

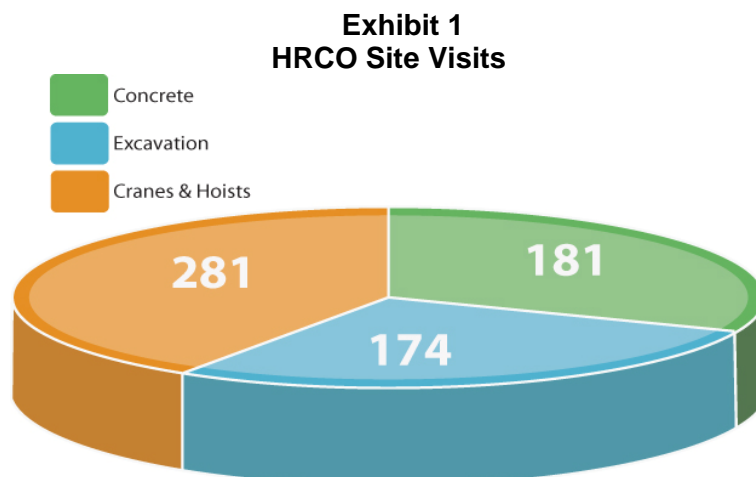
## Introduction

2008 marked the end of a five-year construction boom in New York City. During that time, contractors completed 28,554 new residential, commercial and mixed-use buildings across the five boroughs. As construction began to slow, there was an alarming increase in construction accidents and deaths, and two midtown Manhattan crane collapses brought widespread focus on the dangers in high-rise construction in densely packed cities.

The Department launched the High-Risk Construction Oversight initiative – an intensive study of the three highest risk construction operations: crane and hoist, excavation, and concrete. Engineers and other experts observed New York City’s construction practices at more than 400 sites over 600 times. They consolidated their findings from all five boroughs into 66 recommendations on areas for further study and ways the Buildings Department can improve construction safety and regulation.

## The HRCO Team & Process

A national team of engineers and experts with a wide range of expertise in construction processes conducted the High-Risk Construction Oversight study. CTL Engineers and Construction Technology Consultants, P.C. led this effort. CTL worked closely with Department engineers and other consultants with expertise in cranes and hoists, excavations, and concrete operations. CTL’s site observations were bolstered by meetings with 95 stakeholder organizations in 12 outreach events. They also participated in Department safety conferences with crane manufacturers and building officials from cities around the world. In addition, HRCO experts conducted a benchmarking study. This study compared New York City’s regulations and construction practices to those in 16 other jurisdictions. The examination revealed that the Department has stronger site safety protocols and crane regulations than its counterparts.



### **Defining & Addressing High-Risk Construction Operations**

By analyzing historical accident data, the Buildings Department determined that a disproportionate share of construction accidents occurred during crane and hoist, excavation, and concrete operations. The HRCO initiative generated a large amount of additional data on these activities, which was used to complement the strides the Department had already made in improving construction safety.

#### Cranes and Hoists

Many types of cranes operate in New York City, and they all require highly skilled and trained operators. Of all crane machinery, tower cranes are the most highly engineered and most sophisticated. Each tower crane is individually designed and engineered for the particular site and structure it will help construct, and the same makes and models have varying designs and operational constraints. Moreover, tower cranes are built on-site, creating more opportunity for user error or mechanical malfunction. Once built, they're used to conduct difficult hoisting activities in cavernous urban landscapes, hundreds of feet above the ground. Similarly, hoists are temporary, external elevators that work crews use to move personnel and material. They're tall, built on-site and require advanced engineering. Improper operation and inadequate maintenance can increase the risk for significant accidents and injuries.

The two unrelated tower crane collapses in Manhattan and countless others worldwide in 2008 highlighted the immediate need to improve tower crane oversight and coordination. During 2008, the Buildings Department:

- Instituted tough new crane jumping protocols;
- Mandated new training requirements for workers climbing, assembling and disassembling tower cranes;
- Prohibited tower crane hoisting operations with nylon slings, unless recommended by the crane manufacturer;
- Launched a crane inspection sweep;
- Enhanced Department inspector training;
- Required independent tower crane certification before assembly; and
- Testified before a congressional committee to support strengthened OSHA tower crane regulations.

#### Excavations

Excavation work is the first step in a new building construction project. During these operations, workers dig deep, clearing out old foundations, rock and other impediments to laying a foundation for a new building. Excavating is particularly challenging in New York City, where there is little undeveloped land. Proper excavation work demands highly specialized engineering to protect people and property. When this work is done incorrectly it can undermine the

stability of neighboring buildings, often leading to lawsuits over property damage among building owners.

The HRCO study builds upon the Department's progress advancing excavations safety. In 2007, Buildings launched the Excavations Inspections and Audits unit. Since then, the number of excavations accidents where people have been injured or killed decreased – from 8 in 2006 to 2 in 2008. Our excavations inspectors, examiners and engineers have:

- Conducted 5,300 inspections, and issued more than 3,200 violations and more than 900 Stop Work Orders;
- Audited 500 excavations plans;
- Provided extensive industry outreach and training; and
- Mandated preconstruction surveys and monitoring under the new NYC Construction Codes.

### Concrete Operations

Concrete operations encompass numerous processes, the most common of which entails constructing large wooden frames. Once the frames are built, they're strengthened with shaped steel reinforcement bars called "rebar." Contractors then pour concrete into these reinforced frames to create a building's new floors. As a structure rises, this process becomes increasingly challenging. The Buildings Department has focused on concrete operations in recent years, and the HRCO findings will build upon Department initiatives already implemented, including:

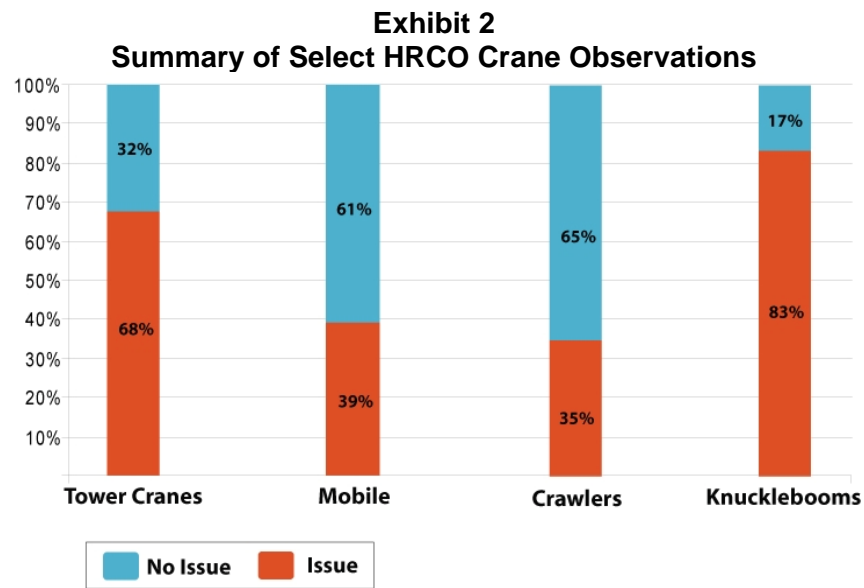
- Mandated fall-prevention safety straps embedded into concrete, tested and inspected regularly;
- Enhanced requirements for contractors' Special Inspections;
- Advanced training and certification for highly specialized Department inspectors;
- Mandated High-Rise Contractors to hire Concrete Safety Managers; and
- Expanded "Major Buildings" categorization under the new NYC Construction Codes, applying safety regulations to additional buildings.

## HRCO Findings

The High-Risk Construction Oversight initiative was a \$4 million investment that yielded opportunities to make construction safer for the people who work, visit and live in New York City. The HRCO experts outlined 66 steps to improve construction safety: 32 in crane and hoist activities; nine for excavations; and 25 in concrete operations.

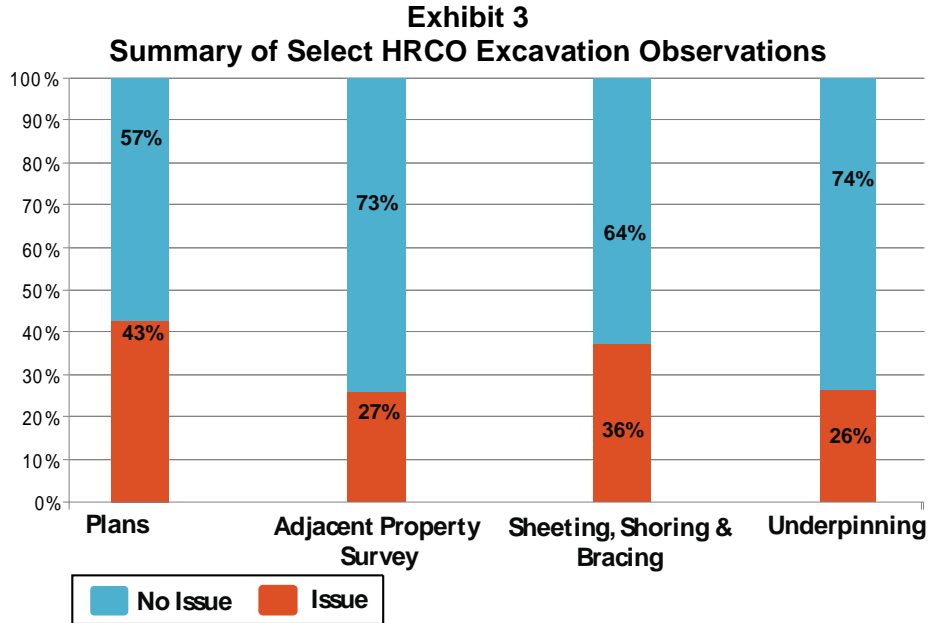
### Cranes & Hoists Findings

The safety strategies to improve crane and hoist operations stem from 269 inspections and information gathered from 10 major tower and mobile crane manufacturers. The HRCO team also interviewed more than 300 people who own, rent and work with cranes and hoists. This intensive research and analysis will improve inspection protocols, enhance equipment and performance standards, improve field operations, and raise maintenance and repair standards. See Exhibit 2.



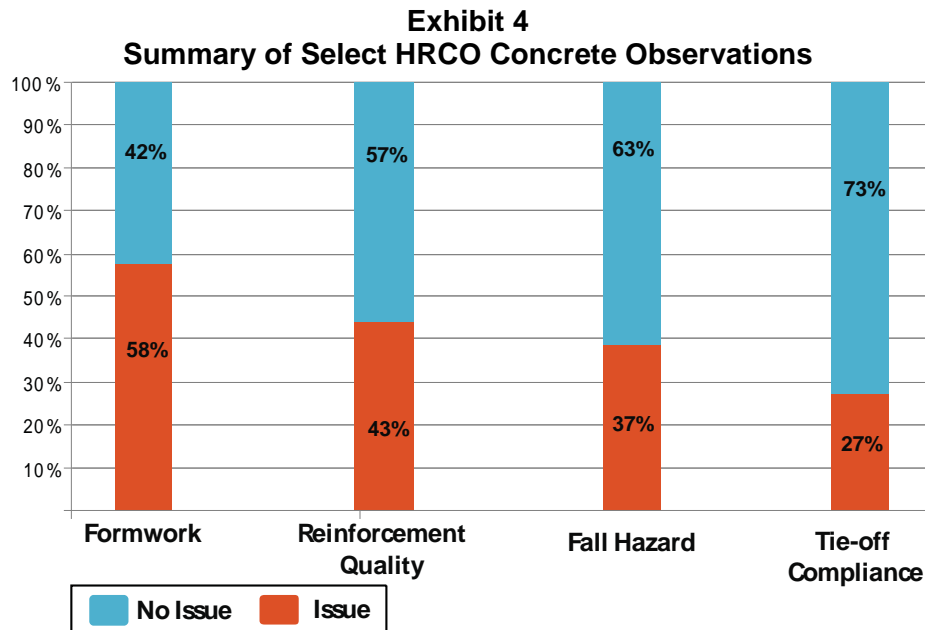
### Excavations Findings

When analyzing New York City excavations operations, CTL expanded the Department’s excavations oversight by inspecting 74 active excavation sites and reviewing 68 sets of excavation plans. These experts found opportunities for improvement in: excavation plans; surveys of adjacent properties; sheeting, shoring and bracing; and underpinning. See Exhibit 3. These findings led to recommendations to establish drawing design standards, strengthen protection for adjacent structures and improve the safety of work performed in the field.



Concrete Findings

To thoroughly understand concrete processes, the HRCO team inspected 68 concrete operations sites. These experts found key safety concerns in formwork, the quality of reinforcements, fall hazards and tie-off compliance. Exhibit 4 summarizes these concerns. The inspection results led to recommendations on potential ways to strengthen inspections, improve construction site safety practices and increase accountability for those failing to follow safety regulations and procedures.



### **Implementing the HRCO Recommendations**

The HRCO experts drafted 66 safety recommendations, which include key areas Buildings should study further and changes Buildings should implement. The Department has already begun carrying out the HRCO recommendations. For example:

- The Department has formalized a tracking agreement with Chicago and Philadelphia to share tower crane information on operational history and fitness;
- Buildings has significantly strengthened the Cranes and Derricks unit with specialized field training for inspectors and sophisticated software and field training for plan examiners;
- The Department is running a seven-language outreach campaign urging construction workers to wear their safety harnesses and tie them off properly; and
- Buildings Department inspectors are now undergoing heightened concrete inspection training.

These steps are part of an ambitious two-year implementation plan now underway. During this period, the Department will be launching an array of initiatives focused on studying key issues, improving the construction industry's practices and strengthening regulations. The Department has outlined each HRCO recommendation, along with the key milestones indicating how it will incorporate them into industry regulation and Agency practice. This plan will evolve as the Department refines its implementation strategy.