

City of New York

OFFICE OF THE COMPTROLLER

Scott M. Stringer
COMPTROLLER



AUDITS AND SPECIAL REPORTS

Marjorie Landa

Deputy Comptroller for Audit

Audit Report on the New York City
Housing Authority's Preventive
Maintenance and Repairs on the Roofs
under Warranty

SE18-059A

July 26, 2019

<http://comptroller.nyc.gov>



THE CITY OF NEW YORK
OFFICE OF THE COMPTROLLER
SCOTT M. STRINGER

July 26, 2019

To the Residents of the City of New York:

My office has audited the New York City Housing Authority (NYCHA) to determine whether NYCHA is adequately performing the preventive maintenance and repairs required under its roof warranties. We perform audits such as these to help ensure that government operations are effectively managed and to identify potential waste of funds and resources.

The audit found that NYCHA's performance of the preventive maintenance and repairs required under its roof warranties is inadequate. We found that NYCHA has not implemented a systematic program of proper roof inspections and scheduled *preventive* maintenance by qualified personnel and scheduled to maximize the life expectancy of its roofs. Instead, at best, NYCHA largely reacts after repair needs are brought to its attention, often as a result of leaks. The lack of proper roof maintenance at NYCHA can lead to building damage resulting from water intrusion into buildings, an increased risk to the residents' health and safety, and higher repair costs.

Our inspections of 35 sampled roofs found significant to moderate deficiencies on 19 (54 percent) of them, indicating inadequate maintenance and repairs. Consequently, at least \$24.6 million in roof-investment at those buildings is at risk and, more importantly, the residents potentially face an increased risk to their health and welfare.

In addition, we found that 8 roofs were replaced at NYCHA's expense 10 years before the expiration of the manufacturer's warranty, with no discernible effort by NYCHA to invoke the warranty coverage and no documented explanation, an estimated economic impact of more than \$4 million.

The audit makes 27 recommendations for the improvement and timeliness of NYCHA's inspections, preventive maintenance, and repairs to preserve the warranty coverage and the roofs' serviceability throughout their expected useful life, including the development of a comprehensive policy and procedure and the effective use of NYCHA's IT systems.

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 e-mail my Audit Bureau at audit@comptroller.nyc.gov.

Sincerely,



Scott M. Stringer

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THE CITY OF NEW YORK OFFICE OF THE COMPTROLLER AUDITS AND SPECIAL REPORTS

Audit Report on the New York City Housing Authority's Preventive Maintenance and Repairs on the Roofs under Warranty SE18-059A

EXECUTIVE SUMMARY

The New York City Housing Authority (NYCHA or the Authority) is the largest public housing authority in the United States, operating 325 housing developments, consisting of 2,418 buildings with approximately 176,000 apartments throughout the five boroughs. Three hundred four of its 325 developments are 30 years or older. NYCHA public housing is home to nearly 400,000 low- and moderate-income residents.

Roofs that are adequately maintained, repaired, and, when necessary, replaced, are essential to preserving building integrity by helping to prevent water intrusion into buildings that degrades ceilings, walls, and floors. Water intrusion can also cause mold, a condition that poses potentially significant health risks to residents. According to NYCHA, during Fiscal Years (FYs) 2000 through 2010, NYCHA spent approximately \$452 million for 715 roof replacements and related work—an average of more than \$632,000 for each roof. Thereafter, from FY 2010 through FY 2014, NYCHA allocated \$309 million for roofs in its Capital Plan. Additionally, in 2015, the City and New York State in combination pledged \$300 million over three years for 223 roof replacements. In addition, in 2018, the City allocated \$1.3 billion in capital funds over 10 years to replace 952 roofs at NYCHA buildings across the City, according to a City Council report.

When putting new roofs on NYCHA buildings, the Authority generally contracts with roofing contractors to install 4-ply roofing systems with manufacturers' 20-year warranties. NYCHA must implement a maintenance program entailing regular, documented inspection and upkeep of the roofs in order to be covered by these warranties. Each roof warranty specifically stipulates that failure by NYCHA to follow the warranty maintenance program will void the warranty. The consequence, if the warranty is voided, is that any subsequent roof repairs—and their cost—would become NYCHA's responsibility.

NYCHA's Capital Projects Division (CPD) is responsible for the replacement and installation of the Authority's roofs, ensuring the adequacy of the contractors' completed work, and securing the essential documents from the contractors—including the roofing systems' maintenance manuals, the contractors' guarantees, and the manufacturers' warranties. CPD is also responsible for maintaining the warranty documents and the dates of warranty coverage in NYCHA's IT systems and transferring the hard-copy warranty documents to the relevant Development Superintendents, the NYCHA officials at each development responsible for inspecting and maintaining the new roofs at his or her assigned development.

From that point forward, each Development Superintendent is responsible for administering the roof warranty, which includes conducting and documenting monthly inspections, initiating work orders for any necessary roof repairs, and maintaining the associated records.

The Development Superintendent reports to a Property Manager, who oversees the development's maintenance and operational activities. In addition, NYCHA has 20 Regional Asset Managers (RAMs) that oversee several developments and, as relevant to this audit, are supposed to inspect the roofs semiannually, among their other responsibilities. The Development Superintendents, Property Managers, and RAMs report through borough and program directors to NYCHA's Senior Vice President (SVP) for Operations, who reports to the General Manager & Chief Operating Officer, who in turn reports to NYCHA's Chair & Chief Executive Officer. NYCHA's Support Services department is responsible for dispatching skilled trades staff, as needed, for various types of work, including assisting the Development Superintendents with assessments of roof problems and the performance of minor roof repairs.

During our recent audit, *Audit Report on the New York City Housing Authority's Oversight of Contracts Involving Building Envelope Rehabilitation* (#SE16-065A), issued June 30, 2017, we observed conditions of ponding and staining, both indications of poor drainage, and other maintenance-related issues on several newly installed roofs that could jeopardize the integrity of the roof systems and the warranty coverage at the affected NYCHA buildings.

We conducted this audit to determine whether NYCHA is adequately performing the preventive maintenance and repairs required under the roof warranties.

The scope of this audit covers roofs that were replaced at various NYCHA buildings throughout the five boroughs during FYs 2000 through 2010, with warranties that should have been in effect during the period of the audit. Accordingly, we focused particularly on roofs with extended warranties—those with a coverage period of at least 20 years—at 158 buildings, which were replaced at a total cost, with related work, of nearly \$275 million.

Audit Findings and Conclusion

Our audit found that NYCHA's performance of the preventive maintenance and repairs required under its roof warranties is inadequate. Although NYCHA stated that it inspected the roofs on a monthly basis, the reports we were provided did not reflect that inspections were in fact done each month. Further, based on our review of the reports we were provided, we found that NYCHA's inspections were performed primarily by janitorial staff, and that they failed to identify deficient conditions on the roofs and thus failed to trigger appropriate action to address them. Overall, we found that NYCHA's approach was largely on corrective maintenance and not on preventive maintenance.

Our inspections of 35 sampled roofs in 13 NYCHA developments found significant-to-moderate deficiencies on 19 (54 percent) of the roofs, indicating that the maintenance and repairs required by the warranty were not always performed or were not performed properly. The deficiencies included ponding water, soft and spongy spots, blisters, sagging roof conditions, open seams at the edges of base flashing on rooftop structures, and damaged masonry. Generally, these kinds of conditions are associated with drainage problems and other issues that leave a roof susceptible to water penetration and an accumulation of moisture under the roof membrane—an ideal condition for mold to grow.

We also found that NYCHA is performing unauthorized roof repairs that do not comply with the roof manufacturers' warranty requirements, potentially jeopardizing the warranty coverage and

increasing costs for NYCHA. This operational failure may well result from our finding that the majority (69 percent) of the 13 Development Superintendents we interviewed—the individuals that NYCHA principally relies on to meet its obligations under the roof warranties and to maintain continued warranty coverage—were not aware of the warranty coverage that applied to their assigned roofs. Finally, we found that NYCHA's roof-related record-keeping—both in hard copy and on its IT systems—which is necessary for the effective tracking of roof maintenance and repairs, and for preservation of NYCHA's roof-warranty coverage, was inadequate.

Based on these audit findings, we determined that at least \$24.6 million in roof-investment at the 19 sampled NYCHA buildings is at risk, as is, potentially, the health and welfare of the tenants who reside in those buildings. In addition, at least 8 roofs were replaced at NYCHA's expense 10 years earlier than their expected useful lives and before the expiration of the manufacturers' warranties, with no discernible effort by NYCHA to invoke the warranty coverage and no documented explanation for the absence of such an effort. We estimate that the economic impact of the premature replacement of those 8 roofs was a loss of \$367,000 and the unplanned expenditure of \$3.7 million to replace them.

Overall, organizational weaknesses and a lack of transparency in NYCHA's operations appear to have significantly impeded its performance of its responsibilities to inspect, preventively maintain, and repair its roofs. NYCHA's roof-related business processes are in urgent need of attention, specifically, in two areas: (1) to establish a clear, current organizational structure with defined roles and responsibilities of designated staff at each level of the organization; and (2) to leverage the capabilities of NYCHA's IT systems by ensuring that they are reliable and complete, and that they can thereby facilitate more effective communication and operations. The fundamental problem identified during our audit—the absence of a systematic program of preventive maintenance and roof-repair at NYCHA—stems from ineffective internal controls at multiple levels of the organization, including outdated written procedures, broad noncompliance with existing procedures, poor record-keeping in both hard-copy form and in NYCHA's IT systems, and overall inattention to roof-warranty administration and enforcement.

Audit Recommendations

This report makes a total of 27 recommendations, including that NYCHA should:

- Perform adequate inspections, preventive maintenance, and repairs in a timely manner to ensure that its roofs are protected by the manufacturers' warranty coverage and can be kept in service throughout their expected useful lives.
- Investigate prolonged ponding conditions observed by the auditors on 14 building roofs to determine whether the roof insulation has been compressed from the weight of the membrane and standing water, whether the roof insulation has become saturated from leaks and has degraded, whether roof drains are clogged, and whether there are inadequate flows to roof drains. NYCHA should consider using advanced moisture-assessment techniques such as thermal scanning to determine the extent of moisture accumulation.
- Develop a comprehensive policy and procedures manual covering roof inspection, maintenance, repairs, and the preservation and use of warranty coverage, and provide it to appropriate staff, including all Development Superintendents. In developing the manual NYCHA should consider consulting with subject matter experts, which might include the National Roofing Contractors Association (NRCA), real property management professionals, and roof manufacturers, to identify best practices and to consider whether

new technologies may offer NYCHA opportunities to improve its performance of these responsibilities.

- Update the standard procedures that touch upon roof inspection, maintenance, repair, and warranty administration to reflect the organization's current operational structure and/or processes.
- Ensure that applicable standard procedures that concern or touch upon record-keeping for roofs are consistently followed. Specifically, designate RAMs or other appropriate officials to regularly review development-level records to ensure that each development maintains a complete file on its roofing systems, including but not limited to the warranty, invoices, and logs of all inspections performed, repairs that have been made to the roofing systems, and contract information for the manufacturer or contractor who replaced the roof(s) at the development, and that the appropriate records are kept up-to-date in Maximo, NYCHA's system of record for asset management.
- Ensure that all IT systems are utilized effectively to realize full benefits of the investments and to help NYCHA management monitor maintenance and repair of its roof assets.

Agency Response

In its response, NYCHA stated that while it “agrees with most of the recommendations, it should be noted that IT enhancements, new project management system and electronic document storage were initiatives that were already underway, and NYCHA management was aware of some gaps in oversight.”

From a careful review of NYCHA's response, it appears that NYCHA generally agreed with 24 of the 27 audit recommendations and disagreed with 3 of the recommendations (Recommendations 4, 26, and 27).

INTRODUCTION

Background

NYCHA is the largest public housing agency in the United States, larger than the next 11 public housing agencies combined. NYCHA operates 325 developments, consisting of 2,418 buildings with approximately 176,000 apartments throughout the five boroughs. Three hundred four of its 325 developments are 30 years or older. NYCHA public housing is home to nearly 400,000 low- and moderate-income residents.

Roofs that are adequately maintained, repaired, and, when necessary, replaced, are essential to preserving building integrity by helping to prevent water intrusion into buildings that will degrade ceilings, walls, and floors, and that can cause mold, a condition that can pose a significant health risk to residents. Roof replacements require substantial investments. According to NYCHA, during FYs 2000 through 2010, NYCHA spent approximately \$452 million for 715 roof replacements and related work—an average of more than \$632,000 for each roof. Thereafter, from FY 2010 through FY 2014, NYCHA allocated \$309 million for roofs in its Capital Plan. Additionally, in 2015, the City and New York State in combination pledged \$300 million over three years for 223 roof replacements. In addition, in 2018, the City allocated \$1.3 billion in capital funds over 10 years to replace 952 roofs at NYCHA buildings across the City, according to a City Council report.

According to a City press release dated January 24, 2017, the City's planned capital investments in NYCHA's roofs were intended to:

- Preserve physical structures by safeguarding them from incoming moisture, saving money on repairing moisture damage;
- Address a significant cause of mold in NYCHA buildings, protecting residents and improving their quality of life; and
- Reduce operating expenses by making buildings more efficient.

Generally, when acquiring new roofs for its residential developments throughout the City, NYCHA contracts with roofing contractors to install 4-ply roofing systems with 20-year “No Dollar Limit” warranties issued by the roofing systems’ manufacturers.¹ The warranty documents establish the time periods for which the manufacturers are responsible for ensuring the quality, workmanship, and performance of the roofs after installation and for replacing or repairing defective roofs. Specifically, the manufacturer guarantees that it will pay for the materials and labor required to promptly repair the roofing system to return it to a watertight condition if leaks occur due to deficiencies in any or all of the roofing system’s materials or workmanship or in the contractor’s installation of the roofing system. The warranty coverage is contingent, however, upon NYCHA’s having implemented a maintenance program entailing regular inspection and upkeep of the roof, documented in NYCHA’s relevant record-keeping systems.²

The warranties require NYCHA to: (1) have qualified individuals inspect each roof under warranty at least semiannually; and (2) regularly remove any debris from the roof, clean the drains, and,

¹ NYCHA’s responsibilities and warranty coverage limitations and exclusions are stipulated in the warranty.

² NYCHA uses roofing products from several manufacturers, such as John Manville and GAF, that issue the roof warranties.

as needed, repair flashing and brickwork, replace caulking, patch seams, and perform any other maintenance work needed to prevent leaks and address conditions that could jeopardize the roof's integrity. In addition, the warranties require NYCHA to inspect each roof after each severe weather event or condition, immediately notify the manufacturer of any leaks, arrange for any necessary roof repairs by the manufacturer's approved contractors only, and institute a roof-access-control policy. The warranty document stipulates that a failure by NYCHA to follow the warranty maintenance program will void the warranty. The consequence, if a warranty is voided, is that any subsequent roof repairs that had been covered by it—and their cost—would become NYCHA's responsibility.

Within NYCHA, CPD is responsible for managing major construction projects, including the replacement and installation of roofs at NYCHA's developments, and determining the date when the warranty coverage begins. Once the construction work is finished, CPD, as a part of its project close-out responsibility, is supposed to ensure that all contract work has been completed in accordance with NYCHA's contract specifications and quality standards and that the essential documents the contractor is obligated to provide—including operating and maintenance manuals for the roofing systems, the contractor's guarantee, and the manufacturer's warranty—are secured in NYCHA's custody. CPD is further responsible for uploading the warranty documents to NYCHA's Primavera system, recording the warranty dates in NYCHA's UNIX system,³ and transferring the hard-copy warranty documents to the Development Superintendent, the NYCHA official responsible for inspecting and maintaining the new roofs at his or her assigned development. From that point forward, the Development Superintendent is responsible for administering the roof warranty, which includes inspecting, maintaining, and initiating work orders for any necessary repairs to the roof, and maintaining, at the development, the associated records, including the warranty document(s), inspection reports, work orders, and repair invoices for the life of the roof.

NYCHA identified four internal policy and procedure documents that: (1) apply to the inspection, maintenance, and repair of roofs and related building components, including roofs under warranty; and (2) delineate the related responsibilities of different NYCHA departments and staff members, by title or function, concerning the administration and enforcement of roof warranties:

- *Administration of Guarantees and Warranties*, Standard Procedure 025:52:1 (revised June 6, 2007). Its purpose is to prescribe the policy and procedures used to record and enforce materials, services, and construction contract guarantees and manufacturers' warranties.
- *Roof Repairs*, Standard Procedure 060:70:1 (September 1, 1987). Its purpose is to prescribe the policy and procedure to for authorizing and performing repairs to roofs that may be covered by warranties and/or contract guarantees.
- *Preventive Maintenance Procedure*, Standard Procedure 060:6:1 (revised September 1, 1985). Its purpose is to provide for regular inspections of all equipment, buildings, and grounds to assure proper maintenance and safety; minimize the frequency of unscheduled repair work; lower the overall cost of maintaining equipment, buildings, and grounds; and provide efficient service with minimum inconvenience to tenants.
- *Managing Maintenance Work Orders*, Standard Procedure 040:09:7 (April 27, 2009). Its purpose is to delineate the process that NYCHA staff will use for the planning, completion, and close-out for all Work Orders (Work Requests) in Siebel and Maximo, which are Asset

³ The name UNIX in this report refers to NYCHA's in-house term for a Microsoft Access database it uses, not the operating system of the same name.

and Management software products that assist staff in delivering service to NYCHA residents.

According to the above-mentioned procedures, NYCHA's Development Superintendents are responsible for: (1) performing inspections, maintenance, and repairs that a warranty requires, which includes regular semiannual inspections and additional inspections following severe weather events; (2) keeping records of those actions to document NYCHA's compliance with the warranty's conditions; (3) notifying the manufacturer of any roof leaks; and (4) ensuring that any necessary repairs of a roof under warranty are performed only by contractors approved by the manufacturer.⁴ To cover the expenses of performing those responsibilities, the Development Superintendents are expected to use their regular operating budget allocations and to request assistance from other NYCHA units (such as Maintenance, Repair, and Skilled Trades [MRST] or CPD) for work requiring specialized knowledge or skills, including minor roof repairs, which could be performed in-house (by a NYCHA roofer, for example), or contracted out to a firm approved by the roof manufacturer.

The Development Superintendents are supposed to maintain hard-copy records of roof maintenance, repairs, and warranties at the developments themselves. In addition, electronic records relating to roof warranties and repairs are supposed to be maintained in three different NYCHA IT systems—Maximo, UNIX, and Primavera. The maintenance work history for roofs and other components of NYCHA's buildings and equipment is supposed to be tracked through work orders in Maximo, NYCHA's system of record for asset management. When a NYCHA staff member initiates a work order in Maximo, the specific work needed is identified by that staff member's selecting from a predetermined list of "failure classes" (e.g., "rooftop" is a failure class, as is "leak from above"). Relevant data, such as maintenance costs for labor, materials, service, and tools, can also be tracked on a work order. UNIX is a Microsoft Access database that NYCHA developed in-house, which NYCHA uses to maintain certain supplemental information about roof warranties; and Primavera is NYCHA's system of record for storing all information and documentation concerning roof construction, including roof warranties, in digital format.

Organizationally, within NYCHA, each Development Superintendent reports to his or her development's Property Manager, who oversees all maintenance and operational activities at the development. The Property Manager reports to a RAM, who oversees several developments within his or her assigned borough(s). The RAMs report to their respective Borough Directors. The Borough Directors report to NYCHA's SVP for Operations, who oversees operations throughout all of NYCHA's developments and reports to the Authority's General Manager & Chief Operating Officer, who in turn reports to the NYCHA Chair & Chief Executive Officer.⁵ Additionally, two other SVPs manage two related operating departments—NextGen and Support Services. NextGen is a 10-year program NYCHA initiated in 2015 to manage approximately 32 NYCHA

⁴ According to NYCHA, each borough office is responsible for sending out a roof inspection bulletin to the developments in that borough during extreme weather conditions. CPD is tasked with managing the roof replacement contracts and CPD's Office of the Director is supposed to ensure that hard-copy project files are kept at NYCHA's headquarters in Manhattan and/or at its record storage facility in Queens, depending on when a roof was replaced or type of a construction record. The record retention schedule varies depending on which department maintains the records and purpose of those records, but construction managers' files are retained at NYCHA headquarters one year after final payment for the roof replacement project, while older project records should be maintained at the Queens facility, according to the NYCHA's procedure for *Records Retention and Disposal Schedules* (#008:59:2, last revised in July 1972).

⁵ Pursuant to a January 31, 2019 agreement, a federal monitor (selected by the U.S. Department of Housing and Urban Development and the U.S. Attorney's Office in consultation with NYCHA and the City) was recently appointed to oversee NYCHA. The agreement requires NYCHA, under the supervision of the federal monitor, to fundamentally reform its operations and remedy deficiencies in them and the resulting inadequate and hazardous condition of its housing stock, including lead paint hazards, mold growth, pest infestations, lack of heat, and inadequate elevator service. In carrying out its responsibilities, the monitor is not responsible for NYCHA's day-to-day operations.

developments,⁶ and has its own RAMs. Support Services is a department within NYCHA that is responsible for dispatching skilled trades staff to all boroughs, as needed, for work on the buildings and their mechanical, plumbing, electrical, and other systems, including assistance to Development Superintendents with assessments of roof problems and with the performance of minor roof repairs. However, if roof repairs will require penetration to a roof's membrane, the NYCHA skilled trades staff can perform required repairs only upon approval by the manufacturer.⁷

During our recent audit, *Audit Report on the New York City Housing Authority's Oversight of Contracts Involving Building Envelope Rehabilitation* (#SE16-065A), issued on June 30, 2017, we observed conditions of ponding and staining, both indications of poor drainage, and other maintenance-related issues on several newly installed roofs that could jeopardize the integrity of the roof systems as well as the warranty coverage at the affected buildings.

The scope of this audit covers roofs that were replaced at various NYCHA buildings throughout the five boroughs, during FYs 2000 through 2010, focused particularly on roofs with extended warranties—those with a coverage period of at least 20 years—at 158 buildings, which were replaced at a total cost of nearly \$275 million, which includes the cost of related work.

Objective

The objective of this audit was to determine whether NYCHA is adequately performing the preventive maintenance and repairs required under its roof warranties.

Scope and Methodology Statement

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 audit 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 included preventive maintenance and repairs on the roofs under warranty that were installed at various NYCHA developments during FYs 2000 through 2010. Please refer to the Detailed Scope and Methodology at the end of this report for the specific procedures and tests that were conducted.

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 on March 7, 2019, and discussed at an exit conference held on March 28, 2019. After the exit conference, NYCHA provided us with additional documentation regarding some of the findings discussed in the

⁶ Within NextGen, there is a sub-department known as Mixed-Finance whose main focus is to generate revenue to reinvest back into NYCHA development sites and across NYCHA by leveraging a 50-50 split of market-rate and affordable housing units. That sub-department manages several developments where the roofs are managed privately by property management companies that are responsible for operating those developments.

⁷ According to the organization chart posted on the NYCHA's website, organizational changes effective December 3, 2018, appear to have added one layer of oversight—a new position designated as Executive Vice-President of Operations—between the SVPs/VPs of Operations and the General Manager & Chief Operating Officer.

preliminary report, all of which we carefully reviewed and considered in preparing the draft report. Where appropriate, the findings were revised to reflect the additional information. On July 2, 2019, we submitted a draft report to NYCHA officials with a request for comments by July 17, 2019. We received a written response from NYCHA officials on July 22, 2019.

In its response, NYCHA stated that while it “agrees with most of the recommendations, it should be noted that IT enhancements, new project management system and electronic document storage were initiatives that were already underway, and NYCHA management was aware of some gaps in oversight.” Based on our review of NYCHA’s response, it appears that NYCHA generally agreed with 24 of the 27 audit recommendations and disagreed with 3 of the recommendations (Recommendations 4, 26, and 27).

Although NYCHA agreed with most of our recommendations, in a majority of the cases its response did not completely address the corresponding recommendation(s). We urge NYCHA to implement our recommendations in their entirety within reasonable timeframes and to substantially increase its efforts to improve its controls and its organizational commitment to properly address the issues raised in this audit.

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

FINDINGS AND RECOMMENDATIONS

Our audit found that NYCHA's performance of the preventive maintenance and repairs required under its roof warranties is inadequate. We found that rather than implementing a forward-looking systematic program of proper roof inspections by qualified personnel and scheduled *preventive* maintenance to maximize the life expectancy of its roofs, NYCHA instead focuses on *corrective* maintenance, which can lead to increased costs, damage to the buildings, and increased risks to the residents' health and safety. NYCHA addresses repairs as needs occur and are brought to its attention, often as a result of leaks, rather than through regular inspection of the roofs by qualified personnel. Although NYCHA stated that it inspected the roofs on a monthly basis, the reports we were provided did not reflect that inspections were in fact done each month. Further, based on our reviews of the reports we were provided, we found that NYCHA's inspections were performed primarily by janitorial staff and were ineffective in that they failed to identify deficient conditions that existed on the roofs and accordingly did not result in appropriate action to address them.

We also found that NYCHA is performing unauthorized roof repairs that do not comply with the roof manufacturers' warranty requirements, thus potentially jeopardizing the benefits of the warranty coverage and increasing costs for NYCHA. In this regard, we found that the majority (69 percent) of the 13 Development Superintendents we interviewed—the individuals that NYCHA principally relies on to meet its obligations under roof warranties and to maintain continued warranty coverage—were not aware of the warranty coverage that applied to their assigned roofs. Finally, we found that NYCHA's roof-related record-keeping—both in hard copy and on its IT systems—which is necessary for the effective tracking of roof maintenance and repairs and for preservation of NYCHA's roof-warranty coverage, was inadequate.

Our inspections of 35 sampled roofs in 13 NYCHA developments found significant to moderate deficiencies on 19 (54 percent) of the roofs, which indicates that maintenance and repairs required by the warranty were not always performed or were not performed properly. The deficiencies included ponding water, soft and spongy spots, blisters, sagging roof conditions, open seams at the edges of base flashing on rooftop structures, and damaged masonry. Generally, these kinds of conditions are associated with drainage problems and other issues that leave a roof susceptible to water penetration and an accumulation of moisture under the roof membrane—an ideal condition for mold to grow.⁸ Controlling moisture is critical for protecting building occupants from mold exposure and for protecting the building, its mechanical systems, and its contents from physical and chemical damage. We determined that at least \$24.6 million in roof-investment at the 19 sampled NYCHA buildings with significant to moderate roof deficiencies is at risk, as is, potentially, the health and welfare of the tenants who reside in those buildings.

In addition, NYCHA's records indicate that at least 8 roofs—consisting of 2 in our sample and 6 others at the same development—were replaced at NYCHA's expense 10 years earlier than their expected useful lives and 10 years before the expiration of the manufacturer's warranty, with no discernible effort by NYCHA to invoke the warranty coverage and no documented explanation.

⁸ According to a complaint filed by the United States Attorney for the Southern District of New York against NYCHA in June 2018, mold is a chronic, costly, and time consuming problem across all 325 NYCHA developments. In a subsequent proposed consent decree (ultimately rejected by the Court), NYCHA admitted, acknowledged and accepted responsibility for the mold growth in the NYCHA buildings. Specifically, the proposed consent decree stated that between 2011 and 2018, NYCHA residents had made thousands of complaints about mold every year; and that, after NYCHA has removed mold from apartments, the mold returns at least 30 percent of the time. A subsequent settlement agreement between HUD, NYCHA, and the City, dated January 31, 2019, which superseded the proposed consent decree, refers to the conditions reported in the June 2018 complaint and admissions by NYCHA in the proposed consent decree about mold issues and to NYCHA's obligations for mold inspection and remediation.

Based on NYCHA's records, we estimate that the economic impact of the premature replacement of those 8 roofs was a loss of \$367,000 (due to the fact that half of NYCHA's initial \$735,000 investment in them, made in 2007 was not realized) and the unplanned expenditure of \$3.7 million to replace them, including related work, in 2016.

Further, 12 (34 percent) of the 35 sampled roofs had mild deficiencies, and the remaining 4 roofs (12 percent) had no visible deficiencies, at the times of our inspections.

Overall, organizational weaknesses and a lack of transparency in NYCHA's operations appear to have significantly impeded NYCHA's performance of its responsibilities to inspect, preventively maintain, and repair its roofs. NYCHA's business processes in relation to roof inspection, maintenance, repair and replacement, are in urgent need of attention, specifically in two areas: (1) to establish a clear, current organizational structure with defined roles and responsibilities of designated staff at each level of the organization; and (2) to leverage the capabilities of NYCHA's IT systems by ensuring that they are reliable, complete and that they can thereby facilitate more effective communication and operations. The fundamental problem identified during our audit—the absence of a systematic program of preventive maintenance and roof-repair—stems from ineffective internal controls in NYCHA's operations at multiple levels of the organization, which include outdated standard procedures, broad noncompliance with existing procedures, poor record-keeping in both hard-copy form and in NYCHA's IT systems, and overall inattention to roof-warranty administration and enforcement.

These matters are discussed in detail in the following sections of this report.

Over \$24 million in Investment in 19 Roofs Is Potentially at Risk as a Result of Inadequate Preventive Maintenance and Repairs

The audit revealed that NYCHA is not following its internal policies and procedures regarding roof inspections and is not complying with the inspection, maintenance, notification, and recordkeeping requirements of its manufacturers' roof warranties. Our inspections found significant-to-moderate deficiencies in 19 of 35 sampled roofs, which reflected inadequate maintenance. NYCHA provided auditors with only 24 of the 33 monthly building-inspection reports that we requested for 33 of the sampled roofs; only 20 of those reports included inspection results for the buildings' roofs, and none of them identified the deficiencies we observed on the abovementioned 19 roofs. NYCHA informed us that its monthly inspections are conducted by janitorial staff rather than by the Development Superintendents, which is contrary to NYCHA's preventive maintenance procedure. We also found that NYCHA has not adequately updated its procedures, some of which are more than 30 years old, to reflect its current organizational structure and the supervisory titles now in use. Moreover, NYCHA's recordkeeping practices concerning its roofs do not comply with its own policies and procedures or the requirements of the warranties. As a result of these issues, NYCHA's investments in the abovementioned 19 roofs is potentially at risk, as is the health and welfare of the tenants who reside in those buildings.

NYCHA's *Preventive Maintenance Procedure* (revised September 1, 1985) prescribes the Authority's requirements for preventive maintenance of numerous building components, including roofs. Specifically, the procedure, at Section II B.4, requires each Development Superintendent to inspect, monthly, the "physical aspect and general conditions" of all public and utility spaces in a development (which include roofs). For purposes of the monthly roof inspections, the *Inspection Guide for Superintendents*, at Section III of the procedure, directs the Development Superintendent to inspect eight aspects of the roof (vent pipes, roof flashing, surface water drainage, roof drains, slag, holes, pitch, and felt) and to record the results on a designated NYCHA

form, which the *Preventive Maintenance Procedure* references variously as: (1) the Janitorial Inspection Report (Form 060.130); (2) the Checks [sic] List - Public Spaces, Utility, and Grounds (Form 060.130); and (3) apparently most recently, the Building Inspection Report (Form 060.130, revised in February 2010). The most recent version of the inspection report, which is included in the *Preventive Maintenance Procedure*, calls for the Development Superintendent to rate 10 specific aspects of the roof as either “good” or “unsatisfactory,” or in one case—ponding—to note whether it exists, “yes” or “no.” The form also includes fields for whether an item “needs repair” and for remarks, a ticket number, and the date a repair is made. Following are the 10 aspects of a roof to be covered in each monthly roof inspection:

- Ballast (slag)
- Door (hardware/holes)
- Drains
- Flashing (damaged)
- Janitorial condition
- Lighting
- Parapet or railing
- Ponding
- Roof fans / vents
- Roof membrane (torn / damaged)

Further, the above-cited *Preventive Maintenance Procedure*, at Section II B.5, states in substance that the District Superintendent—the title of a borough-level property-management position that formerly existed but no longer exists—is supposed to visit and inspect every development that he or she oversees, including the roofs, at least twice a year to ensure that unsatisfactory conditions involving maintenance are remedied. Notably, the requirement for a District Superintendent’s semiannual inspection set forth in NYCHA’s *Preventive Maintenance Procedure* parallels the requirement of the warranties, which stipulates that qualified individuals must conduct the semiannual inspections. According to NYCHA, the relevant responsibilities formerly assigned to District Superintendents are now assigned to its RAMs.⁹

Moreover, at Section II, part B.6, the *Preventive Maintenance Procedure* requires supervisory personnel, who now include the RAMs, to maintain adequate controls that provide for frequent follow-up until reported unsatisfactory conditions have been corrected. Had NYCHA followed the above-mentioned monthly and semiannual inspection protocols, and the preventive maintenance, recordkeeping procedures, and oversight controls prescribed by its *Preventive Maintenance Procedure* (albeit with the appropriate job titles reflecting its current organizational structure) it should have been able to demonstrate compliance with the key roof warranty requirements, including for the frequency of roof inspections, the items to be inspected, the qualifications of the person(s) performing the inspections, and the timely correction of unsatisfactory conditions.

However, notwithstanding the express requirements of the *Preventive Maintenance Procedure*, we found that the Development Superintendents did not perform the monthly roof inspections. The audit showed that, rather than requiring the Development Superintendents to inspect the roofs for which they are nominally responsible, NYCHA’s practice was to have its development-

⁹ NYCHA’s 20 RAMs are assigned to its 6 property management departments. Each RAM is responsible for overseeing the operation and management of multiple NYCHA public housing developments, based either on the development’s location, by borough, or on whether it operates under one of two special programs, specifically, NextGen and Mixed Finance.

level janitorial staff inspect the roofs as part of their monthly building inspections, and to have the Development Superintendent sign-off on the janitorial staff's inspection reports.

Moreover, inasmuch as NYCHA did not produce more than a quarter of the monthly inspection reports we requested, it appears that the monthly roof inspections are not always performed or documented. In addition, we found that the reports that were produced did not accurately reflect the actual condition of the roofs, based on our contemporaneous inspections of the same roofs. Specifically, NYCHA's inspection reports rarely noted or detailed unsatisfactory conditions and never recorded follow-up tasks in the designated areas of the form—ticket number, which should refer to a specific work request, and the date the condition was repaired. Further, the periodic roof inspections that the RAMs are now supposed to perform, whether semiannually or more often, were not documented, and, if done, were ineffective, in that the unsatisfactory conditions we found on the roofs went unaddressed, all of which was contrary to the warranty conditions. A detailed description of what we found follows.

Auditors' Observations of 35 Sampled Roofs

We inspected 35 sampled building-roofs located in 13 developments throughout the five boroughs of New York City and found significant to moderate deficiencies at 19 of them (54 percent).¹⁰ The deficiencies included ponding water, soft/spongy spots, blisters, and open seams at base flashing, all of which indicate drainage problems and roofs that are susceptible to water penetration and an accumulation of moisture under the roof membrane. All of these conditions should have been identified and addressed in the course of the monthly inspections that the Development Superintendents should have been conducting in accordance with NYCHA's *Preventive Maintenance Procedure*. The conditions also were sufficiently severe as to have warranted NYCHA's informing the manufacturer and making or arranging for repairs to correct the deficiencies and prevent further water-damage, but overall NYCHA's records reflect no such notifications (discussed in detail in later sections of the report).¹¹ Correction of these deficiencies, which should be completed under the requirements—and coverage—of the warranty would require work by the NYCHA's skilled trades staff subject to inspection and approval by the manufacturer or by the manufacturer's approved contractors. These kinds of deficiencies, if left unaddressed, can result in more serious issues that could shorten the roofs' expected useful life of 20 years and potentially result in the voiding of the warranty. Accordingly, based on NYCHA's reported costs and the total square footage of the 19 roofs with significant to moderate roof deficiencies, we estimate that \$24,620,162 in roof-investment is at risk.¹²

In addition, we found that 12 (34 percent) of the sampled roofs had mild deficiencies, which included presence of uneven/worn ballast and debris or vegetation. Those deficiencies can be corrected by the development maintenance staff. The remaining 4 roofs (12 percent of the sampled 35) had no visible deficiencies at the times of our inspections.

¹⁰ We used one of the industry standards, ASTM E2018-15 *Standard Guide for Property Condition Assessments* as a guide to formulate the categories of defects that we expect would be identified through examination of the items listed on NYCHA's roof inspection form and developing our severity scales. For ease of presentation, each roof condition was rated on a severity scale ranging from 0 to 10; with 10 representing the most severe deficiencies and 0 representing no visible defects, at the time of our inspection. Defects that are pervasive, affecting a large portion of the material, area, item and/or component that can only be mitigated or corrected with planning, coordination and budgeting are considered significant. Defects that are notable, and those involving several observed occurrences of a material, area, item and/or component that can be corrected with conventional maintenance routines, are considered moderate. Defects that are small, with one or two observed occurrences of a material, area, item and/or component that can be corrected with normal means, are considered mild.

¹¹ According to Maximo records, in one case, at Leavitt Street-34th Avenue development, work was performed by a vendor implying that the work was performed by the manufacturer. Presumably NYCHA may have contacted the manufacturer as a claim under the warranty, but no additional details were available in Maximo.

¹² The square footage of the 19 roofs is recorded in the corresponding warranty documents.

The deficiencies we observed during our inspections of the sampled building-roofs are presented in *Appendix I* and a glossary of terms describing the types of deficiencies we identified is found in *Appendix II*.

NYCHA's Inspection Reports

Our review of NYCHA's available roof inspection reports for the months in which we conducted our inspections revealed that NYCHA's inspections were ineffective in that, overall, to the extent the inspections were documented at all, the inspection reports did not accurately reflect the actual condition of the roofs. Specifically, NYCHA's inspection reports rarely identified deficient conditions or noted their details in the remarks field and never recorded follow-up tasks in the designated areas of the inspection form—which, under the *Preventive Maintenance Procedure*, should list the ticket number, referring to a specific work request, and the date the condition was repaired.

We requested monthly inspection reports from NYCHA for 33 of the 35 sampled roofs for a month that corresponded with the date of one of the inspections by the auditors (either February or March 2018).¹³ NYCHA provided 24 reports, 4 of which did not include any information for the roof conditions. Of the 20 remaining inspection reports that NYCHA provided, all of which included roof-inspection results, 12 were for buildings where we had identified significant to moderate roof-deficiencies, 6 were for buildings where we identified mild roof-deficiencies, and 2 were for buildings where no roof-deficiencies were observed at the time of our inspection. We reviewed NYCHA's roof-inspection reports, focusing on six areas listed on NYCHA's inspection form, all of which should have been included in each of its roof inspections, and compared NYCHA's inspection results for those six items with our inspection results for the same items.

Of the 20 relevant NYCHA inspection reports, only 2 noted any deficiencies—ponding conditions on the roofs of two buildings, Chelsea Buildings #1 and #2, and janitorial conditions¹⁴ on the roof of Building #1. Our inspection of those roofs showed several other unsatisfactory conditions such as roof sag, open seams at base flashing, and damaged masonry, all of which were of a nature and/or severity that indicate longstanding conditions that would have been apparent during earlier inspections by NYCHA and should have been corrected in accordance with the warranty requirements. Ponding at Chelsea Building #1 was not evident at the time of our inspection, but one area of the roof was sagging—a possible indication of a longstanding ponding condition. With the exception of the abovementioned ponding and/or janitorial conditions, *no* deficient roof conditions were noted on any of NYCHA's roof-inspection reports. In contrast, our inspections of the roofs at 16 of the same 20 buildings identified between 1 and 7 deficient conditions per roof that NYCHA failed to identify and correct, as required by the warranty.

The following sections of this report describe three broad categories of deficiencies that we found at 31 of the 35 sampled roofs and the potential effects of each: (1) ponding and other conditions susceptible to water penetration, found on 14 roofs; (2) blisters and soft or spongy roof surfaces, found separately or together on 5 roofs, which could lead to further damage and leaks; and (3) other types of deficiencies found separately or together on 24 roofs indicative of deferred maintenance or repairs that were done inappropriately that could allow water penetration now or in the future.

¹³ We did not request NYCHA's inspection reports for two buildings at the South Beach development, where the roofs had been installed in 2016, since the installations were so recent. We found no deficiencies on those roofs.

¹⁴ Janitorial conditions refer to the cleanliness of the roof including roof-surface free of debris, leaves, plant growth, or other foreign objects that may impede drainage or cause damage to the roof membrane.

Ponding and Other Roof-Conditions Susceptible to Water Penetration

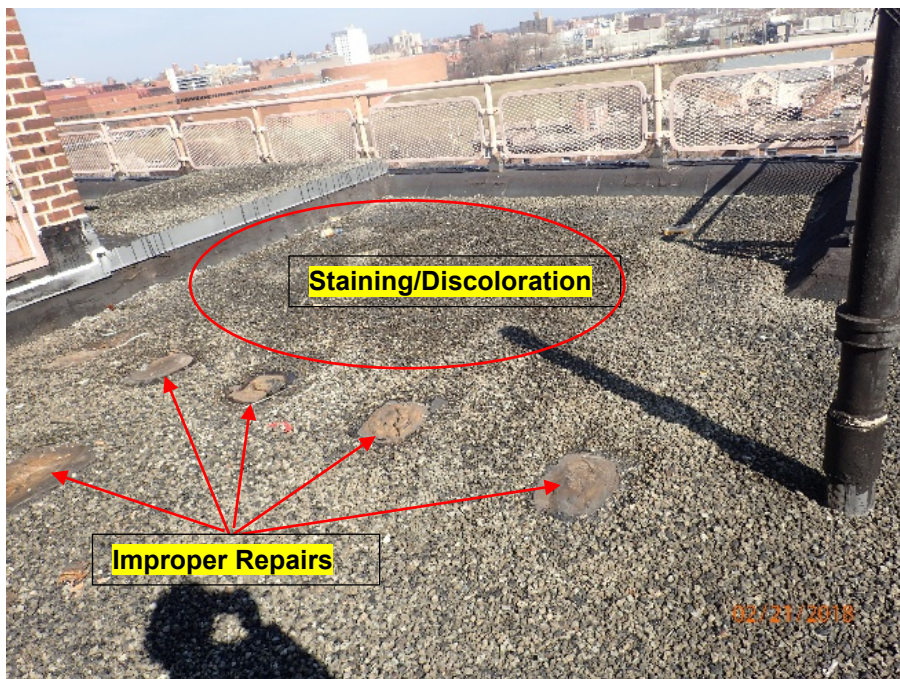
We observed ponding water with other deficient conditions susceptible to water penetration (such as roof sag, improper repairs, and open seams at base flashing), on 14 sampled roofs during our field inspections, all of which have the potential to accelerate aging and shorten a roof's useful life.¹⁵ We found the largest numbers of defects on the roofs of two buildings in different developments: (1) Polo Grounds Houses, Building #4, 2991 Frederick Douglass Blvd. in Manhattan, with 9 defects; and (2) South Jamaica II, Building #12, 106-16 159th Street in Queens, with 11 defects. The 2 roofs are 10 and 11 years old respectively and have deficiencies that would require repair of large areas of the roof membranes to mitigate the defects. We noted ponding water more than 48 hours after the most recent rain event during conditions conducive to drying, and both roofs also showed large areas of staining and discoloration, an indication that water is accumulating for long periods of time and draining slowly. See *Photos below*.

¹⁵ Twelve of the 14 roofs with ponding conditions were part of the 19 roofs with significant to moderate deficiencies discussed above. At the time of our inspections, ponding conditions at the two roofs (Wald and International Tower) were deemed mild conditions.

Polo Grounds Houses (Building #4), 2991 Frederick Douglass Blvd. in Manhattan



South Jamaica II (Building #12), 106-16 159th Street in Queens



Ponding water of short duration is acceptable, according to the National Roofing Contractors Association (NRCA) and roofing manufacturers generally, but ponding water 48 hours after a rain can be detrimental to the roof assembly. The NRCA Roofing Manual for Membrane Roofing Systems – 2011 states, “[t]he criterion for judging proper slope for drainage is that there be no ponding water on the roof 48 hours after a rain during conditions conducive to drying.”

Ponding in excess of 48 hours can be the result of one or multiple causes that must be addressed to facilitate proper drainage, which is required by the warranty. Primarily, the causes of the ponding at the two abovementioned buildings appeared to be inadequate slopes that do not produce positive flow to the roof drains. Other latent causes could include compression of the roof insulation from the weight of the membrane and the standing water on the roofs or that the roof insulation has degraded as a result of becoming saturated from leaks, and that roof sag or low spots developed over time, causing water to stand in those spots instead of flowing toward the drain.

Prolonged ponding conditions can result in the accumulation of moisture in the subsurface of a roof and other parts of the building, according to the *Moisture Control Guidance for Building Design, Construction, and Maintenance*.¹⁶ Moisture control is fundamental to the proper functioning of any building and is important to protect occupants from adverse health effects and to protect a building, its mechanical systems and its contents from physical or chemical damage. In addition to causing health problems, moisture can damage building materials and components. For example:

- Prolonged damp conditions can lead to the colonization of building materials and HVAC systems by molds, bacteria, wood-decaying molds, and insects-pests such as termites and carpenter ants.
- Chemical reactions with building materials and components can cause, for example, structural fasteners, wiring, metal roofing, and air conditioner coils to corrode and flooring or roofing adhesives to fail.
- Water-soluble building materials (e.g., gypsum board) can return to solution, and wooden materials can warp, swell, or rot.
- Brick and concrete can be damaged during freeze-thaw cycles and by sub-surface salt deposition.
- Paints and varnishes inside the buildings can be damaged and may expose underlying lead paint.
- The insulating value (R-value) of thermal insulation can be reduced.

Therefore, ponding and other conditions that prevent or impede proper drainage can cause various detrimental impacts on the building as a whole and should be addressed in accordance with the warranty requirements and under the warranty coverage.

Blisters and Soft/Spongy Roof Surfaces

During our field inspections, we observed blisters at three buildings and soft/spongy spots at four buildings. Altogether, five buildings were affected by one or both of these conditions. Roof blisters are caused by the loss of adhesion of the roofing plies. Blistered areas can fill up with air or water, and if left untreated, blisters can grow larger and allow more moisture to penetrate the roof system.

¹⁶ The *Moisture Control Guidance for Building Design, Construction, and Maintenance* (EPA 402-F-13053) is issued by the U.S. Environmental Protection Agency.

Soft/spongy spots are caused by the separation of the roof plies, physical stress, poor ventilation, and cracking substrate or poor workmanship. Any damage to the surface of the roof, such as cracking, will allow water to enter the roof system and eventually cause leaks. In the event of roof leaks, both of these deficiencies—blisters and soft/spongy spots—would be covered under the warranty if they were due to product and/or installation defects, contingent upon NYCHA's performing required maintenance.

Other Roof Deficiencies

In addition to the above deficiencies, we observed other types of deficiencies on 24 roofs that can be addressed by NYCHA maintenance staff and do not require manufacturers' attention under the warranty coverage. Those deficiencies were a result of either deferred maintenance that should have been performed or repairs that were done inappropriately. Among other things, we observed:

- 13 roofs with worn slag (gravel surfaces),
- 21 roofs with open seams at the base flashing on the rooftops,
- 7 roofs with damage around the roof-railings, and
- 4 roofs with aged caulking, all of which should have prevented, and can be remedied, with adequate maintenance.

The layer of slag on the surface of a built-up roof provides protection from the UV rays, which otherwise will break down the roof surface and the asphalt between the layers of the roofing system. Once the surface becomes bare, the membrane becomes susceptible to further breakdown by UV rays and to punctures, scrapes, and cuts from foot traffic and accidental damage from equipment or tools used by service contractors. Open seams at the base flashing and aged caulking joints at flashing details allow water to enter the roofing system, causing and subsequently exposing other areas of the building to leaks. Furthermore, we observed exfoliating masonry above the counterflashing, which is an indication of moisture and condensation being trapped and not properly vented out of the wall. As a result of the deterioration of the masonry, water can seep behind the base flashing and eventually cause damage to the roofing and lead to leaks into the building.

A summary of the deficiencies we observed during our inspections of the sampled building-roofs is presented in *Appendix I* and a glossary of terms describing the types of deficiencies we identified is found in *Appendix II*. Sample photographs of the types of roof deficiencies described above and of inappropriate repairs observed during our field inspections are shown in *Appendix III*.

Overall, we found that the presence of these deficient conditions is attributable to weaknesses in NYCHA's controls over preventive maintenance and repairs at multiple levels of its operations. Specifically, as reported in more detail below, NYCHA's four written policies that concern roof maintenance and repair and the administration of roof warranties are, in some instances, outdated and/or inconsistent with one another; and, apart from those shortcomings, they are not always enforced and followed. As a result, the Authority lacks a coherent, comprehensive program to provide the kind of regular inspection, maintenance, and repair it needs to keep its roofs in sound condition and to protect its interests under the manufacturers' warranties.

Factors Putting NYCHA's Investment in Roofs at Risk – Noncompliance with Roof Warranty Requirements

Proper roof care requires an organized program of regular inspections by qualified individuals, combined with regular preventive maintenance and repair by workers with adequate skills and training, and proper record-keeping processes that ensure complete, accurate records of those activities, none of which was found during this audit. Without such a program NYCHA will continue to incur the risk that required work may not be performed until obvious, undesirable, and preventable symptoms—such as leaks into the interior of its buildings—are reported, either by the janitorial staff during their monthly building inspections or by other NYCHA staff or residents. The audit identified three particular problems that impede NYCHA's ability to properly protect the investments that have been made in its roofs:

- **Inadequate Inspections** - As reported above, NYCHA's Development Superintendents did not conduct the monthly inspections prescribed by NYCHA's Preventive Maintenance Procedure, which itself dates from 1985. Instead, to the extent that monthly inspections were performed at all as reflected in NYCHA's records, they were performed by janitorial staff. In addition, the semiannual supervisory inspections of roof conditions that District Superintendents were supposed to conduct were not being performed, as the position of District Superintendent no longer exists. Although NYCHA states that the RAMs, who replaced District Superintendents, conduct routine inspections, those inspections were not documented and therefore their efficacy cannot be determined. Based on the sample of NYCHA's janitorial roof inspection reports that we reviewed, and on the uncorrected deficiencies we observed on a majority of the sampled roofs, the inspections that NYCHA has been conducting have been ineffective in identifying deficient conditions and securing adequate maintenance and timely repairs.
- **Lack of Preventive Maintenance** - The conditions we observed on a majority of the 35 roofs we inspected indicate that NYCHA lacks a systematic preventive maintenance program for its roofs. NYCHA's current practice is reactive, meaning that repairs are performed only when problems are discovered by janitorial staff or reported by other NYCHA staff or residents, as opposed to regular, scheduled maintenance of those roof-related areas and items that need such attention on a preventive basis.
- **Outdated and Conflicting Policies and Procedures** - Shortcomings in and relating to NYCHA's written procedures for roof inspection, maintenance, repair, and administration of roof warranties contribute to the inadequacy of NYCHA's roof inspections and lack of preventive maintenance. Those shortcomings include outdated and inconsistent written procedures, noncompliance with the procedures that exist, and inadequate record-keeping in both hard copy files and in NYCHA's IT systems (reported in detail in later sections of the report).
- Had NYCHA developed the kind of proactive measures prescribed by its roof warranties, many of the deficient conditions we observed on the sampled roofs could have been avoided or mitigated prior to their becoming significant issues requiring extensive and costly repairs or early replacement of entire roofs. However, based on the results of our inspections of the sampled roofs and our review of NYCHA's corresponding records, the audit identified an overall lack of compliance with roof-warranty requirements, which is delineated and summarized in the table found in *Appendix IV*. The noncompliance puts NYCHA's investment of more than \$24 million in 19 of the sampled roofs at risk.

At Least 8 Roofs Were Replaced 10 Years Prematurely, Costing NYCHA \$367,000 in Loss of Initial Investment and \$3.7 Million for Replacement Roofs

We found that 8 roofs at NYCHA's South Beach development in Staten Island were replaced 10 years earlier than their 20-year warranted life, costing NYCHA \$367,000 in loss of roof-investment since only one half of the \$735,310 in roof investment had been realized. Subsequently, NYCHA spent \$3,695,654 for replacements of those eight roofs in 2016, expenses that were untimely and unplanned, based on the roofs' expected useful lives.

According to the UNIX data we initially received in January 2018 from NYCHA, all 8 building-roofs were then under 20-year warranty coverage, from 2007 through 2027, which indicates that the roofs were installed in or around 2007. However, in September 2018, in response to our request for copies of the warranties for two of those eight roofs, which were part of our audit sample, NYCHA provided warranty documents that indicated that the two roofs were installed not in 2007, but much more recently—specifically, in 2016. The latter date that was also consistent with the contract document that the Development Superintendent provided to us during our site inspections. Subsequently, when we re-examined NYCHA's UNIX records, we saw that both the warranty period and the contract number had been updated—to reflect the 2016 replacement of all eight roofs. Because that information had been overwritten, the updated UNIX record no longer shows the previous warranty coverage dates.

The abovementioned sequence of events established three relevant facts: (1) the 8 roofs that NYCHA installed in 2007 were replaced approximately halfway through the warranty period, with no effort by NYCHA to exercise the warranty coverage and no readily-apparent explanation in NYCHA's UNIX database or any other record provided to us; (2) NYCHA failed to update its UNIX database to reflect the 2016 installation of the roofs—and the new warranty coverage dates—for at least 24 months; and (3) the UNIX database does not track how long a given roof lasts before it is replaced.

NYCHA's project documents revealed no explanation for why the 8 roofs installed in 2007 were replaced 10 to 11 years earlier than expected or why they were not replaced by the same manufacturer under the 2007-2027 warranties. Additionally, our review of work orders for the two sampled roofs uncovered no record of a significant issue that would have necessitated their early replacement. Further, in September 2018, in the absence of explanatory records from NYCHA, we contacted the roof manufacturer listed on the old warranty to obtain any available information regarding the circumstances that may have led to early replacement of those eight roofs. The manufacturer, however, provided information for only three roofs, and that information shed no light on the reason for their early replacement. We were able to verify that NYCHA did not make any warranty claims to the manufacturer over the years and that the manufacturer's records indicated that the warranties for those three roofs were still active at the time we contacted the manufacturer.

Subsequently, we asked NYCHA to explain the early replacement of all eight roofs and for information regarding the cost. Additionally, we asked NYCHA to provide information indicating whether other roofs had been replaced earlier than the expiration of their warranty coverage and if so, to provide related information, including the cost of the replacements.

NYCHA later explained that during the design phase of a roof-replacement project for the eight South Beach buildings, from November 2012 to February 2014, CPD observed that the roofs were in poor condition, determined that they had a history of documented leaks—from 2009

through 2013—and found evidence that the leaks had been repaired by NYCHA without contacting the warrantor. Based on that information, CPD decided to replace the roofs and parapet walls at all eight buildings in 2016, thus acquiring new 20-year warranties.

After the exit conference, on April 2, 2019, NYCHA provided the audit team with some additional information—a *draft* executive summary of a consultant’s 2011 assessment report of building-envelope conditions at the South Beach development, which included an assessment of the roofs. The newly-provided executive summary offers some insight into why CPD may have initiated or become engaged in the design of a roof replacement project at the buildings in question in 2012, only five years after their then-existing roofs were installed. However, neither the executive summary nor NYCHA’s explanation addresses the question of why NYCHA did not contact the original manufacturer-warrantor to repair or replace the roofs installed in 2007, particularly if the leaks NYCHA was concerned about dated back to 2009, when the roofs were only two years old. In addition, NYCHA did not provide details, such as detailed inspection reports with photographs, to substantiate the poor condition of the eight roofs. Moreover, NYCHA did not answer our question of whether it was a standard CPD practice to replace roofs during the warranty period without invoking the warranty coverage. With regard to our question concerning the cost of replacing the eight roofs at the South Beach development in 2016, NYCHA provided the requested information after the exit conference, which indicates that the cost for the roofs installed in 2016 was consistent with our estimated cost of \$3,695,654.

In response to our asking whether other roofs had been replaced earlier than the expiration dates of their warranties, NYCHA stated that its examination of all roof replacement projects in progress during the audit scope period revealed no other such instances. NYCHA did not provide additional detail on what records and information it examined.

Because NYCHA has provided only partial answers to our inquiry, we do not know whether NYCHA’s early replacement of the eight abovementioned roofs without invoking the warranty coverage was an isolated or more common occurrence. The facts established to date, however, indicate that, for reasons NYCHA has not explained, NYCHA admittedly failed to notify the manufacturer-warrantor when leaks and other deficiencies were found on the roofs soon after they were installed, and that the information in NYCHA’s UNIX database was out of date and inaccurate when we first checked it. Furthermore, accepting NYCHA’s explanation that the roofs were replaced because they were in poor condition and that the manufacturer had not been notified as required by the warranty, this matter demonstrates the costs of non-compliance with the warranty requirements and weaknesses in NYCHA’s internal controls that put its investments in roofs at risk of waste and abuse.

Recommendations

NYCHA should:

1. Perform adequate inspections, preventive maintenance, and repairs in a timely manner to ensure that its roofs are protected by the manufacturers’ warranty coverage and can be kept in service throughout their expected useful lives.

NYCHA Response: NYCHA agreed with the recommendation, stating, “NYCHA will migrate warranty data to the Maximo system. Maximo will automatically generate rooftop inspections (both monthly and semi-annual) for all roofs under warranty. For any deficiencies found, Maximo will generate the appropriate corrective maintenance work order. A warranty check flag will also be displayed

stating that the roof is under warranty so that staff will be prompted to follow the procedure for roofs under warranty. Electronic images of warranties will be made available to development staff. All roof warranty data will eventually be stored in Maximo. NYCHA plans to have all roof warranty functionality described in this paragraph in production by December 2019.”

“Property Management staff will inspect and clear roof drains on a monthly basis and after all rain/snow falls of more than 1 inch of precipitation. Staff will work to schedule Preventative Maintenance work orders. Staff will complete Corrective Maintenance work orders to repair roofs in a timely manner (12 months).”

Auditor Comment: We are pleased that NYCHA agreed with this recommendation and presented an implementation plan. However, as discussed in this report, it is imperative that NYCHA designate qualified individuals to perform roof inspections to ensure that the inspections are done adequately and as prescribed by the manufacturers’ warranty coverage. We note that “Property Management staff” generally do not have the expertise to conduct roof inspections at the level required by the manufacturers to ensure that the warranty coverage can be maintained throughout the expected useful lives of the roofs. We urge NYCHA, as it implements this recommendation, to ensure that only qualified staff will perform the work required under the warranties.

2. Perform appropriate repairs to address deficiencies on the roofs as identified in this audit.

NYCHA Response: “NYCHA agrees with the recommendation.”

3. Investigate prolonged ponding conditions observed by the auditors on 14 building roofs to determine whether the roof insulation has been compressed from the weight of the membrane and standing water, whether the roof insulation has become saturated from leaks and has degraded, whether roof drains are clogged, and whether there are inadequate flows to roof drains. NYCHA should consider using advanced moisture-assessment techniques such as thermal scanning to determine the extent of moisture accumulation.

NYCHA Response: NYCHA agreed with recommendation, stating, “NYCHA’s Capital Projects Division is reviewing the infrared roof thermography reports and work order leak tickets for the top floor apartments at the cited buildings to determine if there is any damage to the roofs.”

Auditor Comment: We are pleased that NYCHA has started to use an advanced roof inspection method for detecting trapped moisture in combination with the appropriate work orders to determine if there is any damage to the roofs. However, in its response, NYCHA did not address how it will identify potential root causes of ponding. Therefore, we urge NYCHA to implement this recommendation in its entirety.

4. Take appropriate action to correct the root cause(s) of inadequate flows to roof drains to mitigate ponding on the roofs.

NYCHA Response: NYCHA appeared to disagree with the recommendation, stating, “If the prolonged ponding described in #3 did not do damage to the roofs,

then there will be no need to take any action to correct inadequate flow to the roof drain unless it is a clogged roof drain.”

Auditor Comment: In its response, NYCHA still appears to be focused on corrective maintenance and fails to recognize the importance of the preventive maintenance required under the warranty as presented in the audit report. Therefore, we reiterate our recommendation and continue to urge NYCHA to follow it.

5. Conduct semiannual inspections of roof conditions in the Spring and Fall by qualified individuals experienced in preventive maintenance and repairs as recommended by the roof manufacturers and the NRCA.

NYCHA Response: NYCHA agreed with the recommendation, stating, “NYCHA’s Property Management staff will conduct semi-annual inspections of roof conditions by qualified individuals (12 months).”

Auditor Comment: We are pleased that NYCHA recognizes the importance of having qualified individuals conduct roof inspections.

6. Conduct monthly inspections by Development Superintendents in accordance with the current Preventive Maintenance policy and ensure that the superintendents secure proper performance of applicable preventive maintenance responsibilities in accordance with the same policy.

NYCHA Response: “NYCHA agrees with the recommendation. NYCHA’s Operations Division will revise a checklist for Development Superintendents to use in this inspection (6 months).”

Auditor Comment: We are pleased that NYCHA has agreed to revise a checklist for Development Superintendents to use. We note that NYCHA’s response only addressed the monthly inspections but did not address roof-repair work orders and the record-keeping aspect of the recommendation. We urge NYCHA to reexamine the recommendation to ensure a complete implementation plan.

7. Conduct roof inspections after major rain events to help timely identify root causes of ponding, and when required consider pumping ponding water off the roof.

NYCHA Response: NYCHA appeared to agree with the recommendation, stating, “NYCHA’s Construction, Safety and Quality Department (CSQ) of Capital Projects Division (CPD) has inspected nine (9) newly installed roofs: Tilden Houses (Bldgs. #5 thru #8) on June 24, 2019 and Campos Plaza II (Building #3) on June 27, 2019, and found no issues of ponding. CSQ will continue to randomly inspect completed roof installations as they become available.”

Auditor Comment: NYCHA appeared to agree with the recommendation. However, its response focuses on newly installed roofs without any mention of older roofs. We urge NYCHA to fully implement the recommendation for all buildings.

8. Document the results of all semiannual, monthly, and weather-related inspections, and initiate work orders for the required repairs in Maximo.

NYCHA Response: “NYCHA agrees with the recommendation (12months).”

9. To provide proper transparency and accountability, ensure that adequate records are maintained to establish the basis and identify the individuals responsible for any decision to replace a roof during a warranty period, and if applicable, to explain why NYCHA did not exercise the warranty coverage.

NYCHA Response: NYCHA agreed with the recommendation, stating, “Based on the Physical Needs Assessment (PNA) rating for roofs to note the level of deficiency, a Design and Project Management Department representative will visit the roofs being considered for replacement on the Five-Year Plan with the manufacturer. The manufacturer will issue a report that will advise CPD regarding the condition of the roof. Upon further review, it was determined that by virtue of the project being in the approved capital plan, the considerations regarding decision to replace roof were made and approved.

“CPD reviewed the Five-Year Plan and determined that the planned roof replacement projects do not have existing warranties.”

NYCHA’s Inadequate Administration and Enforcement of Roof Warranties Led to Negligible Use of Those Warranties for Repairs

NYCHA seldom used a warranty to have leaks and other deficient roof conditions repaired by the manufacturers under warranty terms. NYCHA’s failure to invoke the warranty coverage it paid for is largely unexplained in its records and may be related to three previously-mentioned problems: (1) a lack of awareness of the coverage among the Development Superintendents who ostensibly would exercise it; (2) the incoherence and obsolescence of NYCHA’s various written procedures that apply to roof inspection, maintenance, and repair; and (3) noncompliance with the applicable procedures, which could compromise NYCHA’s ability to demonstrate that it met the conditions for invoking warranty coverage. Internal control weaknesses are present at multiple levels of NYCHA’s organization, resulting in inadequate warranty administration and enforcement.

Roof Warranties Rarely Used to Repair Roof Leaks

Based on our assessment of NYCHA’s data covering almost a decade’s worth of work orders (January 1, 2009 to December 31, 2017) recorded in the Authority’s Maximo system, we found that NYCHA used warranty coverage on only 9 out of a total of 709 work orders, or about 1 percent of the time, when repairs were required on roofs during the warranty period.¹⁷ Conversely, the work was performed by NYCHA in-house staff in 700, or over 98 percent of the cases. In addition, it appears from the available records that NYCHA did not ensure that the repair work was done under the supervision of, or was subject to, the inspection and approval of the manufacturer of the materials, a lapse that could permit the manufacturer to void the warranty.

¹⁷ According to NYCHA, work done under a warranty is recorded as “Vendor” in the “Craft” data entry field of a work order, referring either to the manufacturer’s contractor or another contractor acceptable to the manufacturer. No other relevant information, such as a notification to the manufacturer, is tracked in Maximo by NYCHA. Thus, the absence of a “Vendor” entry should mean that the work was done by NYCHA in-house staff. In those cases where there are “Vendor” entries in Maximo, however, NYCHA has not provided any substantiating evidence that the alleged work was in fact performed under the warranty at no cost to the Authority.

NYCHA's Standard Procedure *Roof Repairs* (060:70:1), prescribes the Authority's policy and procedures to be followed for authorizing and performing repairs to roofs that may be covered by warranties and/or contract guarantees. In particular, the procedures provide that NYCHA should: (1) notify the roofing manufacturer whenever any repairs of a roof are necessary; and (2) ensure that repair work is done under the supervision of, or subject to the inspection of, the manufacturer. Section III of the *Roof Repairs* Policy states,

[t]he terms of roofing warranties are rigid. They require the Authority to notify the manufacturer of the materials whenever any repairs are necessary. The warranties also provide that repair work be done under the supervision of, or subject to, the inspection and approval of the manufacturer of the materials. *It is extremely important that the requirements of roofing warranties be strictly observed in order to determine whether the roofing company or the manufacturer of the material is responsible for any repairs needed.* [Emphasis added.]

In addition, NYCHA's Standard Procedure *Administration of Guarantees and Warranties* (025:52:1), Section II, states that

[a]ll guarantees and warranties for the proper performance of materials and workmanship in all contracts or Purchase Orders shall be strictly enforced. In the event that repairs or alterations are required during the guarantee/warranty period, the Authority will assume no expense unless the repair or alteration is clearly not included in the scope of the guarantee/warranty.

In Maximo, NYCHA categorizes roof maintenance and repair issues by different identifiers known as "Failure classes." For the failure class "Leak From Above," which indicates leaks occurring through the roof of a given building, Maximo reflects 497 applicable work orders, and for failure class, "Rooftop," which indicates deficient conditions requiring repairs to the roof area, there were 212 applicable work orders—a total of 709 (497 plus 212) work orders.¹⁸

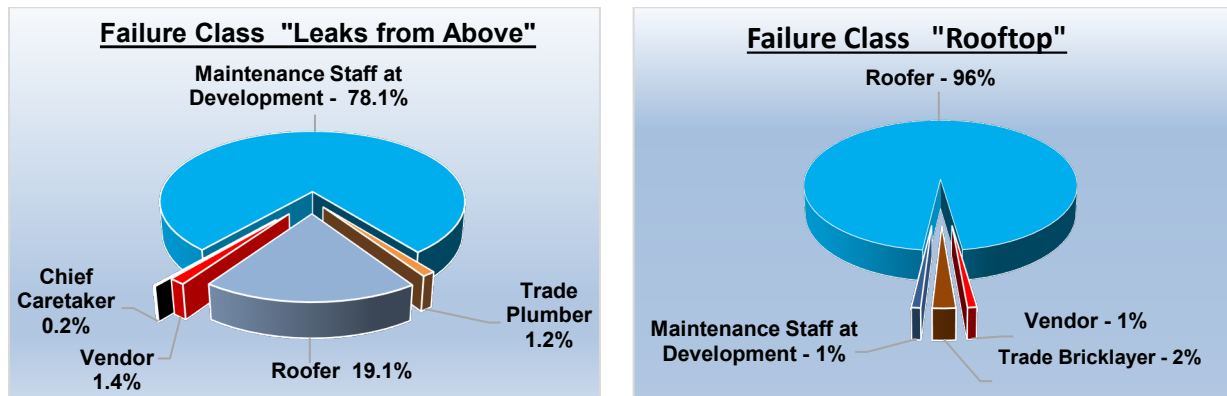
The charts in Figure 1 below compare the number of work orders completed by various crafts for the two applicable failure classes, during the period January 1, 2009, to December 31, 2017.¹⁹

¹⁸ Although a query for "Leak from Above" work orders yielded work orders for every floor of the building, only the work orders from the uppermost floor (below the roof) of the building were used in our analysis. Additionally, although water can travel many different ways, work orders related to leaks from a window, sink, or bathtub, as well as work orders involving plumbing stack leaks and cancelled work orders, were omitted from the results in order to consider only those work orders that involved roofs. A total of 613 work orders for "Leak from Above" were found, but we removed from the list 116 work orders that appeared to be for leaks not originating from a roof and work orders that were cancelled, resulting in the 497 applicable work orders. Similarly, for "Rooftop," we removed 291 work orders resulting in the 212 applicable work orders.

¹⁹ NYCHA uses Maximo for recording maintenance work history by work orders. The data for who performed the work is tracked by recording the name of a trade on a work order. Craft refers to the trade of the person that performs the work (i.e. roofer, welder, carpenter, elevator mechanic, or vendor). Vendor refers to the entity (the original roof contractor or manufacturer's contractor) that performs the work other than in-house staff such as maintenance staff, or skilled trades/craft workers, such as roofers.

Figure 1.

Number of Completed Work Orders
in Maximo by Craft



- Our analysis of the 497 work orders classified under the “Leaks From Above” failure class showed that “Vendor” (referring either to the manufacturer’s contractor or another contractor acceptable to the manufacturer) performed the repairs for only 7 work orders at two developments (1.4 percent). Those seven instances were the only ones in which NYCHA may have exercised its contractual right to warranty coverage. For the remaining 490 work orders, the work was performed by NYCHA’s in-house staff, meaning that NYCHA did not exercise the warranty coverage.
- Similarly, of the 212 work orders classified under the “Rooftop” failure class, the repairs were performed by “Vendor” on only 2 work orders (1 percent). On the remaining 210 work orders, the work was performed by NYCHA’s in-house staff, incurring additional unnecessary cost.

In addition to a lack of organized preventive maintenance and repair program for roofs, as explained previously, it appears that several other control weaknesses contributed to the near-complete absence of warranty claims by NYCHA, including:

- **Outdated standard procedures/processes.** NYCHA’s standard procedures have not been updated to reflect current operational structure and/or processes. Consequently, roof maintenance and repairs cannot be performed adequately. The following examples illustrate the issues in detail:
 - NYCHA’s standard procedure *Roof Repairs* (SP 060:70:1), was last revised in 1987, 32 years ago. It refers to a Form # 061.06, Request for Plant Services Work, Non-Scheduled and/or Non-Budgeted, also commonly referred to as a “Work Ticket” that was used prior to NYCHA’s launch of its Maximo Asset Management software in 2007, and the procedure also refers to outdated job titles and departments. For example, the procedure directs the Development Superintendent to notify the “Plant Services Roofing Section,” which does not currently exist, “whenever there is evidence of a roof leak.” Similarly, the superintendent is directed to notify the “Contract Guarantee Section of Management Planning,” which also does not appear to exist, if it is found that the roof needs a repair that is the contractor’s (as opposed to the manufacturer’s)

responsibility. It does not direct the Development Superintendent to contact the manufacturer when roof leaks are confirmed.

- NYCHA's *Preventive Maintenance Procedure* was last revised in 1985, 34 years ago, has not been updated to incorporate workflows in Maximo, and still includes requirements for recording certain information on forms that have been replaced by Maximo functionalities. Additionally, although the procedure requires monthly inspections of the roofs, documented with Building Inspection Report (Form 060:130), that form does not include details of all of the components of the roof to be inspected that are typically recommended by the roof manufacturers. Also, in practice, based on the Building Inspection Reports we reviewed, unsatisfactory roof conditions were rarely recorded in the reports, and those that were recorded did not include any details that would show the extent of the problems noted. Moreover, the inspection reports we reviewed were not supplemented by any photographic evidence. In addition, as noted previously, when we asked NYCHA to provide a sample of 33 reports, NYCHA provided only 24, and 4 of those contained no evidence that a roof inspection was conducted. The abovementioned gaps suggest that the inspection reports are not always filled out and that those that are filled may be incomplete and inaccurate. Overall, it appears that the primary report that ostensibly records the condition of NYCHA's roofs each month is of limited reliability as a record of the actual condition of those roofs.²⁰
- Maximo contains modules for preventive maintenance of critical assets and functions, such as elevators, heating systems, and West Nile virus protection systems. However, NYCHA has not implemented a similar module in Maximo for roofs—one of its most critical assets.
- **Noncompliance with applicable parts of the standard procedures.** NYCHA did not follow applicable procedures and processes. The following examples illustrate the kinds of conditions that hampered NYCHA from adequately performing roof maintenance and repairs:
 - Hard-copy record-keeping at the developments—the most critical aspect of any effective program of preventive maintenance and repair—was found to be inadequate. NYCHA's Standard Procedure, *Roof Repairs* (060:70:1), Section IV, D1, requires Development Superintendents to each maintain a contract folder containing various documents and all contract correspondence. Such files were lacking required documents at all 13 developments where the 35 sampled roofs are located. The most basic record, a copy of the warranty, was not present at 10 of the 13 developments.
 - We discovered that at 9 of the 13 developments we visited, the Development Superintendents were not aware of the warranty coverage.²¹ The development Superintendent is the person responsible for contacting the manufacturer or contactor in the event of a roof-leak that is covered under a warranty, according to NYCHA's *Administration of Guarantees and Warranties*, Standard Procedure 025:52:1, Section IV.C. If a Development Superintendent is not aware of the warranty and does not have the contact information readily available, then this step in the warranty claim process could easily be omitted, resulting in nonuse of warranty coverage.

²⁰ NYCHA reports that it is currently updating its *Administration of Guarantees and Warranties*, Standard Procedure 025:52:1, which was last revised in 2007.

²¹ When we asked the Development Superintendents why they were not aware of the warranty coverage and about problems with record-keeping, generally their responses were: a lack of training and written policies/procedures for newly appointed Development Superintendents and high turn-over at the Development Superintendent position.

- NYCHA's *Preventive Maintenance Procedure* (Standard Procedure 060:61:1), Section IIA.2, emphasizes staff training and states that, "[p]articular attention shall be given to the training of supervisory personnel in all aspects of [the] preventive maintenance program." However, during our site visits to 13 developments, we found that not only were 9 Development Superintendents unaware of the roof warranty coverage, as noted above, but that more than half of those did not know whom to contact to obtain a copy or information on warranty.
- NYCHA's *Administration of Guarantees and Warranties* (Standard Procedure 025:52:1) states in substance, at Section VI (C), that where an affected work location, such as a development, discovers a product defect during the manufacturer's warranty period, it should notify the manufacturer in accordance with the requirements of the warranty. Thereafter, if the manufacturer fails or refuses to honor the warranty, the Superintendent of the affected work location should put its request to the manufacturer in writing, simultaneously notifying the Law Department, which should then be included in all further communication and informed of any action the manufacturer takes. Notwithstanding those instructions and the deficiencies we identified in most of the 35 NYCHA roofs we inspected, all of which occurred during the warranty period, we found no record of any correspondence in either Maximo or the hard copy files at the development to show that the manufacturer was notified of any of the deficiencies and asked to repair them and no indication that the Law Department was notified of the issues.
- **Inadequate record-keeping in Maximo.** NYCHA's Standard Procedure, *Managing Maintenance Work Orders* (Standard Procedure 040:09:7), at Section I.C, requires NYCHA staff to quantify and capture the labor hours spent and material costs incurred in staff's performance of maintenance and repair work. However, we found that the data was not always captured. As a result, the data that should have been available to NYCHA's decision makers for various purposes, including accurately quantifying the funds spent internally for work that potentially could have been performed under warranty, was not considered. As a related matter, the work order process in Maximo does not include a step that would prompt or require the user to check for the existence of warranty coverage before issuing a work order.
- **A lack of warranty enforcement data.** Despite our multiple requests, NYCHA has not been able to provide us any information on whether NYCHA tracks warranty claims, whether it has in fact made any claims under warranties for the sampled roofs, and whether it maintains a list of voided warranties, if any. The failure of NYCHA to produce this information indicates that it does not maintain it. Without the requested information we (and NYCHA) cannot determine whether any of the manufacturers have failed or refused to comply with the warranty claim(s) and, if so, whether the Law Department was appropriately notified as required by NYCHA's standard procedure, *Administration of Guarantees and Warranties* (025:52:1). According to that procedure, development management is responsible for administering and enforcing the warranty, and the procedure does not specify a person or division centrally responsible at the agency-management level.

Recommendations

NYCHA should:

10. Develop and implement policies and procedures that ensure that roofs are properly maintained in accordance with the requirements of applicable warranties. Toward that end, NYCHA should adopt the following specific recommendations.

NYCHA Response: NYCHA agreed with the recommendation, stating, “NYCHA’s Capital Projects Division and Operations Division will collaborate with stakeholders to update the Standard Procedure.”

Auditor Comment: We urge NYCHA to ensure that its implementation plan fully and adequately addresses the relevant findings—including the existence of multiple standard NYCHA procedures applicable to roof maintenance—and fully implement this recommendation.

11. Develop a comprehensive policy and procedures manual covering roof inspection, maintenance, repairs, and the preservation and use of warranty coverage, and provide it to appropriate staff, including all Development Superintendents. In developing the manual, NYCHA should consider consulting with subject matter experts, which might include the NRCA, real property management professionals, and roof manufacturers, to identify best practices and to consider whether new technologies may offer NYCHA opportunities to improve its performance of these responsibilities.

NYCHA Response: NYCHA agreed with the recommendation, stating, “NYCHA’s Capital Projects Division and Operations Division will collaborate with stake holders to update the Standard Procedure.”

Auditor Comment: Please see Auditor Comment to Recommendation 10.

12. Consider switching to an electronic filing system at the development level so that relevant documents are readily available.

NYCHA Response: NYCHA agreed with the recommendation, stating, “As previously stated in NYCHA Response to Audit Recommendation No. 1, all roof warranty data will eventually be stored in Maximo. In addition, the Guaranty and Warranty system managed by CPD is being linked with Maximo to provide access of information to the development project managers.”

Auditor Comment: We urge NYCHA, as it implements this recommendation, to ensure that in addition to the documents it specifically mentions in its response, all of the other documentation relevant to roof maintenance, including invoices, contract specifications and drawings, are maintained electronically and are available at the development level. In addition, we urge NYCHA to set a reasonable timeframe for implementing the recommendation, a concern raised by its statement that “all roof warranty data will *eventually* be stored in Maximo.” [Emphasis added.]

13. Update the standard procedures that touch upon roof inspection, maintenance, repair, and warranty administration to reflect the organization's current operational structure and/or processes.

NYCHA Response: NYCHA agreed with the recommendation, stating, "NYCHA's Capital Projects Division and Operations Division will collaborate with stakeholders to update the Standard Procedure."

Auditor Comment: Please see Auditor Comment to the Recommendation 10.

14. Implement necessary operational changes to facilitate adequate maintenance and repairs of the current roofs.

NYCHA Response: NYCHA agreed with the recommendation, stating, "NYCHA's Operations Division will conduct a full business process review and implement changes from that review."

15. Ensure that applicable standard procedures that concern or touch upon record-keeping for roofs are consistently followed. Specifically, designate RAMs or other appropriate officials to regularly review development-level records to ensure that each development maintains a complete file on its roofing systems, including but not limited to the warranty, invoices, and logs of all inspections performed, repairs that have been made to the roofing systems, and contract information for the manufacturer or contractor who replaced the roof(s) at the development, and that the appropriate records are kept up-to-date in Maximo, NYCHA's system of record for asset management.

NYCHA Response: NYCHA stated that it "agrees with this recommendation and will implement. As previously stated in NYCHA Response to Audit Recommendation No. 1, all roof warranty data will eventually be stored in Maximo."

Auditor Comment: We urge NYCHA, as it implements this recommendation, to ensure that it designates an appropriate official, or officials, who will be responsible for management oversight and for ensuring that the inspections performed at the development level are adequate, to address the lack of documented oversight described in the audit report.

16. Ensure that appropriate training is provided to relevant staff, especially to the Development Superintendents, for administering and enforcing the roof warranties, and to janitorial staff for improving monthly inspections and recording conditions on their inspection reports.

NYCHA Response: NYCHA agreed with the recommendation, stating, "CPD will begin to require roof manufacturer's representative(s) to attend project closeout meetings to discuss administering and enforcing the roof warranties with Property Management in September 2019. This requirement will become part of the closeout checklist in eBuilder. NYCHA's Operations Division will provide Development Superintendents with the appropriate training."

17. Implement a warranty check in Maximo for work orders that involve roof leaks and ensure that the warranty checks are recorded on those work orders.

NYCHA Response: NYCHA agreed with the recommendation, stating, “As previously stated in NYCHA Response to Audit Recommendation No. 1, all roof warranty data will eventually be stored in Maximo. A warranty check flag will also be displayed stating that the roof is under warranty so that staff will be prompted to follow the procedure for roofs under warranty. NYCHA plans to have all roof warranty functionality in production by December 2019.”

Auditor Comment: We remind NYCHA, as it implements this recommendation, of the need to ensure that all the necessary information to exercise the manufacturers’ warranties is appropriately maintained, including work orders.

18. Enforce warranties and track warranty claims. Particularly, maintain relevant information such as details of work performed under warranty, if any, voided warranties, if any, and any instance in which a manufacturer has failed or refused to comply with its obligations on a warranty claim, and in any such case determine and document all relevant communications, including whether and when the designated NYCHA employee appropriately notified the Law Department and the resulting action or outcome.

NYCHA Response: NYCHA agreed with the recommendation stating, “NYCHA’s Operations Division will build these recommendations into the revised standard procedure. The details of work information can be stored in Maximo. In addition, NYCHA’s Capital Projects Division will maintain warranties in eBuilder and provide copies to Development staff at the project’s closeout meeting. The Development staff will also have direct access to warranties through Maximo.”

Inadequate Use of IT systems

Primavera and Maximo, the two primary information systems that NYCHA relies on to manage its assets and roof construction projects, are not adequately used and updated to efficiently track the status of its roof warranties and its roof-repair costs. We found deficiencies in record-keeping in both systems, including that data was inaccurate or incomplete, and that key documents—digital copies of roof warranties—were missing in the majority of cases. Consequently, the reliability of both systems is questionable and NYCHA is hindered in its ability to monitor roof-maintenance and repair as required by the warranty and in maintaining appropriate financial accountability for those activities.

According to NYCHA,

- Maximo is its system of record for asset management, which includes the recording of work orders for all maintenance and repairs;
- Primavera is NYCHA’s system of record for storing all information and documentation concerning roof construction, including roof warranties, in digital format; and
- UNIX is an Access database that NYCHA developed in-house, which it uses to maintain certain supplemental information about roof warranties, such as the project and contract numbers associated with each warranty, the management company, the project’s

originator, NYCHA's building number, the prime contractor, and the warranty's start and end dates.²²

According to Comptroller's Directive #1, *Principles of Internal Control*, Section 2,

Internal control is a fundamental component in the successful financial accountability of any public or private entity. Effective internal control provides a necessary and continuing surveillance over the various processes, plans and procedures that are the foundation for which management relies upon to successfully achieve the purpose, goals and objectives of the agency while maintaining appropriate financial accountability for the organization's activities. In addition, internal control serves as the first line of defense in safeguarding assets and help preventing or detecting errors and fraud.

In addition, according to the NYCHA's procedure for *Managing Maintenance Work Orders*, Section III B, "[a] work order specifies the particular work to be accomplished, along with identifying the labor, materials, services, and tools needed to complete the work."

However, we found that NYCHA does not ensure that: (1) the necessary labor and materials costs for each work order are always recorded in Maximo or that the cost recorded in Maximo is always reliable; (2) all warranties are uploaded in Primavera; and (3) reliable warranty data is maintained in UNIX. Specifically, we found:

- In Maximo, work orders were entered without labor and/or material costs, and descriptions of work and activities were not sufficiently detailed to determine the scope of work performed.²³
- In Primavera, of the 158 buildings with manufacturers' roof warranties that were in effect during the audit scope period, the entire record for one roof installation was missing and of the remaining 157 records, the digital copies of the warranties for 118 roofs (75 percent) were missing.
 - For the 35 sampled roofs, the warranties for 6 roofs were present, and the warranties for 29 roofs (83 percent) were missing. Subsequently, after we notified NYCHA, the agency located 24 of the 29 missing warranties and uploaded them to Primavera. Of the five missing warranties, NYCHA was able to locate three warranties after the exit conference, but two warranties remain missing as of the date of this report.²⁴
- In UNIX, supplemental records for 10 of the 158 warranties were missing.
 - Of the 35 sampled building-roofs, warranty information was not recorded in UNIX for 4.

Besides missing records in both Primavera and UNIX, in 13 of the 30 warranties available for the sampled building-roofs in Primavera, we found discrepancies in four cases between the warranty

²² Documents and information of the interest under the audit scope were: warranty documents in Primavera; warranty information in UNIX; and work orders in Maximo.

²³ We examined 245 work orders associated with the sampled building-roofs that had been entered in Maximo between January 1, 2009, and December 31, 2017, where work was done by NYCHA roofers and data for labor and/or material costs had been entered. Of that group, 80 work orders had either no data for labor costs or a \$0.00 entry as labor cost; 20 work orders showed a questionable labor cost of only \$10.00, which was significantly less than the \$38 average hourly rate of a roofer during that period; and 27 work orders listed a labor cost between \$10.00 and \$20.00.

²⁴ One of three warranties included a 20-year warranty for Armstrong I Building #10 that began in 2011 as opposed to in 2008, the warranty start date previously reported by NYCHA.

start and end dates recorded on the warranties found in Primavera and the dates recorded in UNIX; those discrepancies varied in length from two weeks to over a year.

In addition, we found that warranty data in UNIX was not recorded timely. For example, NYCHA's current records of the roof warranties for three South Beach buildings (#1, #2, and #6) were entered in UNIX and in Primavera in 2018, two years after the roof installations were completed, and only after we requested copies of the warranties for the sampled roofs at this development—which had been missing—in the course of our fieldwork.²⁵ Moreover, as discussed previously in this report, it appears from the updated records that 8 roofs at South Beach were replaced approximately 10 years prematurely, as measured by their expected useful lives and the dates of the warranties we previously found in UNIX. The records we received from NYCHA provide no explanation of the circumstances or decision-making that resulted in NYCHA's incurring the expense of replacing 8 roofs that were under warranty coverage. Such discrepancies and omissions in NYCHA's electronic records increase the risk that agency management may lack reliable information that should be considered for the purpose of reaching informed business and strategic decisions.

Furthermore, NYCHA's Development Superintendents, who are supposed to monitor the condition of their developments' roofs, notify the manufacturers of defects, and otherwise enforce and ensure NYCHA's compliance with warranty terms, should be able to obtain reliable warranty information from CPD, the division responsible for maintaining the digital copies of warranties in Primavera. However, to the extent that the warranty information recorded in Primavera and UNIX is outdated, incomplete, inaccurate, or otherwise unreliable, NYCHA incurs an increased risk that its Development Superintendents will be unable to readily obtain the information needed to carry out their responsibilities, potentially leading to failures to timely notify manufacturers of roof defects, worsening roof problems, unauthorized repair work, unnecessary costs, and forfeiture of warranty coverage.

Finally, NYCHA's inadequate use of both its Primavera and Maximo systems has been consistently cited in previous audits by the Comptroller's Office dating back to 2010. Recently, in 2017, in its response to our audit report, *Audit Report on the New York City Housing Authority's Oversight of Contracts Involving Building Envelope Rehabilitation*, (#SE16-065A), NYCHA stated that it was then in the process of procuring new construction project management software, as a replacement for Primavera. At present, based on the cost-breakdowns for Maximo and Primavera that NYCHA provided after our March 28, 2019 exit conference, it appears that substantial funds have been allocated to these IT systems. NYCHA's implementation cost for Maximo, Phase 1, was \$33.9 million, and its annual license and support costs during FY 2018 totaled \$5.9 million. For Primavera, NYCHA's implementation cost was \$6.7 million, and its annual license and support costs totaled for FY 2018 \$271,000.²⁶ However, considering that NYCHA is not adequately using its existing IT systems and was unable to provide complete, relevant information on the costs of its systems within a reasonable time, the prospect of the Authority's realizing full value on its investments in new IT resources is open to question.

²⁵ According to UNIX data on January 12, 2018, the warranty period for these buildings was from March 23, 2007, to March 1, 2016. After we informed NYCHA, on April 9, 2018, we found that the warranty periods for these buildings were updated (building #1 from April 18, 2016, to April 18, 2036, building #2 from March 1, 2016, to March 1, 2036 and building #6 from February 10, 2016, to February 9, 2036).

²⁶ NYCHA did not provide any information related to UNIX system. Also, information provided by NYCHA on Maximo included the cost of Phase 1 only; NYCHA did not disclose any information about any additional phases and associated costs.

Recommendations

NYCHA should:

19. Ensure that all necessary labor and material data are recorded accurately and entered in a timely manner in Maximo.

NYCHA Response: NYCHA agreed with the recommendation, stating, “NYCHA will explore how to best capture material data in Maximo work orders.”

Auditor Comment: The response did not expressly address the entire recommendation. Thus, we note that, as stated in the audit, Maximo currently has the capacity to record labor and material data, but NYCHA is not ensuring that it does so. Thus, we urge NYCHA, as it designs and implements a plan to put this recommendation into effect, to address the current operational weaknesses that have resulted in its not accurately and timely capturing necessary labor and material data in Maximo.

20. Ensure that all roof warranty documents are uploaded in Primavera by CPD in a timely manner.

NYCHA Response: NYCHA agreed with the recommendation, stating, “NYCHA’s CPD is uploading copies of the warranties into our project management system - eBuilder. Primavera will sunset at the end of 2019.”

Auditor Comment: We urge NYCHA to ensure that the proposed control is consistently followed.

21. Ensure that all warranty information for roof-projects is maintained and recorded accurately, completely, and promptly in UNIX by the CPD’s Analysis & Reporting unit staff.

NYCHA Response: NYCHA agreed with the recommendation, stating, “NYCHA has a new system and will ensure that all warranty information is maintained and recorded accurately, completely, and promptly. In addition, NYCHA’s CPD is uploading copies of the warranties into eBuilder.”

Auditor Comment: We urge NYCHA to ensure that the proposed controls are consistently followed.

22. Ensure that all IT systems are utilized effectively to realize full benefits of the investments and to help NYCHA management monitor maintenance and repair of its roof assets.

NYCHA Response: NYCHA agreed with the recommendation, stating, “NYCHA has a new system and will ensure that all warranty information is maintained and recorded accurately, completely, and promptly. In addition, CPD is uploading copies of the warranties into eBuilder. As previously stated in NYCHA response to Recommendation No. 1, Maximo will automatically generate rooftop inspections (both monthly and semi-annual) for all roofs under warranty. For any deficiencies found, Maximo will generate the appropriate corrective maintenance work order.”

Auditor Comment: We acknowledge the proposed implementation plans to address the recommendation. However, we urge NYCHA to include functionalities into eBuilder to help NYCHA management monitor maintenance and repair of its roof assets.

23. Regularly and systematically maintain and update its information on the costs of implementing the IT systems mentioned in this report—Primavera, Maximo, and UNIX—including, annual licensing fees, and operating costs, for use in performing appropriate cost-benefit analyses as well as for budgeting and planning purposes.

NYCHA Response: NYCHA agreed with the recommendation, stating, “NYCHA’s IT fully tracks the implementation costs, on-going license costs, and on-going support costs of both Primavera and Maximo. Primavera is being sunset and replaced by eBuilder. The ‘UNIX’ system has been sunset and will be replaced with functionality in Maximo.”

Auditor Comment: Although NYCHA stated that it “fully tracks the implementation costs, on-going license costs, and on-going support costs of both Primavera and Maximo,” as noted in footnote 26 of this report, this was not the case during the audit.

NYCHA Lacks Financial and Organizational Accountability for Roofs

Notwithstanding the significant investments of public funds that have been made in NYCHA’s roofs and the 20-year warranties that come with them, and despite the roofs’ critical importance in protecting NYCHA’s buildings and residents from the results of water damage, NYCHA lacks a coherent and reliable process to monitor its staff’s performance in maintaining its roofs and to account for the cost of doing so. Considering the outdated procedures, unreliable records, and inadequate roof inspection, maintenance, and warranty-administration described previously in this report, it appears that NYCHA’s management has failed to implement a sound internal control environment or to engage in the “necessary and continuing surveillance” over its processes and procedures to achieve agency purposes, goals, and objectives while maintaining financial accountability and safeguarding assets, as prescribed by Comptroller’s Directive #1.

In attempting to determine the costs NYCHA incurred in repairing and maintaining roofs, we found that the data recorded in Maximo was unreliable, as noted previously. Additionally, according to NYCHA officials, roof maintenance is not individually itemized in its operating budget but instead is subsumed within the overall operations budget at the development level, which means that even if NYCHA kept reliable cost data, a comparison of its actual costs against its budgeted costs for roof maintenance could not be performed.

Moreover, in NYCHA’s organizational structure, primary responsibility for roof maintenance and warranty administration resides with development staff, specifically, Development Superintendents at 325 different locations throughout the City. As noted previously, at the borough level, the District Superintendent position no longer exist, but NYCHA deploys RAMs in its regional and programmatic property management departments, each of whom is responsible for actively monitoring property operations (including roof-inspections) and financial reports of a group of NYCHA developments under his or her jurisdiction. However, no performance metrics related to warranty usage or roof maintenance and repairs are either received from the developments or maintained at the borough- or program-level where the RAMs are assigned. Additionally, the RAM we interviewed did not know whether any of the roof warranties at the developments under his jurisdiction had been voided or whether any manufacturers had refused

to make or cover repairs under warranty, but was familiar with the challenges in determining the accurate costs of maintenance and repairs in NYCHA developments with respect to roofs.

Overall, the lack of performance measures and cost information relating to roof maintenance reflects a poor internal control environment that leaves NYCHA's valuable assets—not only its roofs, but the buildings, equipment, and residents the roofs are supposed to protect, as well as the funds already invested—at risk for damage and waste. Our inquiries uncovered no evidence of any internal or external audit or other systematic examination of NYCHA's roof maintenance and repair activities or spending in the recent past or any evidence that NYCHA management has attempted to isolate and examine, much less track, these costs. Consequently, NYCHA has been able to provide answers to only some of our inquiries as shown below:²⁷

- NYCHA's average annual spending on construction of new roofs (\$226.4 million);
- NYCHA's expenditures for roof replacements for the past five years (\$880.9 million);
- The total square footage of the roofs of NYCHA's buildings (18.9 million square feet [SF]);
- NYCHA's estimated roof replacement cost per square foot (approximately \$225 per SF);
- Whether NYCHA tracks its annual preventive maintenance and repair costs for roofs, and if so, its annual spending on those activities;
- Within NYCHA, whether anyone other than each development's superintendent is responsible for making sure that the roof-warranty claim process is used when roofs under warranty need repair or replacement;
- Whether NYCHA requires roof manufacturers whose products were installed on NYCHA's buildings to provide cost reports and updates regarding any work they and their approved contractors performed, if any, on the roofs under warranty;
- Whether there were any cases in which a warranty was voided by a roof manufacturer;
- Whether NYCHA experienced any problems with manufacturers performing repairs required under warranty, with specifics if so; and
- The cost of implementing NYCHA's Maximo and Primavera systems, including if applicable any annual licensing fees and/or operating costs (\$39.8 million and \$7.0 million, respectively).

Recommendations

NYCHA should:

24. Ensure that necessary controls are implemented, and those controls are working properly to facilitate transparency of programmatic activities and related information.

NYCHA Response: NYCHA agreed with the recommendation, stating, "NYCHA's Operations Division will conduct ongoing QA [quality assurance] of roof inspections and repair work."

²⁷ After the exit conference, NYCHA provided responses to some of these inquiries (shown inline in *parentheses*), but the responses lacked adequate details and/or substantiating documentation.

25. Ensure that the RAMs actively monitor property operations and financial reports, as required.

NYCHA Response: “NYCHA agrees with the recommendation and will implement.”

26. Develop a separate maintenance budget for roofs at the development level to help NYCHA assess actual costs vs. budgeted costs and for strategic planning purposes.

NYCHA Response: It appears that NYCHA disagreed with the recommendation, stating, “NYCHA utilizes Physical Needs Assessment analysis and work order data to assess roof replacement needs.”

Auditor Comment: We strongly urge NYCHA to reexamine the recommendation and implement it.

27. Develop and maintain appropriate performance metrics including warranty usage for its roof assets, at the agency and/or at the operations level.

NYCHA Response: It appears that NYCHA disagreed with the recommendation, stating, “NYCHA’s Capital Planning Department maintains condition rating as an indication of roof performance as part of the Physical Needs Assessment records.”

Auditor Comment: We strongly urge NYCHA to reexamine the recommendation and implement it.

DETAILED 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 included roofs that had been replaced between FYs 2000 and 2010 and were under warranty for which NYCHA was responsible for performing preventive maintenance and repairs to keep the warranties in effect.

We obtained background information about NYCHA from its website and the Mayor's Management Report. We reviewed other relevant information from NYCHA's website including its Capital Plans and budget reports to understand NYCHA's funding commitments. In addition, we reviewed future capital investments for roof replacement at various NYCHA buildings pledged by the Mayor's Office. Further, we reviewed a prior audit issued by our office, entitled *Audit Report on the New York City Housing Authority's Oversight of Contracts Involving Building Envelope Rehabilitation* (#SE16-065A), issued June 30, 2017, and noted findings and conditions relevant to this current audit.

To understand NYCHA's policies and procedures, and existing regulations governing NYCHA's roof maintenance and repairs, we obtained and reviewed:

- NYCHA's Standard Procedures (SPs) for Roof Repairs (060:70:1), Preventive Maintenance Procedure (060:61:1), Administration of Guarantees and Warranties (025:52:1), Managing Maintenance Work Orders (040:09:7), Record Retention – Housing Developments (GM-3699), and Records Retention and Disposal Schedules (008:59:2).
- Preventive maintenance guidelines of several roof manufacturers whose products are used by NYCHA and warranties issued by those roof manufacturers.²⁸
- Various NYC and NYS codes, rules, and regulations including the NYC Building and Construction Code, the NYC Energy Code, and the New York State Historic Preservation Office (SHPO) guiding standards.

We reviewed manufacturers' warranties for maintenance requirements. We also reviewed industry standard such as National Roofing Contractors Association's Manual for Inspection and Maintenance of Built-up and Polymer-modified Bitumen Roof Systems, and the *Standard Guide for Property Condition Assessments* (ASTM E2018-15) published by American Society for Testing and Materials (ASTM International) as a guide to formulate categories of roof defects. The above-cited policies, procedures, regulations, and other relevant guidance were used as audit criteria where applicable.

To understand NYCHA's internal controls for administering preventive maintenance and roof repairs, we reviewed NYCHA's organizational charts. We interviewed directors and other supervisory staff of the Brooklyn and Bronx Property Management Departments. We interviewed a RAM and a roofing supervisor from the Manhattan Property Management Department. We also

²⁸ Roof manufacturers include Johns Manville, GAF, and Firestone whose 4-ply roofing systems are used by NYCHA.

interviewed directors of NYCHA's Maintenance, Repairs and Skilled Trade Division, and a director and a senior project manager from the Capital Project Division to understand their roles and responsibilities. Additionally, we interviewed support staff from NYCHA's Information Technology (IT) Department to understand the IT systems used by various divisions, the data captured by these systems, and how NYCHA utilizes these systems for administering roof maintenance and repairs. We documented these interviews in memoranda and forwarded each memorandum to NYCHA for verification. In addition, we forwarded follow-up questions to NYCHA when required. Subsequently, we obtained an understanding of work-flow processes for preventive maintenance and roof repairs and documented our understanding of the internal controls and our assessment of the risk of fraud in a memorandum. We interviewed the Superintendents at the developments during site inspections of the sampled building-roofs.

NYCHA provided us a list of roofs that were replaced throughout the five boroughs during FYs 2000 through 2010. The list consisted of 741 roof-records with data about development, building, warranty start and end dates, vendor, and expenditure amount. We followed up with NYCHA about information that was missing on the submitted list, which subsequently NYCHA provided us with an updated list. The updated list consisted of 715 records.²⁹ Our analysis of the roof warranty start and end dates for those records found the following:

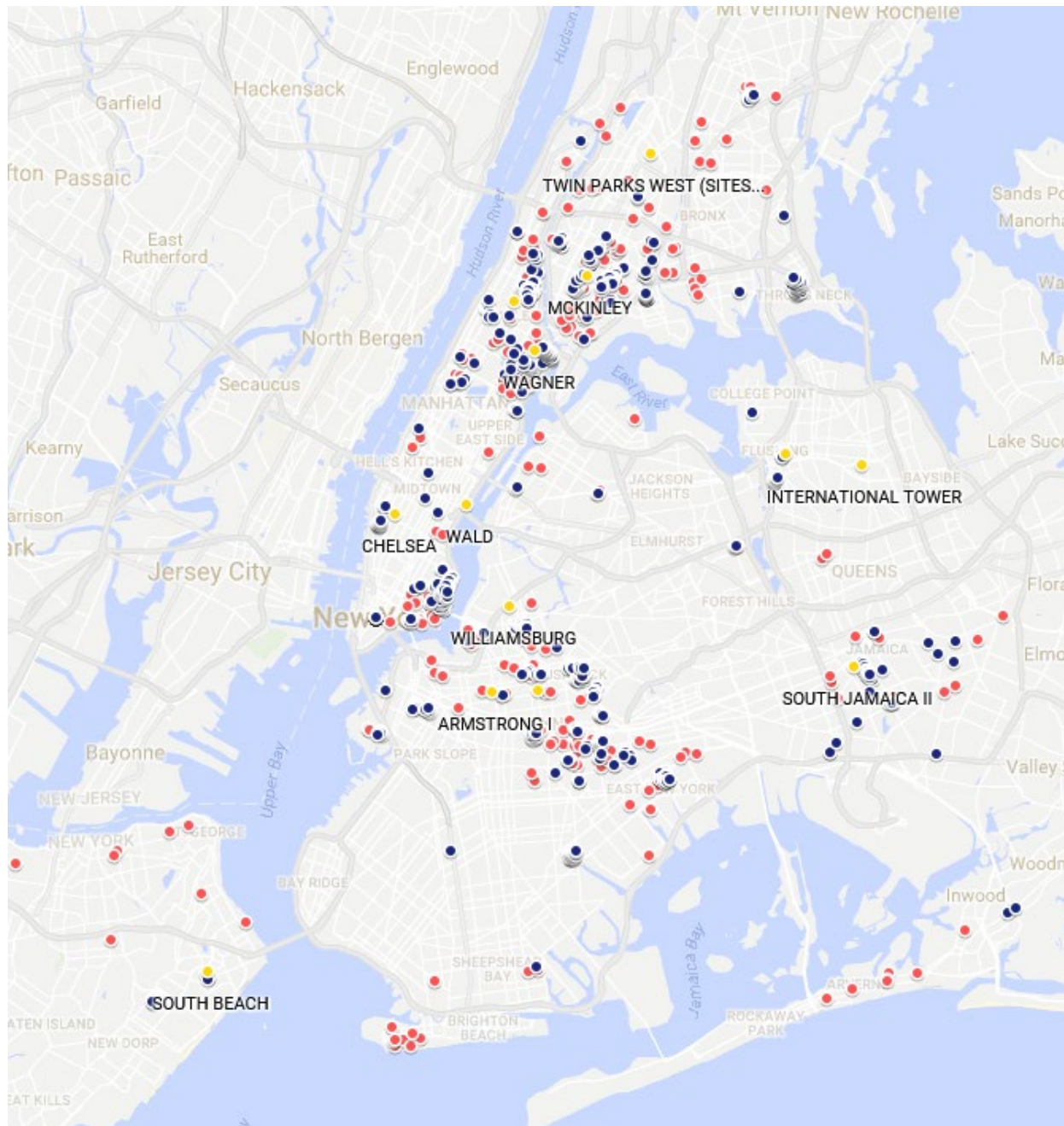
- Roofs installed during FYs 2000 through 2010 at 459 buildings had 3-year contractors roof guarantees that had already expired;
- A roof installed at one building had a 15-year roof warranty; and
- Roofs installed at 158 buildings were covered under 20 to 25 year manufacturers' roof warranties (i.e., extended warranties).
- For the remaining 97 buildings where roofs were installed, we were unable to determine the warranty period because 92 of the data records lacked guarantee or warranty dates, and five others had the same start and end dates for the guarantee period.

The focus of the audit was roofs with extended warranties installed during FYs 2000 through 2010; on 158 building-roofs with \$274,866,238 in the total cost of work.

A judgmental sample of 20 percent of the population of building-roofs (sampling unit) with 20+ year warranties was selected. The sample consisted of roofs at 35 buildings located in 13 developments across the five boroughs of New York City. The number of roofs at buildings selected per borough was determined by the borough share of the total building population and age of the roof. The total cost of roof replacements and other related work for the sampled roofs was \$50.7 million or 18 percent of the total cost of work.

²⁹ Per NYCHA, data corrections resulted in a reduced number of roofs.

The map below shows all NYCHA developments with color coded dots. Blue dots [●] represent NYCHA developments where roofs were replaced during FYs 2000 through 2010; Yellow dots [●] with development name are developments where audit sample building-roofs are located; and Red dots [●] represent reminder of the developments in NYCHA's portfolio where roofs were not replaced during FY 2000 through 2010. [\[Click on the map for additional development-level views\]](#)



Initially, we conducted field visits at three of the sampled roofs at three different developments to obtain an understanding of activities performed and documentation maintained at the developments. We interviewed the Superintendents and requested required documents (e.g., drawings and specifications, a copy of warranty, skilled trade sign-in logs, work orders) to be maintained at the developments. Accompanied by the Superintendent, a CPD staff and a member of NYCHA's Internal Audit department, we also conducted inspections of the sampled roofs at each of those developments.

Subsequently, based on our assessment of NYCHA's internal controls, the requirements in its standard procedures, and manufacturers' maintenance guidelines to assess NYCHA's preventive maintenance and repairs, program, we developed a field survey including a roof inspection checklist. Specifically, the survey was designed to evaluate the Superintendent's experience and training, his/her understanding of roof inspection requirements, warranty claim process; and record-keeping at the developments. Accompanied by a member of NYCHA's Internal Audit staff and a CPD staff member, we visited all sampled developments and interviewed each Superintendent. We documented our evaluations on the field survey questionnaire and obtained sample documents from the Superintendents. We also conducted inspections of roofs at the sampled buildings and documented the conditions we observed with photographs.³⁰

We reviewed record-keeping in Primavera, NYCHA's systems of record for project management information and relevant records including warranties. In addition, we reviewed UNIX, NYCHA's supplemental system of record for warranty information. Finally, we used NYCHA's application Maximo, the system of record for managing work orders, to understand the history of maintenance and repairs on those roofs using relevant failure codes "Rooftop" and "Leak from Above" as identified by NYCHA. We evaluated the results of our queries to understand the history and types of repairs conducted on those roofs, trades of people who performed the repairs, and to assess associated labor and material costs.³¹

After gathering documentation and evaluating roof conditions in the field, the audit team compiled and assessed the information to determine NYCHA's compliance with maintaining roofs in good condition to maximize the serviceable life and other relevant aspects. Additional documents, information and clarifications were requested from NYCHA as needed during the audit and at the end of our fieldwork. We also obtained relevant industry standards and conducted research on the Internet.

The results of our samples while not projectable to the population of NYCHA building-roof replacements, provided sufficient evidence to support our findings and conclusions about NYCHA's preventive maintenance and repairs of roofs.

³⁰ Two of the roofs in the sample building-roofs at two developments were not accessible for inspection and were at leased buildings where NYCHA was not responsible for the roof maintenance. We substituted these audit sample with total four buildings at two other developments.

³¹ The reliability of the results is limited to the extent data captured in the Maximo and provided by NYCHA; there is no independent source to compare and test the completeness of the data.

Summary of Roof Deficiencies (Sampled Roofs)

| | | | | | | Field of Roof | | | | | | Drainage | | Sheet Metal and Base Flashing | | | Bulkheads, Parapets and Railings | | | | Total # of Defects (by Bldg.) | | | | | | |
|------------------------|-----------|-----------------|----------------------------|---------------------|-------------------|----------------------|-------------------|------------------------------|----------|--------------------|--------------|----------|-------------------------|--------------------------------|-----------------------------|----------------------|----------------------------------|-----------------|-------------------|-----------------|-------------------------------|---|---|---|---|---|--|
| BOROUGH | # | Severity Rating | DEVELOPMENT | BUILDING # | Roof Age* (Years) | Uneven/ Worn Ballast | Soft spot/ Spongy | Blisters/ Entrapped Moisture | Roof Sag | Debris/ Vegetation | Roof Patches | Ponding | Staining/ Discoloration | Missing/ Damage Metal Flashing | Open Seams at Base Flashing | Aged/ Loose Caulking | Cracks/ Displacements | Damaged Masonry | Weep holes Issues | Damaged Railing | | | | | | | |
| BRONX | 1 | 3 | MCKINLEY | 3 | 9 | X | | | | | | | X | | | | | | | X | 3 | | | | | | |
| | 2 | 2 | MCKINLEY | 4 | 9 | | | | | | | | X | | | | | | | | 1 | | | | | | |
| | 3 | 0 | TWIN PARKS WEST | 1 | 10 | | | | | | | | | | | | | | | | 0 | | | | | | |
| BROOKLYN | 4 | 3 | ARMSTRONG I | 10 | 9 | | | X | | | | | | | X | | | | | | 2 | | | | | | |
| | 5 | 8 | ARMSTRONG I | 11 | 9 | | | | | | | X | | | | | | | | | 1 | | | | | | |
| | 6 | 1 | ROOSEVELT II | 7 | 10 | X | | | | | | | | | | | | | | | 1 | | | | | | |
| | 7 | 5 | ROOSEVELT II | 8 | 10 | | | | | | | X | | | | | | | | | 1 | | | | | | |
| | 8 | 0 | ROOSEVELT II | 9 | 10 | | | | | | | | | | | | | | | | 0 | | | | | | |
| | 9 | 3 | WILLIAMSBURG | 1 | 16 | | | | | | | | | | X | | | | | | 1 | | | | | | |
| | 10 | 6 | WILLIAMSBURG | 2 | 18 | X | | | | X | X | | | | X | X | | X | | | 6 | | | | | | |
| | 11 | 3 | WILLIAMSBURG | 3 | 18 | | | | | X | | | | | | X | | | | | 2 | | | | | | |
| | 12 | 7 | WILLIAMSBURG | 13 | 20 | X | | | | X | | | X | | | X | | | X | | 5 | | | | | | |
| | 13 | 7 | WILLIAMSBURG | 15 | 21 | X | X | | | | | | | X | X | X | X | | | | 6 | | | | | | |
| | 14 | 7 | WILLIAMSBURG | 17 | 21 | X | X | X | | X | | | | X | | X | X | | | | 7 | | | | | | |
| | MANHATTAN | 15 | 5 | CHELSEA | 1 | 11 | | | | X | | | | | | X | | | X | X | | 4 | | | | | |
| | | 16 | 6 | CHELSEA | 2 | 11 | | | | X | X | | | X | | X | | | X | | | 5 | | | | | |
| | | 17 | 8 | POLO GROUNDS TOWERS | 1 | 11 | X | | | X | | | | X | X | | X | X | | | X | 7 | | | | | |
| 18 | | 8 | POLO GROUNDS TOWERS | 2 | 10 | X | | | X | X | | | | X | | X | | | | X | 6 | | | | | | |
| 19 | | 4 | POLO GROUNDS TOWERS | 5 | 10 | X | | | | | | | | X | | X | | | | | 3 | | | | | | |
| 20 | | 10 | POLO GROUNDS TOWERS | 4 | 10 | X | X | | X | X | X | | X | X | | X | | | | X | 9 | | | | | | |
| 21 | | 5 | WAGNER | 1 | 10 | | | | | | | | X | X | | | | | | | 2 | | | | | | |
| 22 | | 5 | WAGNER | 5 | 10 | | | | X | X | | | X | X | | | | X | X | | 6 | | | | | | |
| 23 | | 2 | WAGNER | 6 | 10 | | | | | | | | | X | | | | | | | 1 | | | | | | |
| 24 | | 6 | WAGNER | 8 | 10 | | | | | | | | | X | X | | | | | | 2 | | | | | | |
| 25 | | 5 | WALD | 1 | 11 | | | | | | | | | X | | X | | | | | 2 | | | | | | |
| 26 | | 3 | WALD | 3 | 11 | | | | | | | | | X | | X | | | | | 2 | | | | | | |
| 27 | | 4 | WALD | 4 | 11 | | | | X | | | | | X | | X | | | | | 3 | | | | | | |
| 28 | | 6 | WALD | 5 | 11 | | | | | | | X | | X | | X | | | | | 3 | | | | | | |
| QUEENS | 29 | 4 | INTERNATIONAL TOWER | 1 | 11 | | | | | | | | X | | X | | | | | X | 3 | | | | | | |
| | 30 | 4 | LEAVITT STREET-34TH AVENUE | 1 | 9 | X | | | | | | | X | | | | | | | X | 3 | | | | | | |
| | 31 | 10 | SOUTH JAMAICA II | 12 | 11 | X | X | X | X | | X | X | X | X | | X | | X | X | X | 11 | | | | | | |
| | 32 | 7 | SOUTH JAMAICA II | 17 | 11 | X | | | | X | X | | | X | | X | | X | X | | 7 | | | | | | |
| | 33 | 7 | SOUTH JAMAICA II | 18 | 11 | | | | X | | X | | | | | X | | X | X | | 5 | | | | | | |
| STATEN ISLAND | 34 | 0 | SOUTH BEACH | 1 | 11 | | | | | | | | | | | | | | | | 0 | | | | | | |
| | 35 | 0 | SOUTH BEACH | 2 | 11 | | | | | | | | | | | | | | | | 0 | | | | | | |
| 9+ Significant Defects | | | | | | Total (by Defect) | | | | | | 13 | 4 | 3 | 9 | 9 | 6 | 14 | 16 | 1 | 21 | 4 | 1 | 8 | 4 | 7 | |
| 5-8 Moderate Defects | | | | | | 42% | 13% | 10% | 29% | 29% | 19% | 45% | 52% | 3% | 68% | 13% | 3% | 26% | 13% | 23% | | | | | | | |
| 1-4 Mild Defects | | | | | | | | | | | | | | | | | | | | | | | | | | | |

† Actual age of the roofs at South Beach was determined to be approximately 2 years instead of 11 years.

Descriptions of Roof Deficiencies

| Deficiency | Details |
|---------------------------------|--|
| Aged Caulking Joints | Caulking that is not pliable does not provide a good seal and can allow water to get behind the base flashing and cause leaks. |
| Blisters | Roof blisters are caused by the loss of adhesion of the roofing plies. These area can fill up with air or water and if left untreated, blisters can grow larger and allow more moisture to get into the roof system. |
| Damaged Masonry | Indication of water trapped in the wall and causing damage to the masonry. |
| Damaged Railing | Lack of proper maintenance to railing pitch pockets that can allow water to seep into the roofing system and corrosion from metal railing that causes a reaction to the membrane causing it to deteriorate. |
| Debris/ Vegetation | Can get into or prevent rain water from reach the roof drains, causing standing water on roof that increases the chances for leaks |
| Missing/ Damaged Metal Flashing | Can allow moisture/water to get behind base flashing and enter the roofing system, eventually causing a leak. |
| Open Seams at Base Flashing | Open seams at base flashing will allow water to enter the roofing system causing leaks. The majority of roof leaks occur at the termination points and where penetrations occur. This includes areas such as flashings, edge and perimeter details, scupper, drains and curbs. |
| Parapet Cracks/Displacements | Can cause membrane fatigue and cracks/displacement can be a source for water to enter the wall and get into the roofing system |
| Ponding | Potential causes could be: the original tapered insulation design for drainage may not have created positive flow to roof drains; the roof insulation has been compressed from the weight of the membrane and standing water or the roof insulation has become saturated from leaks and has degraded; and roof sag or low spot over time has causes water to stand instead of running towards the drain. |
| Roof Sag | Low spot in the roofs can be the result of the substrate creep over the years and is often associated with ponding. |
| Staining/Discoloration | A sign of water slowly draining from the roof which can be a source for leaks and can compromise laps and seams and eventually cause leaks. |
| Soft/Spongy Roof Surface | Soft/Spongy spots are caused by the separation of the roof plies, physical stress, poor ventilation, cracking substrate or bad workmanship. Any damage to the surface of the roof or cracking, will allow water to enter the roof system and eventually cause leaks. |
| Worn/Uneven slag | The layer of slag on a built-up roof provides protection from the sun's UV rays which breaks down and dries out the surface and asphalt between layers the roofing system. Once the surface becomes bare, the membrane become susceptible to further breakdown by UV rays as well as punctures, scrapes and cuts from foot traffic and service contractors. |

Roof Deficiencies (Examples)

Roosevelt Houses II (Bldg. #7) 93 Lewis Ave., Brooklyn
Uneven/Worn Slag



South Jamaica Houses (Bldg. #12); 106-16 159th Street, Queens
Blisters/Spongy Spots



Wald Houses (Bldg. #1); 10 Ave. D, Manhattan
Roof Sag



Roosevelt Houses II (Bldg. #7); 50 Stuyvesant Ave., Brooklyn
Algae



Polo Grounds Towers (Bldg. #4); 2991 Frederick Douglass Blvd., Manhattan
Debris



S. Jamaica Houses (Bldg. #12); 106-16 159th St., Queens
Inappropriate Roof Patches



Wald Houses (Bldg. #3); 30 Avenue D, Manhattan
Damaged Base Flashing



Chelsea Houses (Bldg. #2); 425 & 428 W. 25th St., Manhattan
Open Seams at Base Flashing



Williamsburg (Bldg. #1); 90 Maujer St., Brooklyn
Displaced Base Flashing



Williamsburg (Bldg. #13); 171 Scholes St, Brooklyn
Clogged Drain and Debris



Polo Grounds Towers (Bldg. #1); 2937 Frederick Douglass Blvd., Manhattan
Deteriorated Pitch Pocket



Williamsburg (Bldg. #15); 205 Ten Eyck Walk., Brooklyn
Inappropriate Repair at Caulking Joint and Base Flashing



Summary of Compliance with the Warranty Requirements

| | Warranty Requirements | In Compliance? | Comments |
|---|---|----------------|---|
| 1 | Maintain a file on the Roofing System including but not limited to the Guarantee, invoices, and subsequent logs of all inspections performed and repairs that have been made to the roofing system. | No* | Our inspection found 34 of 35 roofs (at 12 of 13 developments) did not have a roofing file with the required documents. |
| 2 | Immediate notification of Manufacturer of Roof Leaks | No | No evidence was found that the manufacturers were notified. No log is maintained and information is not tracked in Maximo. |
| 3 | Semi-annual inspection by an experienced individual | No | Roof inspections were not conducted monthly by the Superintendents and at least semi-annually by the District Superintendents. Only monthly inspections were conducted by the janitorial staff who may not have adequate experience to perform the roof inspections. |
| 4 | Additional inspections after severe weather conditions | No | No evidence was found. No log is maintained and information is not tracked in Maximo. |
| 5 | As-needed preventive maintenance and repairs of roof and related building components: | | |
| | Ballast | No* | 14 of 35 roofs had worn ballast** |
| | Door | No* | Three of 35 bulkhead doors had a broken latch.** |
| | Drains | No* | Two of 35 roofs had a clogged drain.** |
| | Flashing | No* | 21 of 35 roofs had open seams in base flashing that needed maintenance.** |
| | Janitorial Condition/debris removal | No* | Nine of 35 roofs had debris needing clearing.** |
| | Parapet and Railing | No* | Seven of 35 roofs corrosion at railing and pitch pocket that need maintenance.** |
| | Ponding | No* | 14 of 35 roofs had standing water on the roof.** |
| | Roof Fans/Vents | No* | Three of 35 roofs had roof fan hoods that needed securing.** |
| | Roof Membrane | No* | Six of 35 roofs had areas where roof has been patched. All of the patch work was performed by NYCHA's in-house staff according to Maximo.** |
| 6 | Roof Repairs by a Manufacturer's approved Contractor | No* | Of the 709 applicable work orders, repairs were performed by contractors for nine work orders only. Also, we were unable to determine if they were roof manufacturer's approved contractors. For the remaining 700 (98%) work orders, the repairs were performed by NYCHA's in-house staff. |
| 7 | Roof access control policy | No* | Roofs are considered means of egress. However, our examination of the required Skilled Trades Daily Location Log at the developments showed that over 80 percent of the time "roofers" did not sign-in/out.** |

* Partial Compliance

** Observations at the time of our inspections



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

VITO MUSTACIUOLO
GENERAL MANAGER

July 17, 2019

Ms. Marjorie Landa
Deputy Comptroller for Audit
NYC Office of the Comptroller
One Centre Street, Room 1100
New York, NY 10007

Dear Ms. Landa:

This letter is in response to your July 2nd letter which provided the draft Audit Report on the New York City Housing Authority's Preventative Maintenance and Repair on the Roofs Under Warranty – # SE18-059A.

NYCHA is committed to providing safe, clean, and connected communities for everyone who lives in public housing.

While NYCHA agrees with most of the audit recommendations, it should be noted that IT enhancements, new project management system and electronic document storage were initiatives that were already underway, and NYCHA management was aware of some gaps in oversight.

We have included the NYCHA response on the following pages, which provides our responses to each recommendation.

Audit Recommendation No. 1

NYCHA should perform adequate inspections, preventive maintenance, and repairs in a timely manner to ensure that its roofs are protected by the manufacturers' warranty coverage and can be kept in service throughout their expected useful life.

NYCHA Response:

NYCHA will migrate warranty data to the Maximo system. Maximo will automatically generate rooftop inspections (both monthly and semi-annual) for all roofs under warranty. For any deficiencies found, Maximo will generate the appropriate corrective maintenance work order. A warranty check flag will also be displayed stating that the roof is under warranty so that staff will be prompted to follow the procedure for roofs under warranty. Electronic images of warranties will be made available to development staff. All roof warranty data will eventually be stored in Maximo. NYCHA plans to have all roof warranty functionality described in this paragraph in production by December 2019.

Property Management staff will inspect and clear roof drains on a monthly basis and after all rain/snow falls of more than 1 inch of precipitation. Staff will work to schedule Preventative Maintenance work orders. Staff will complete Corrective Maintenance work orders to repair roofs in a timely manner (12 months).

Audit Recommendation No. 2

Perform appropriate repairs to address deficiencies on the roofs as identified in this audit.

NYCHA Response:

NYCHA agrees with the recommendation.

Audit Recommendation No. 3

Investigate prolonged ponding conditions observed by the auditors on 14 building roofs to determine whether the roof insulation has been compressed from the weight of the membrane and standing water, whether the roof insulation has become saturated from leaks and has degraded, whether roof drains are clogged, and whether there are inadequate flows to roof drains. NYCHA should consider using advanced moisture-assessment techniques such as thermal scanning to determine the extent of moisture accumulation.

NYCHA Response:

NYCHA's Capital Projects Division is reviewing the infrared roof thermography reports and work order leak tickets for the top floor apartments at the cited buildings to determine if there is any damage to the roofs.

Audit Recommendation No. 4

Take appropriate action to correct the root cause(s) of inadequate flows to roof drains to mitigate ponding on the roofs.

NYCHA Response:

If the prolonged ponding described in #3 did not do damage to the roofs, then there will be no need to take any action to correct inadequate flow to the roof drain unless it is a clogged roof drain.

Audit Recommendation No. 5

Conduct semiannual inspections of roof conditions in the spring and fall by qualified individuals experienced in roof preventive maintenance and repairs as recommended by the roof manufacturers and the NRCA.

NYCHA Response:

NYCHA's Property Management staff will conduct semi-annual inspections of roof conditions by qualified individuals (12 months).

Audit Recommendation No. 6

Conduct monthly inspections by Development Superintendents in accordance with the current Preventive Maintenance policy and ensure that the superintendents secure proper performance of applicable preventive maintenance responsibilities in accordance with the same policy.

NYCHA Response:

NYCHA agrees with the recommendation. NYCHA's Operations Division will revise a checklist for Development Superintendents to use in this inspection (6 months).

Audit Recommendation No. 7

Conduct roof inspections after major rain events to help timely identify root causes of ponding, and when required consider pumping ponding water off the roof.

NYCHA Response:

NYCHA's Construction, Safety and Quality Department (CSQ) of Capital Projects Division (CPD) has inspected nine (9) newly installed roofs: Tilden Houses (Bldgs. #5 thru #8) on June 24, 2019 and Campos Plaza II (Building #3) on June 27, 2019, and found no issues of ponding. CSQ will continue to randomly inspect completed roof installations as they become available.

Audit Recommendation No. 8

Document the results of all semiannual, monthly, and weather-related inspections, and initiate work orders for the required repairs in Maximo.

NYCHA Response:

NYCHA agrees with the recommendation (12 months).

Audit Recommendation No. 9

To provide proper transparency and accountability, ensure that adequate records are maintained to establish the basis and identify the individuals responsible for any decision to replace a roof during a warranty period, and if applicable, to explain why NYCHA did not exercise the warranty coverage.

NYCHA Response:

Based on the Physical Needs Assessment (PNA) rating for roofs to note the level of deficiency, a Design and Project Management Department representative will visit the roofs being considered for replacement on the Five-Year Plan with the manufacturer. The manufacturer will issue a report that will advise CPD regarding the condition of the roof. Upon further review, it was determined that by virtue of the project being in the approved capital plan, the considerations regarding decision to replace roof were made and approved.

CPD reviewed the Five-Year Plan and determined that the planned roof replacement projects do not have existing warranties.

Audit Recommendation No. 10

NYCHA should develop and implement policies and procedures that ensure that roofs are properly maintained in accordance with the requirements of applicable warranties. Towards that end, NYCHA should adopt the following specific recommendations.

NYCHA Response:

NYCHA's Capital Projects Division and Operations Division will collaborate with stakeholders to update the Standard Procedure.

Audit Recommendation No. 11

Develop a comprehensive policy and procedures manual covering roof inspection, maintenance, repairs, and the preservation and use of warranty coverage, and provide it to appropriate staff, including all Development Superintendents. In developing the manual, NYCHA should consider consulting with subject matter experts, which might include the NRCA, real property management professionals, and roof manufacturers, to identify best practices and to consider whether new technologies may offer NYCHA opportunities to improve its performance of these responsibilities.

NYCHA Response:

NYCHA's Capital Projects Division and Operations Division will collaborate with stakeholders to update the Standard Procedure.

Audit Recommendation No. 12

Consider switching to an electronic filing system at the development level so that relevant documents are readily available.

NYCHA Response:

As previously stated in NYCHA Response to Audit Recommendation No. 1, all roof warranty data will eventually be stored in Maximo.

In addition, the Guaranty and Warranty system managed by CPD is being linked with Maximo to provide access of information to the development project managers.

Audit Recommendation No. 13

Update the standard procedures that touch upon roof inspection, maintenance, repair, and warranty administration to reflect the organization's current operational structure and/or processes.

NYCHA Response:

NYCHA's Capital Projects Division and Operations Division will collaborate with stakeholders to update the Standard Procedure.

Audit Recommendation No. 14

Implement necessary operational changes to facilitate adequate maintenance and repairs of the current roofs.

NYCHA Response:

NYCHA's Operations Division will conduct a full business process review and implement changes from that review.

Audit Recommendation No. 15

Ensure that applicable standard procedures that concern or touch upon recordkeeping for roofs are consistently followed. Specifically, designate RAMs or other appropriate officials to regularly review development-level records to ensure that each development maintains a complete file on its roofing systems, including but not limited to the warranty, invoices, and logs of all inspections performed, repairs that have been made to the roofing systems and contract information for the manufacturer or contractor who replaced the roof(s) at the development, and that the appropriate records are kept up-to-date in Maximo, NYCHA's system of record for asset management.

NYCHA Response:

NYCHA agrees with this recommendation and will implement. As previously stated in NYCHA Response to Audit Recommendation No. 1, all roof warranty data will eventually be stored in Maximo.

Audit Recommendation No. 16

Ensure that appropriate training is provided to relevant staff, especially to the Development Superintendents for administering and enforcing the roof warranties and to janitorial staff for improving monthly inspections and recording conditions on their inspection reports.

NYCHA Response:

CPD will begin to require roof manufacturer's representative(s) to attend project closeout meetings to discuss administering and enforcing the roof warranties with Property Management in September 2019. This requirement will become part of the closeout checklist in eBuilder¹.

NYCHA's Operations Division will provide Development Superintendents with the appropriate training.

¹ eBuilder is a cloud-based project management software used to manage and track the performance of a program or project portfolio. CPD procured this system to manage its portfolio from the initiation of the project through its closeout using a series of workflows. CPD utilizes several modules and processes to manages its portfolio (example cost, schedule, budget, commitment, change order, RFI, design review). The system went live in March 2019 and is currently in the adoption phase.

Audit Recommendation No. 17

Implement a warranty check in Maximo for work orders that involve roof leaks and ensure that the warranty checks are recorded on those work orders.

NYCHA Response:

As previously stated in NYCHA Response to Audit Recommendation No. 1, all roof warranty data will eventually be stored in Maximo. A warranty check flag will also be displayed stating that the roof is under warranty so that staff will be prompted to follow the procedure for roofs under warranty. NYCHA plans to have all roof warranty functionality in production by December 2019.

Audit Recommendation No. 18

Enforce warranties and track warranty claims. Particularly, maintain relevant information such as details of work performed under warranty, if any, voided warranties, if any, and any instance in which a manufacturer has failed or refused to comply with its obligations on a warranty claim, and in any such case determine and document all relevant communications, including whether and when the designated NYCHA employee appropriately notified the Law Department and the resulting action or outcome.

NYCHA Response:

NYCHA's Operations Division will build these recommendations into the revised standard procedure. The details of work information can be stored in Maximo.

In addition, NYCHA's Capital Projects Division will maintain warranties in eBuilder and provide copies to Development staff at the project's closeout meeting. The Development staff will also have direct access to warranties through Maximo.

Audit Recommendation No. 19

Ensure that all necessary labor and material data are recorded accurately and entered in a timely manner in Maximo.

NYCHA Response:

NYCHA will explore how to best capture material data in Maximo work orders.

Audit Recommendation No. 20

Ensure that all roof warranty documents are uploaded in Primavera by CPD in a timely manner.

NYCHA Response:

NYCHA's CPD is uploading copies of the warranties into our project management system - eBuilder. Primavera will sunset at the end of 2019.

Audit Recommendation No. 21

Ensure that all warranty information for roof-projects is maintained and recorded accurately, completely, and promptly in UNIX by the CPD's Analysis & Reporting unit staff.

NYCHA Response:

NYCHA has a new system and will ensure that all warranty information is maintained and recorded accurately, completely, and promptly. In addition, NYCHA's CPD is uploading copies of the warranties into eBuilder.

Audit Recommendation No. 22

Ensure that all IT systems are utilized effectively to realize full benefits of the investments and to help NYCHA management monitor maintenance and repair of its roof assets.

NYCHA Response:

NYCHA has a new system and will ensure that all warranty information is maintained and recorded accurately, completely, and promptly. In addition, CPD is uploading copies of the warranties into eBuilder.

As previously stated in NYCHA Response to Audit Recommendation No. 1, Maximo will automatically generate rooftop inspections (both monthly and semi-annual) for all roofs under warranty. For any deficiencies found, Maximo will generate the appropriate corrective maintenance work order.

Audit Recommendation No. 23

Regularly and systematically maintain and update its information on the costs of implementing the IT systems mentioned in this report- Primavera, Maximo, and UNIX- including, annual licensing fees, and operating costs, for use in performing appropriate cost-benefit analyses as well as for budgeting and planning purposes.

NYCHA Response:

NYCHA's IT fully tracks the implementation costs, on-going license costs, and on-going support costs of both Primavera and Maximo. Primavera is being sunset and replaced by eBuilder. The "UNIX" system has been sunset and will be replaced with functionality in Maximo.

Audit Recommendation No. 24

Ensure that necessary controls are implemented, and those controls are working properly to facilitate transparency of programmatic activities and related information.

NYCHA Response:

NYCHA's Operations Division will conduct ongoing QA of roof inspections and repair work.

Audit Recommendation No. 25

Ensure that the RAMs actively monitor property operations and financial reports, as required.

NYCHA Response:

NYCHA agrees with the recommendation and will implement.

Audit Recommendation No. 26

Develop separate maintenance budget for roofs at development level to help NYCHA assess actual costs vs. budgeted costs and for strategic planning purposes.

NYCHA Response:

NYCHA utilizes Physical Needs Assessment analysis and work order data to assess roof replacement needs.

Audit Recommendation No. 27

Develop and maintain appropriate performance metrics including warranty usage for its roof assets, at the agency and/or at the operations level.

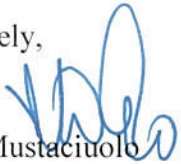
NYCHA Response:

NYCHA's Capital Planning Department maintains condition rating as an indication of roof performance as part of the Physical Needs Assessment records.

We look forward to our continued collaboration with all our stakeholders to improve customer service and obtain the funding required.

If you have any questions, please contact Hyacinth Jeffers, Acting Audit Director, at 212-306-8055.

Sincerely,



Vito Mustaciuolo
General Manager

cc: Kathryn Garcia, Vice Chair
Kelly D. MacNeal, Executive Vice President for Legal Affairs & General Counsel
Robert Marano, Executive Vice President & Chief Information Officer
PV. Anantharam, Executive Vice President for Finance & Chief Financial Officer
Deborah Goddard, Executive Vice President for Capital Projects
Daniel Greene, Acting Chief Compliance Officer
Carolyn Jasper, Acting Executive Vice President of Operations
Cathy Pennington, Acting Quality Assurance Officer and SVP for Information Technology
Tricia L. Roberts, Vice President for Finance
Hyacinth Jeffers, Acting Director, Internal Audit & Assessment