Elevators Funding Year 2011: 12 Developments & 163 Elevators Funding Year 2012: 9 Developments & 80 Elevators
- Funding Year 2013: 7 Developments & 73 Elevators
- Funding Year 2014: 26 Developments & 167 Elevators
- Created a New Specialized Elevator Design Unit to Expedite Elevator Replacement Projects
- CCTV Cameras in elevators: 906 installed to date Installed Remote Elevator Monitoring System (REMS): 1,124 elevators with remote monitoring
- Installed Door Zone Restrictors (DZR) in 750 elevators at 85 Developments that do not require them by code.

Increase Public Awareness through Resident Participation

- Held Resident Association Meetings that focused on Elevator Safety and Maintenance Issues; Presentations were made to the Council of Presidents (COP) and Resident Associations
- Created a Power Point presentation for residents of developments scheduled to have their elevators replaced

- Met with Resident Associations at Developments Scheduled for Modernization
- Held Elevator Summit with Resident Leaders in January & March 2009
- Elevator TIPS developed with COP, Journal Articles

Working with Other Agencies

- Collaborating with the DOB on training initiatives
- New Memorandum of Understanding with the DOB on Elevator Safety Inspections signed in 2009
- Elevator Code Seminar Held with DOB
- Working with FDNY to improve communications and on various training initiatives

As previously mentioned, NYCHA was implementing the ESSP during the course of this Audit. A significant component of the ESSP was the complete reorganization of the Elevator Program into a centralized organizational structure. There were also two other significant implementations during the course of this Audit; the DOB promulgated new elevator regulations and NYCHA implemented the Maximo Asset/Work Order Management System. There was a significant adjustment period for the new DOB elevator regulations, in fact the DOB granted an extension for compliance with the inspection requirements for all registered elevators in the City. I am proud to say that NYCHA satisfied the inspection requirements without use of the extension, but there certainly was a learning curve with the new regulations.

The Maximo System was implemented throughout NYCHA in July 2009. This was an enterprise wide undertaking that involved hundreds of staff members using the system throughout the city simultaneously. Typical timeframes for large organizations to implement enterprise wide technology solutions, such as Maximo, is two years. Of course, issues were identified and we have been diligently working through them to fully realize the advantages of the new system while ensuring reliable and accurate data is being inputted and utilized to our advantage. We are designing and have begun distributing various new reports to better illustrate and track areas that are improving and others that need improvement. Although the system has been improved greatly since implementation, upgrades and modifications are still being made.

All of these significant implementations (i.e., Maximo, ESSP, reorganization, and new DOB Elevator Code) will improve elevator service for NYCHA residents.

In response to the recommendations:

Recommendation number 1:
NYCHA should, as part of its reorganization of its elevator operations, continue to assess and identify areas where efficiencies and improvements can be made in responding to and resolving elevator outages.

NYCHA's Management Response:
This recommendation is acceptable and ongoing. NYCHA is continually assessing its operations and identifying areas where improvements can be made in responding to and resolving elevator outages.

The report states that NYCHA attempts to respond to emergency situations within two hours. In emergency situations, NYCHA dispatches staff as soon as they can be made available. We will contact staff who are already dispatched on work and redirect them to the reported emergency.

Additionally, before the end of the business day from Monday through Friday, NYCHA will authorize additional time for staff to repair elevators in any building that has no service. NYCHA has recently begun to authorize additional time for staff to return all elevators to service with the exception of those needing major repairs, on the day before long weekends or major Holidays.

The report states that NYCHA uses DOB certified inspectors to perform all Category 1 and Category 5 tests. This certification is not presently required by code and provides an added level of proficiency to further ensure compliance and safety.

The report identifies various issues related to the Maximo work order system. Maximo is a new maintenance reporting system. As with all new systems in an environment as large and complex as NYCHA, there are technology and business modifications that need to be implemented to validate report data, refine date entry fields and correct user input issues.

The report states that NYCHA needs to ensure that elevator inspections are done promptly. NYCHA is committed to performing timely reports and it should be noted that, in connection with the inspections, none of the findings indicated that NYCHA performed any inspections past their due date.

The report states that NYCHA cannot rely on its primary reports to assess performance and outages or to measure the effectiveness of its repair and maintenance activities. NYCHA's reports are formulated by our newly installed Maximo system. The introduction of any new computer software is never perfect upon implementation. Maximo is adequate to meet our needs, but as with any roll out, modifications need to be done as issues are revealed during its use. NYCHA will continue to monitor the system to ensure that additional enhancements are made when deficiencies are identified.

The report states that the longer an elevator is out of service the greater the inconvenience to NYCHA residents. It needs to be noted that although an elevator is out of service, oftentimes there is a second or third elevator that is used to service the building. It is considered an emergency if a building is without elevator service and NYCHA responds expeditiously to make repairs to restore at least one elevator. During non-business hours, staff responds primarily to emergencies. On occasion, buildings with limited service (when at least one elevator is in operation in the building, but another is out of service) are not addressed until the next business day. This policy will inflate the time to restore elevator service, but is not indicative of buildings that do not have elevator service at all.

The sample set of elevators chosen for this report are almost exclusively buildings with multiple elevators (i.e., 103 of the 104 elevators in the Audit are in multiple-car buildings). This is where the procedure described above would be used. Approximately 51% of NYCHA elevators are in single car buildings (i.e. the building has only 1 elevator). Thus the sample set is not a true representation of the distribution of NYCHA elevators and the time to restore service cannot be considered typical for NYCHA.

Recommendation number 2:
Ensure that required PM work is performed and that all such work is appropriately supported by PM schedules (checklists) that are completed by the work teams and kept on file at each development as required and recorded in Maximo.

NYCHA's Management Response:
We agree with this recommendation and have implemented it. However we will phase out the use of the checklist as we orientate to the new process since the PM schedules are now automated. This provides greater transparency and the ability to review PM status from remote locations. Additionally, it was identified that PM work done by other units within the Elevator Bureau was being entered into Maximo but not counted toward PM. We have made changes to the data entry to more accurately reflect the PM being completed.

Recommendation number 3:
Document instances of and justifications for not performing scheduled PM work. These reports should be approved by a supervisor and communicated to the Elevator Bureau Borough Administrators, who should also be notified of all instances in which PM work is not performed. Repeat periods of PM nonperformance should be investigated and corrective action taken.

NYCHA's Management Response:
We agree with this recommendation. The implementation will take place during the fourth quarter of this year.

The report states that preventive maintenance is not being consistently performed. As indicated in the report, NYCHA's records reveal that 77% of the applicable preventive maintenance tasks for the selected 104 elevators were completed. We arrived at this figure by correlating all available data including mechanic's logs, development logs,

motor room sign in sheets and Maximo. It was discovered that the task completion was not recorded properly on all occasions. We have implemented a new Maximo PM work order to document this work more easily, we have restructured the way various units report their tasks to better reflect PM, and we have created Maximo generated reports to better illustrate PM. It should be noted that there are occasions where NYCHA exceeds the manufacturers recommended PM schedules for our installed equipment. NYCHA's goal is to perform all of the necessary PM on all of our elevators.

Recommendation number 4:

Formally notify and remind all NYCHA elevator inspectors and related personnel of the City's requirement that elevator inspection certificates must be signed, dated, and stamped by the inspector upon completing a periodic inspection, a Category 1, or a Category 5 test. Follow-up reminders of these and other requirements should also be made. Further, the inspection supervisor should periodically sample inspection certificates to ensure compliance.

NYCHA's Management Response:

This recommendation is acceptable and has already been implemented with the exception that for Category 1 and Category 5 tests the inspection certificate is signed by the third party witness, not the performing inspector.

Recommendation number 5:

Require that work orders to correct the cited deficiencies be created immediately after the results of the inspection are recorded in Maximo.

NYCHA's Management Response:

We agree with the intent of this recommendation, but we cannot implement as written. The inspection work orders are created immediately in Maximo; however they are not finalized until they are reviewed. Our MOU with the DOB allows 15 days to finalize and file the reports that document the deficiencies and the DOB code allows up to 45 days to finalize and file the Category 1 and Category 5 reports since the inspection of record is the responsibility of the Witnessing Firm. We did experience technical issues with the handheld device that we use for inspections and the Maximo program, which contributed to delays and we also experienced issues with witnessing firms meeting the timeframes of the New DOB elevator code. We are working to resolve these issues and plan to meet the mandated timeframes within the 4th quarter of 2010. Please be aware that potential hazardous deficiencies that were identified during inspections require NYCHA to remove the car from service and complete the repairs immediately. All other deficiencies are required to be corrected within 45 days of the filing date.

Recommendation number 6:

Ensure that Inspection/Test ELV 3 report forms and Test Correction Reports are filed with the DOB within the established time requirements.

NYCHA's Management Response:
We agree with this recommendation and plan to implement it in the 4th quarter of 2010 (Please see explanation for Recommendation 5).

However, we disagree with the statement "Without the original certificates completed by the inspectors who performed the inspection or test, the level of assurance that they were conducted in accordance with regulations is diminished". Replacement certificates are used when historical documentation is not present at the development. The replacement certificate is signed by the person who performed the inspection and the source document for the replacement certificate is the inspection report, which was available for all of the inspections.

Recommendation number 7:
Continue to work to correct and enhance management reporting deficiencies to ensure that internal and published performance indicators and measures are accurately reported.

NYCHA's Management Response:
This recommendation is acceptable, has been implemented and is ongoing.

Recommendation number 8:
Review the data fields in the Maximo work order system to determine whether edit checks are in place and functioning properly; remedy any problems found.

NYCHA's Management Response:
This recommendation is acceptable, has been implemented and is ongoing.

The report highlights Maximo deficiencies revealed in this audit. As stated, the Maximo implementation was a large undertaking involving hundreds of users located citywide. As with any program implementation on this scale, issues were discovered and are being addressed. Some of the issues mentioned in the report have already been corrected. The report states that only closed work orders are captured in Maximo reports and, because there is a lag in closing work orders, the reports are missing data. When Maximo was first rolled out, users were allowed to complete work orders without inputting information required to close them. The system has since been modified and now required fields must by filled in before work orders can be completed. This corrects the issue identified in the Audit. The report also mentions that Maximo did not have adequate edit checks in certain date fields. Maximo has been modified to include a pop up reminder when certain dates exceed the parameters of the work order to minimize data entry errors. Although we are still performing needed upgrades to Maximo, it is more accurate and user friendly that when the audit was first conducted.

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Again, we thank you for the opportunity to comment on this draft report. Be assured, that NYCHA will continue to take the necessary steps to ensure complete integrity in all facets of its elevator operations.

If you have any questions, please contact Brenda Keating, Audit Director, at 212-306-3433.

Sincerely,

Michael Kelly
General Manager

cc: Gloria Finkelman
Brian Clarke
Brenda Keating
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