2017

NYC Buildings

Forensic Engineering: Existing Buildings, Alterations and New Construction

Course Number SW0517

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BUILD SAFE / LIVE SAFE
CONFERENCE

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Course Description

- This course will discuss the complexities of the structural evaluation and assessment of existing buildings in New York City. The intent is to bring to light the numerous Code requirements governing existing buildings, which set forth minimum standards for identification of safe, unsafe and in-between conditions.
- The course will give a brief overview of how to determine the vintage of a building, how to ascertain the relevant building codes, and why this is important. We will also discuss issues related to un-engineered and poorly engineered buildings, as well as temporary construction, and how these conditions may lead to structural failure. Finally, we address the impact such structural failures can have on public safety and the adverse effects on adjacent properties.
- This course will include several case studies which will serve to elaborate on the concepts described above.

Learning Objectives

At the end of the this course, participants will be able to:

1. Review ways to determine the vintage of a building and why this knowledge is critical in evaluating its structure as it relates to historic building codes.
2. Discuss un-engineered, poorly engineered, and temporary structures and be able to identify the unique risks associated with such structures, especially as it relates to failures.
3. Review the knowledge of the building vintage, historic codes, and structural evaluation in order to appropriately assess and be able to determine structurally compromised building conditions.
4. Learn how to evaluate a structurally compromised building and assess the impact the condition may have on public safety and the threat to adjoining properties.

FORENSIC ENGINEERING UNIT (FEU)

- Created in 2005
- Mission is to support the Agency's incident response at the highest level of engineering capacity
- Secondary mission is to provide engineering support for any emerging special need and trend developing in the Agency

NOTE: Sweeps include bowstring; monopoles; BIB; gas station canopies

FORENSIC ENGINEERING UNIT

- Provides the Agency with engineering competence for incidents, collapses, fires, weather events
  - Site management in real time
- Enforces DOB laws, rules, bulletins, policies and processes
- Provides industry outreach
- Responds to incidents by stabilizing and making a property safe when owner fails to act
- Prepares engineering reports

FORENSIC ENGINEERING UNIT

NOTE: FEU with NYCEM

Who We Work With

Other Units

- ERT
- BEST
- BEI
- OBM
- Excavation
- Special Ops
- Legal/UB
- IGA
- BSIU

Outside Agencies

- FDNY
- NYPD
- NYCEM
- HPD
- LPC
- DDC
- DOE
- DSNY
- Law Dept.
- City Hall
- ConEd
- DA's Office

WHO WE WORK WITH

(continued)

Private Sector

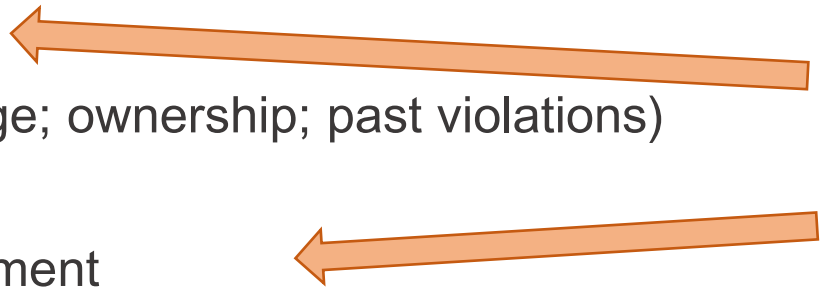
- ❑ Owners
- ❑ Property Managers
- ❑ Engineers
- ❑ Architects
- ❑ Expeditors
- ❑ Attorneys

INCIDENTS CAN LEAD TO INVESTIGATIONS

- Additional agency and private sector coordination
- Court appearances
- Depositions
- FOIL requests

General Approach: Incident/Referral

1. Response
   a. Incident → Immediate
   b. Referral → Scheduled (Triage Jobs)
2. Research
   a. Historic
      (Building vintage; ownership; past violations)
   b. Code
3. Inspection/Assessment
4. Action
   a. Emergency Orders (IED; Emergency Work Summons)
   b. Summons (DOB vs OATH; Class; Cure/Remedy)
5. Follow Up
   a. Audits
   b. Meetings



Can happen in reverse order or concurrently

Relevant Code Sections

- **§28–105.4.1** – Emergency Work *(by Owner)*
- **§28–215.1** – Emergency Work *(by City)*
- **§28–301.1** – Owner's Responsibilities - Safe: Failure to Maintain
- **§28–207.4** – Vacate Order
- **§28–216.1** – Conditions constituting an unsafe building or structure

CASE 1: LEANING BUILDING (EXISTING)

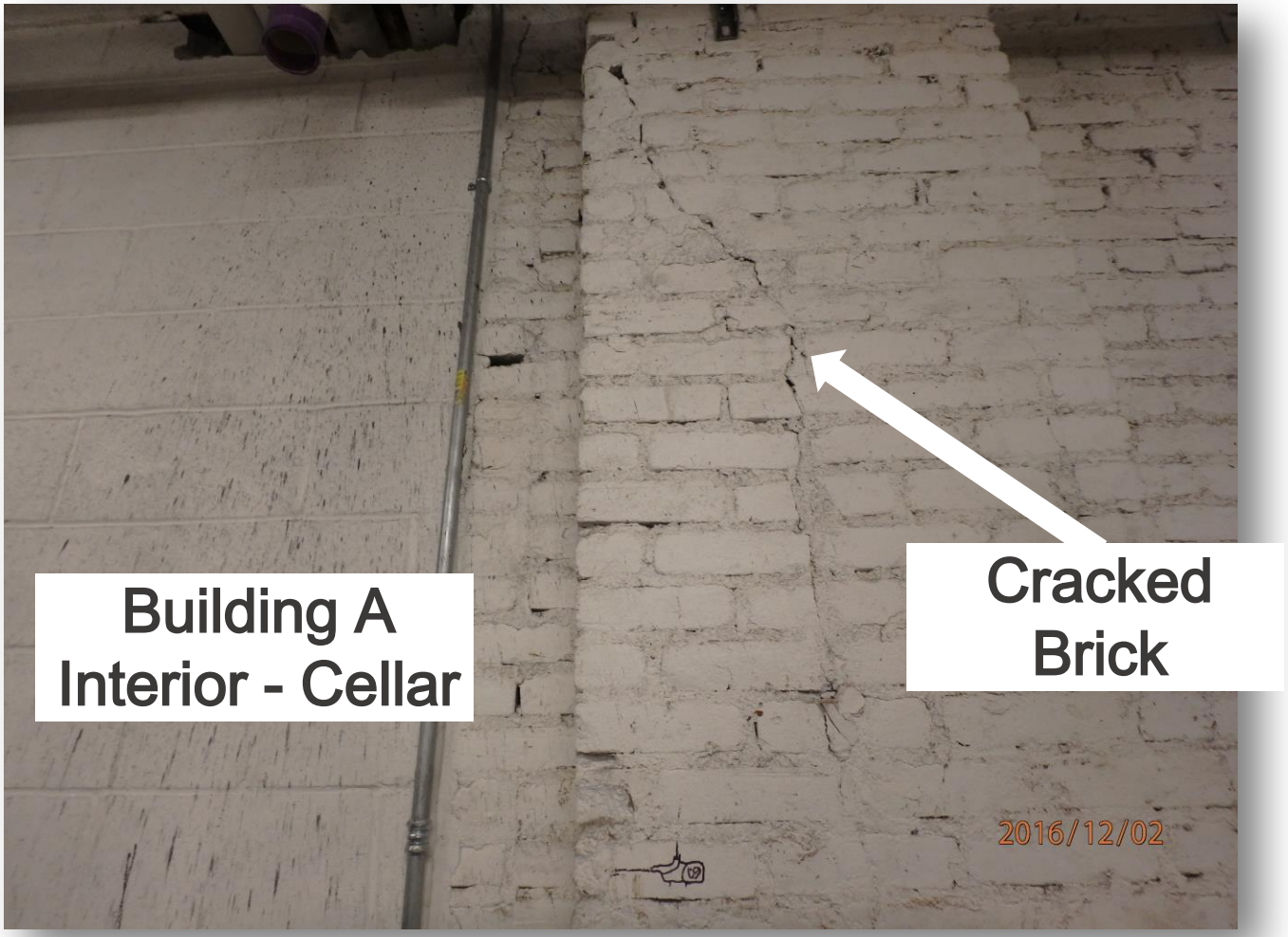
- Referral from BSIU
- Complaint was for a gap between buildings

CASE 1:
LEANING BUILDING – MAGNITUDE

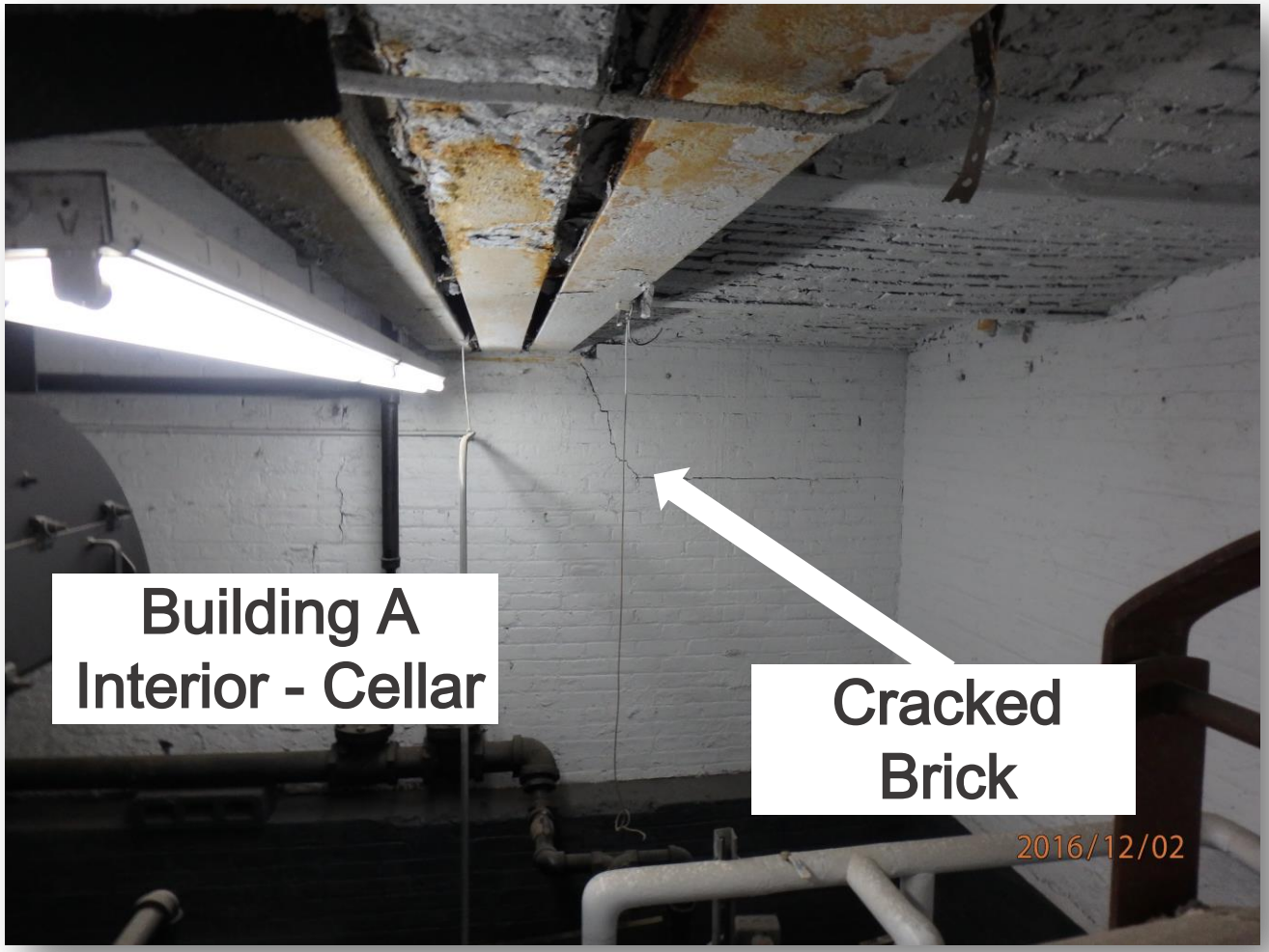
CASE 1: RESPONSE

- FEU site visit to both buildings with Owner, geotechnical engineers
- In-house meeting with Owners, engineers
- Extensive research into history of building construction as well as geology of the area

CASE 1: INSPECTION

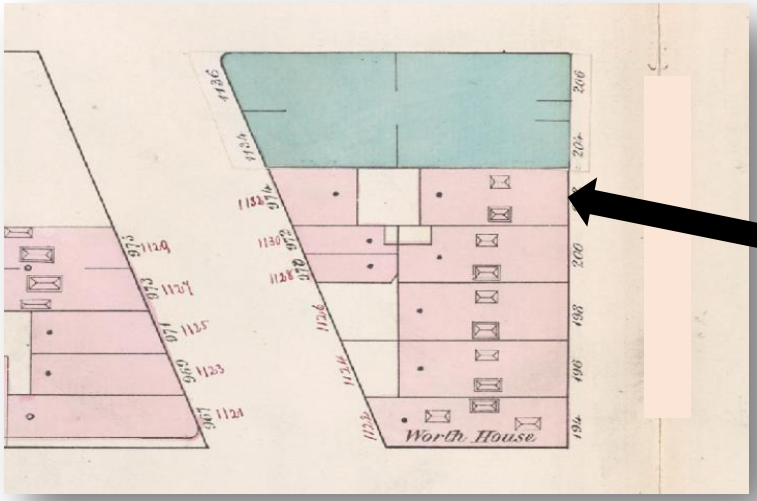


CASE 1: INSPECTION



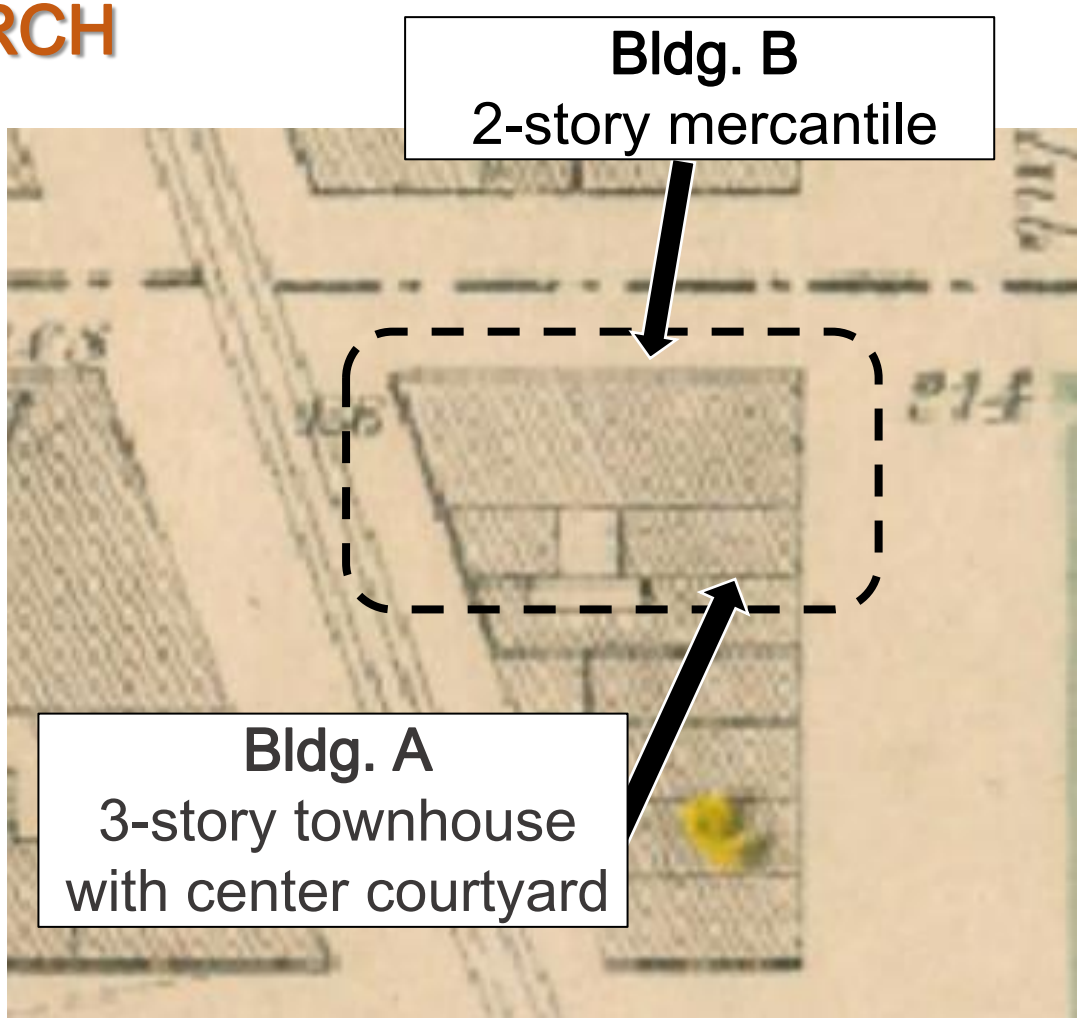
CASE 1: RESEARCH

- Construction of buildings determined from historic tax maps
  - 1852 – nothing on site
  - 1857 – Building A lot has 3 story townhouse



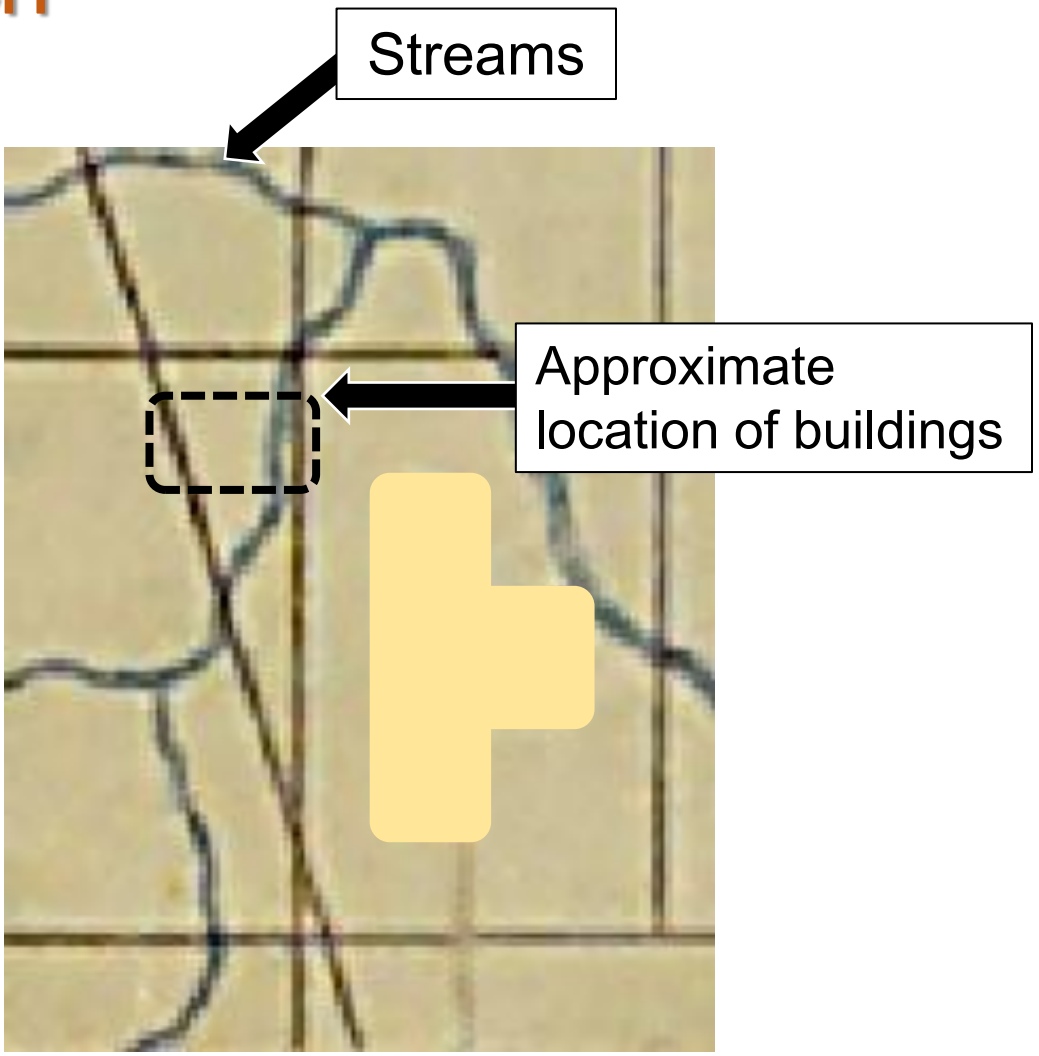
CASE 1: RESEARCH

- Buildings on both lots by 1860
- Both buildings vertically enlarged to four (4) stories by late 1800s
- Extensions were made on original foundations



CASE 1: RESEARCH

- Research into the geology of the site showed this



CASE 1: RESEARCH/ASSESSMENT

1901

Original 4-story **Bldg. A** is demolished and replaced with an 11-story building

- Added load to original foundations
- Constructed frame within building and new foundations
- Unsuitable/compressible soils likely overloaded
- Significant uniform settlement likely begins

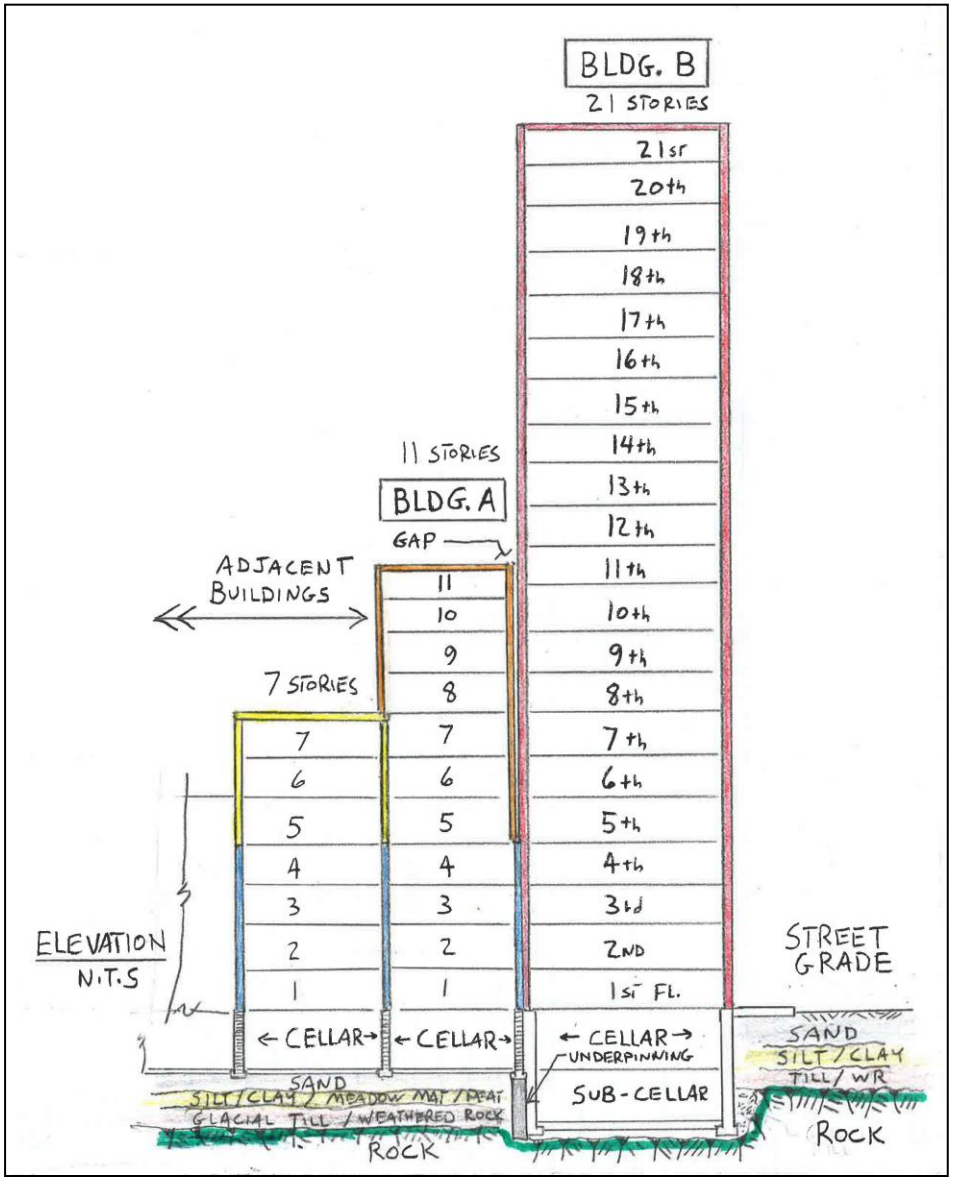
CASE 1: RESEARCH/ASSESSMENT

1912

Original 4-story **Bldg. B** is demolished and replaced with a 21-story building

- Excavated 30ft. deep into weathered rock for Bldg. B foundations
- Underpinned **Bldg. A** north wall to bedrock
- South foundation wall of **Bldg. A** remains on partially unsuitable soils

CASE 1: ASSESSMENT



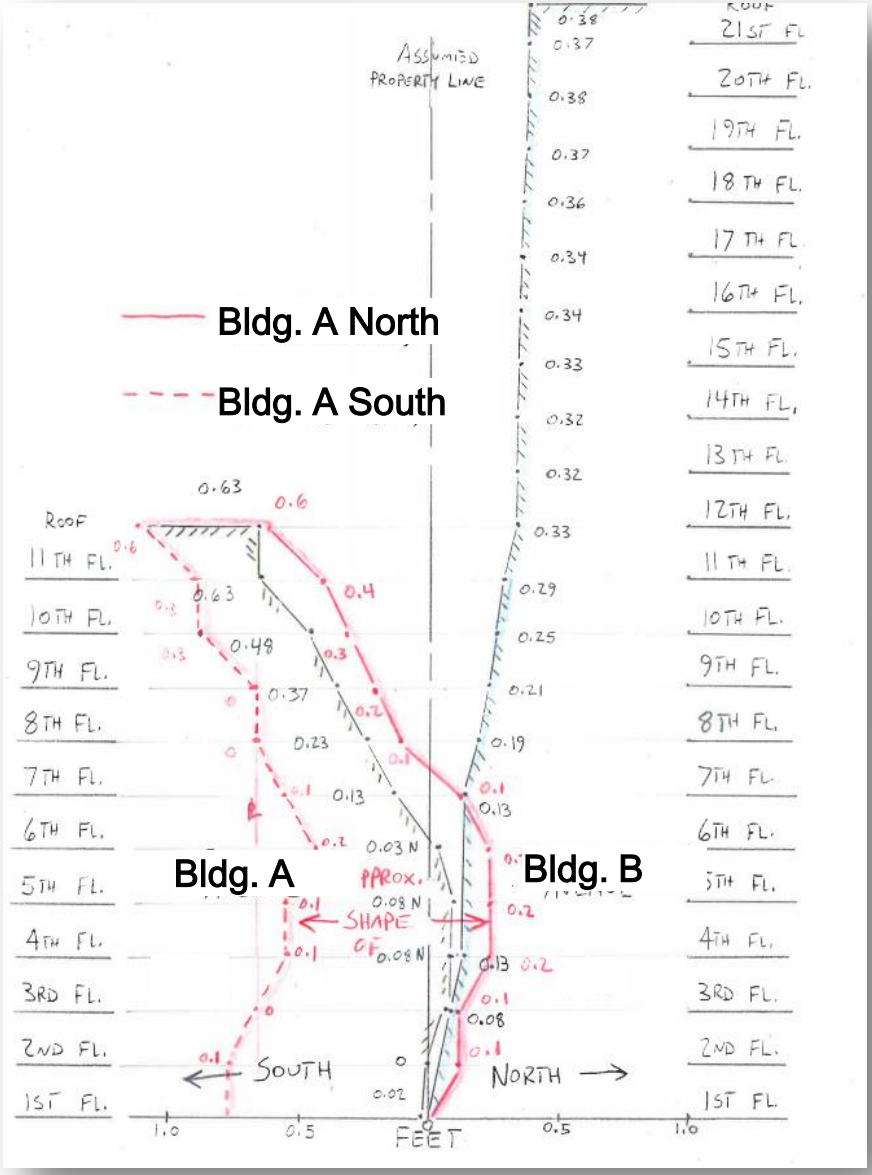
CASE 1: ACTION

- FEU issued similar Commissioner's Orders to both buildings
  - Owners to provide property line surveys
  - Determine compliance with the code (walls plumb, straight and true)

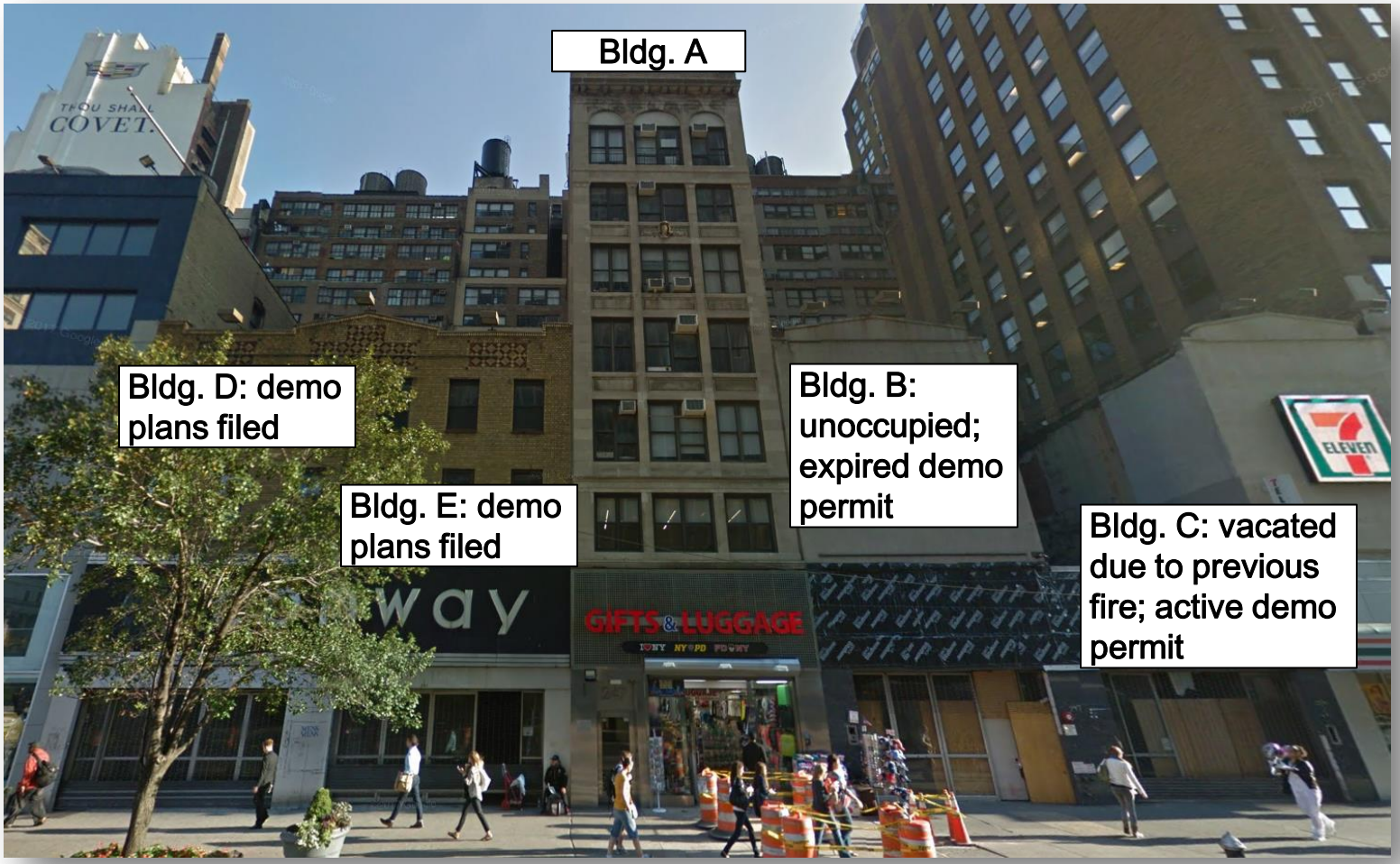
- Additional order to **Bldg. A** for foundation investigation
  - Test pits: material type, conditions, footing, soil classification
  - Soil borings and other testing: subsurface conditions
  - Analysis: building loads, estimate history of settlement/differential settlement

CASE 1: FOLLOW UP

- Which building is leaning in which direction?
- Both buildings will be required to submit building surveys a minimum of once every five (5) years to coincide with FISP reports



CASE 2



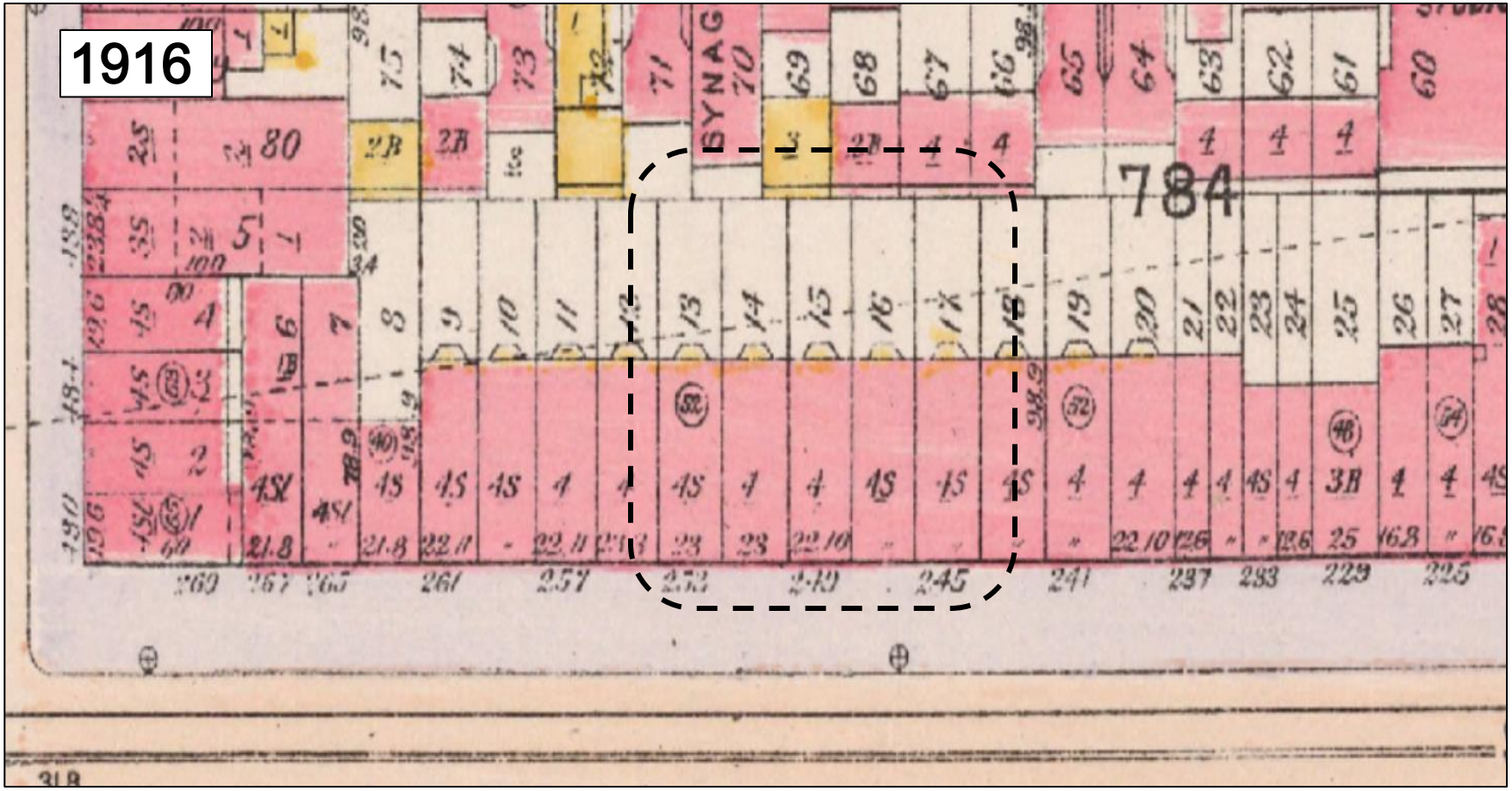
NOTE: Buildings B thru E owned by same company; Bldg . A has different owner

CASE 2: ALTERATION

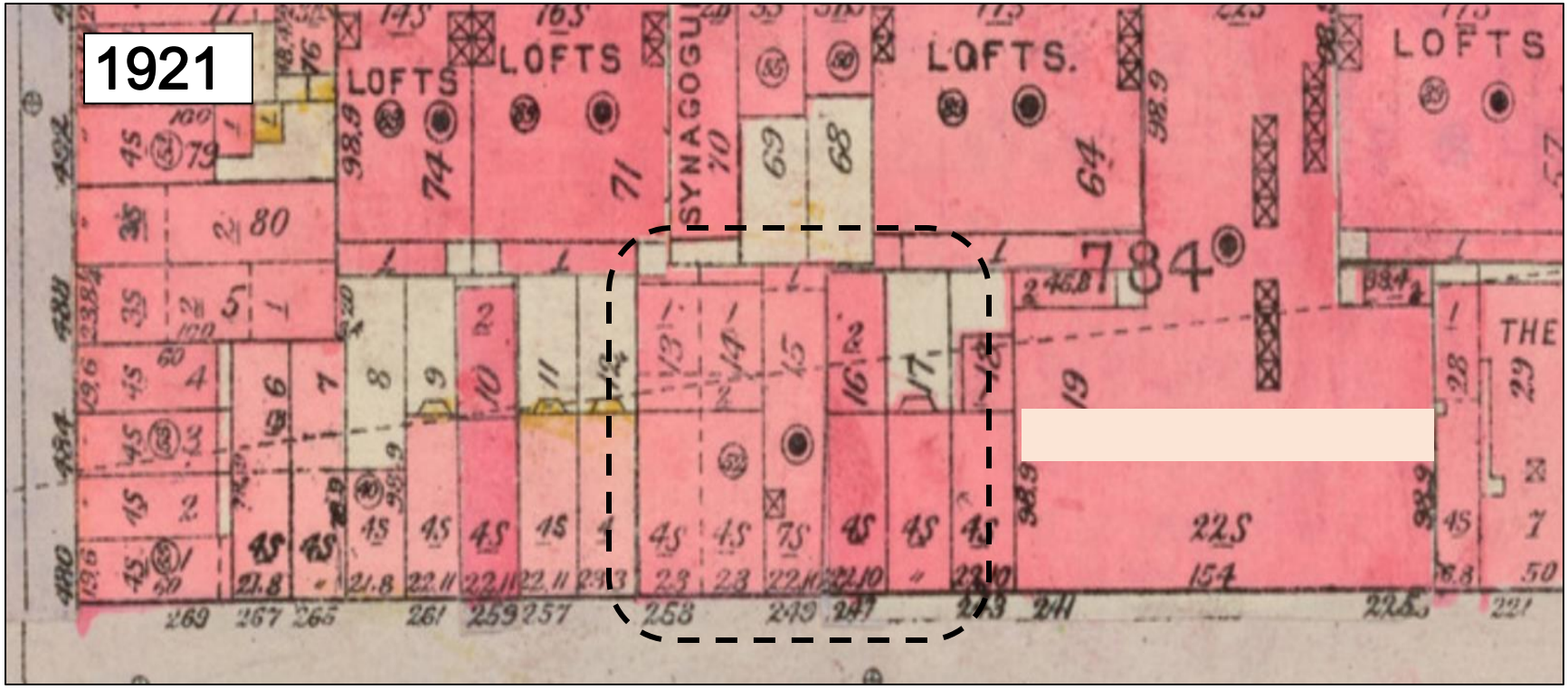
- Referral from: IGA
- Stalled demolition site
- Extensive damage/deterioration due to long term lack of maintenance
- Fire damage from year prior
- Heavy Pedestrian traffic/bus route affected
- Response: repeated site visits with owner and engineers

CASE 2: RESEARCH

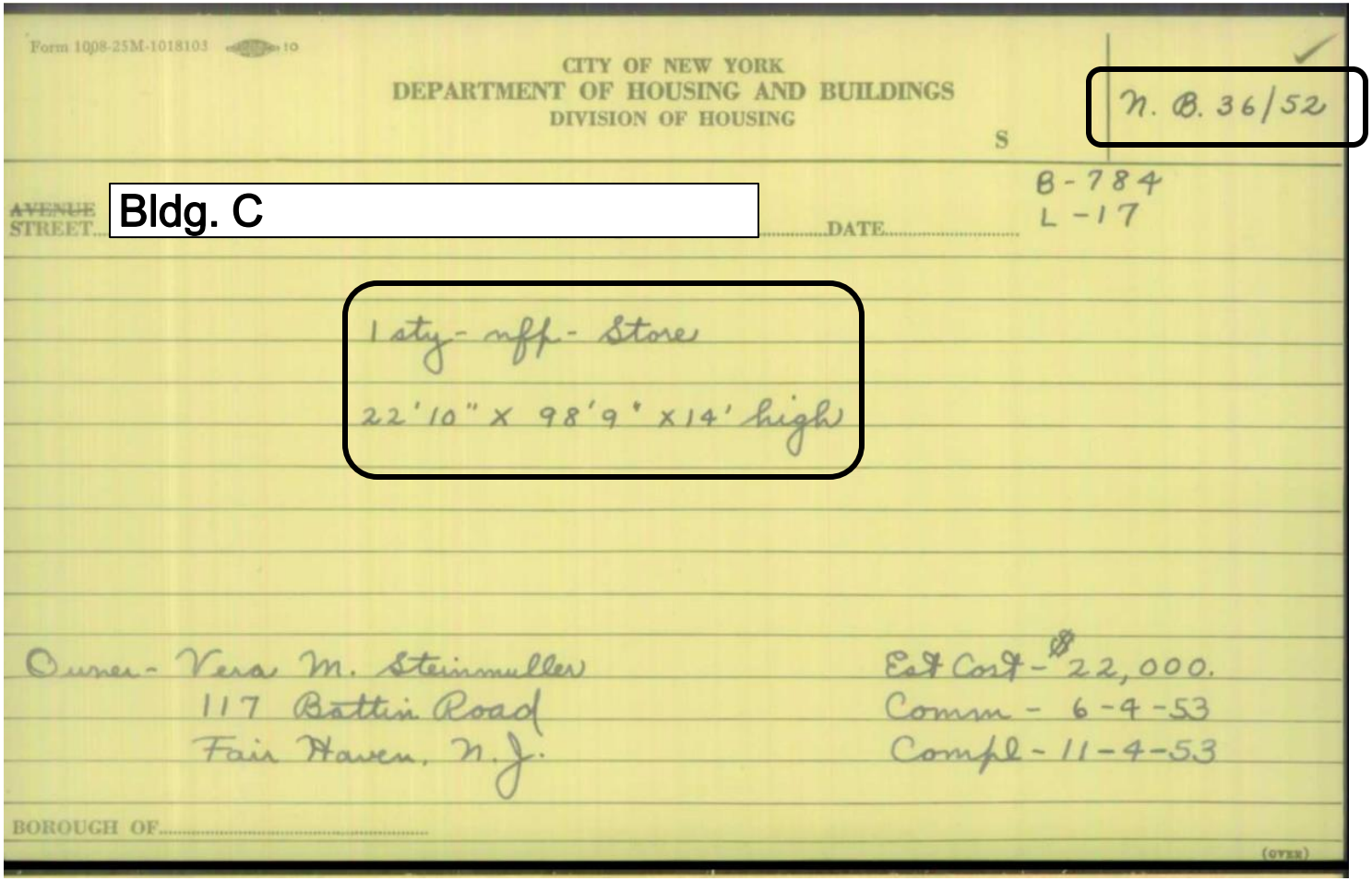
CASE 2: RESEARCH



CASE 2: RESEARCH



CASE 2: RESEARCH



Form 1008-25M-1018103 10

CITY OF NEW YORK
DEPARTMENT OF HOUSING AND BUILDINGS
DIVISION OF HOUSING

N. B. 36/52

S

B-784
L-17

~~AVENUE~~ STREET Bldg. C DATE

1 sty - mfg - Store

22'10" x 98'9" x 14' high

Owner - Vera M. Steinmuller
117 Battin Road
Fair Haven, N.J.

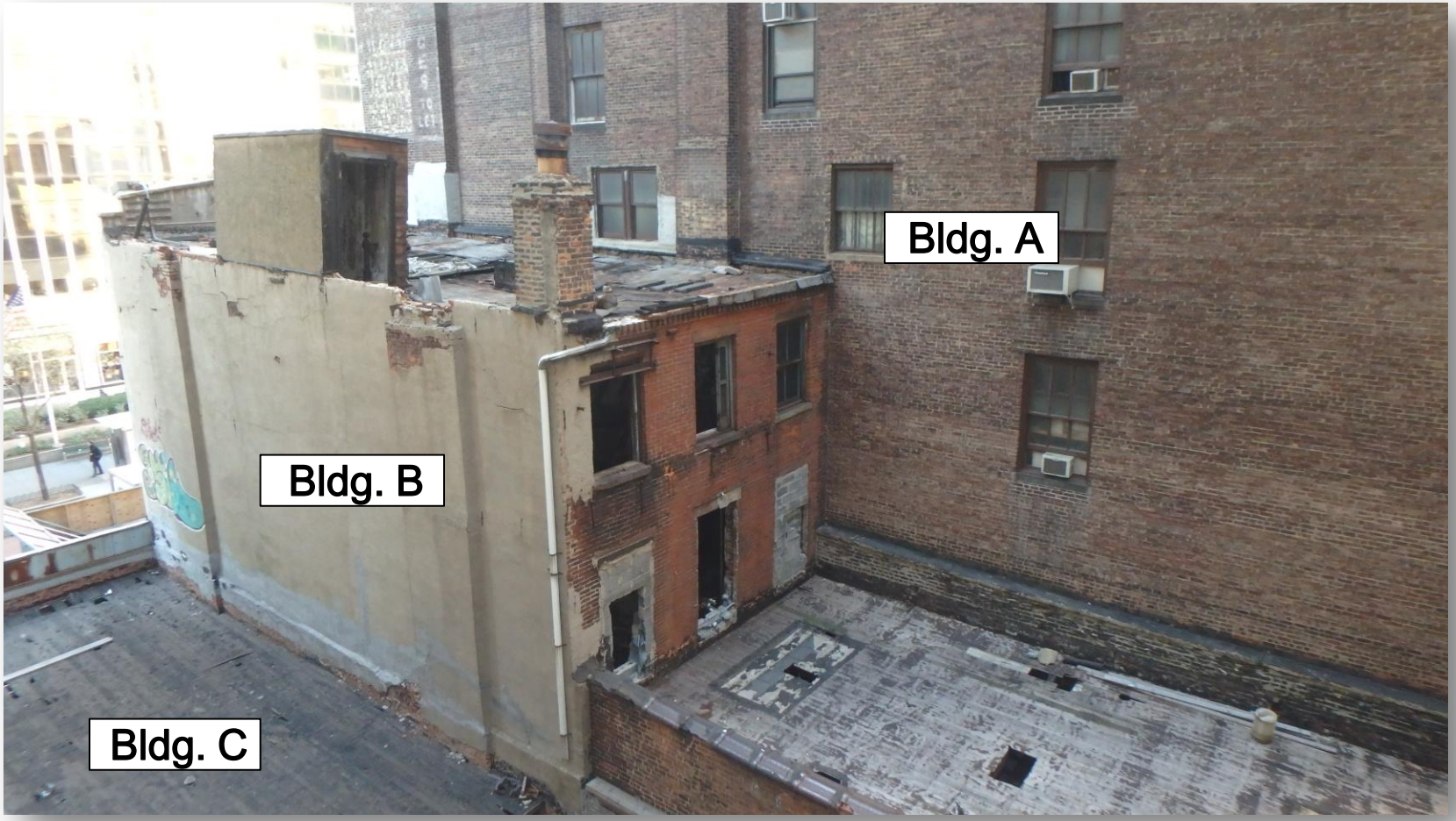
Est Cost - $22,000.
Comm - 6-4-53
Compl - 11-4-53

BOROUGH OF

(OVER)

CASE 2: INSPECTION

CASE 2: INSPECTION



CASE 2: INSPECTION

CASE 2: ASSESSMENT/ACTION

Buildings B, C, D, E

- Fire and water damage
- Roofs compromised
- Wood roof and floor joists rotted and deflecting
- All buildings vacated
- DOB violations issued to effect either full or partial demolition
- All buildings demolished to grade under permit

CASE 2: ASSESSMENT

CASE 2: RESEARCH (1916 CODE)

Per 1916 Code

The front, rear, side and party walls shall be properly bonded together, or anchored to each other every 6' in their height by wrought-iron tie anchors, not less than 1 1/2" by 3/8" in size, and not less than 24" in length. The side anchors shall be built into the side or party walls not less than 16", and into the front and rear walls, so as to secure the front and rear walls to the side, or party walls, when not built and bonded together.

CASE 2: RESEARCH (2014 CODE)

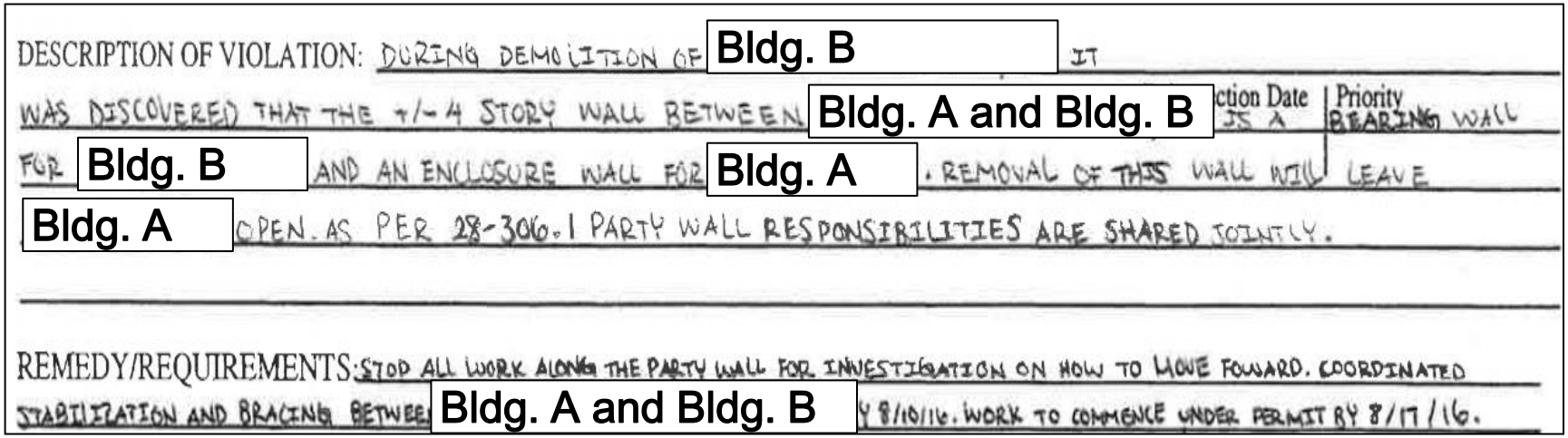
3309.8. Adjoining walls (protection of adjoining property)

When any construction or demolition operation exposes or breaches an adjoining wall…the person causing the construction or demolition operation shall…perform the following:

1. Maintain the structural integrity of such walls and adjoining structure, and have a registered design professional investigate the stability and condition of the wall and adjoining structure, and take all necessary steps to protect such wall and structure.

CASE 2: ACTION

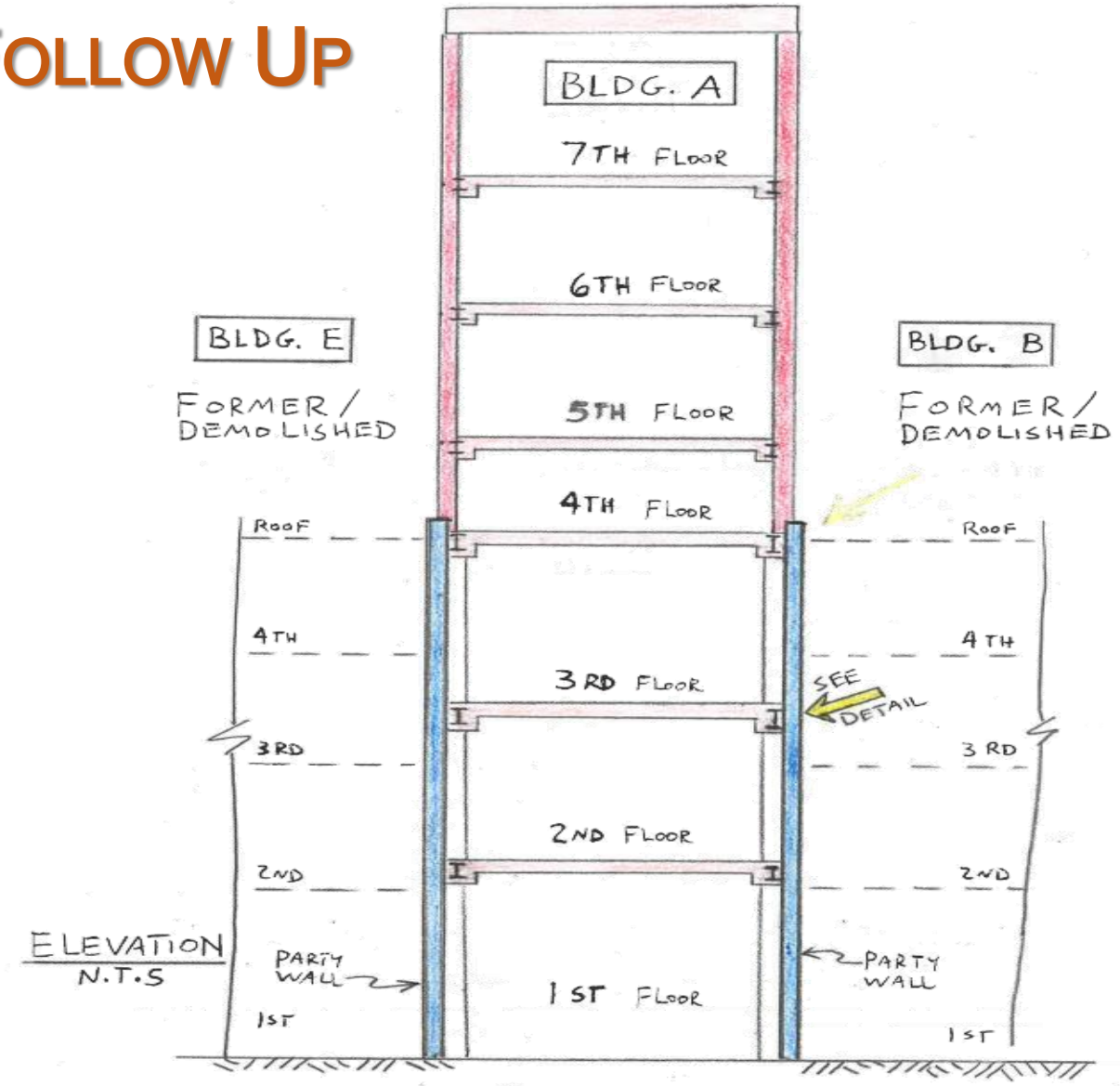
- Stop Work Order on demolition of **Bldg. B** and **Bldg. E**


DESCRIPTION OF VIOLATION: DURING DEMOLITION OF Bldg. B IT
WAS DISCOVERED THAT THE +/- 4 STORY WALL BETWEEN Bldg. A and Bldg. B ction Date JS A | Priority BEARING WALL
FOR Bldg. B AND AN ENCLOSURE WALL FOR Bldg. A . REMOVAL OF THIS WALL WILL LEAVE
Bldg. A OPEN. AS PER 28-306.1 PARTY WALL RESPONSIBILITIES ARE SHARED JOINTLY.

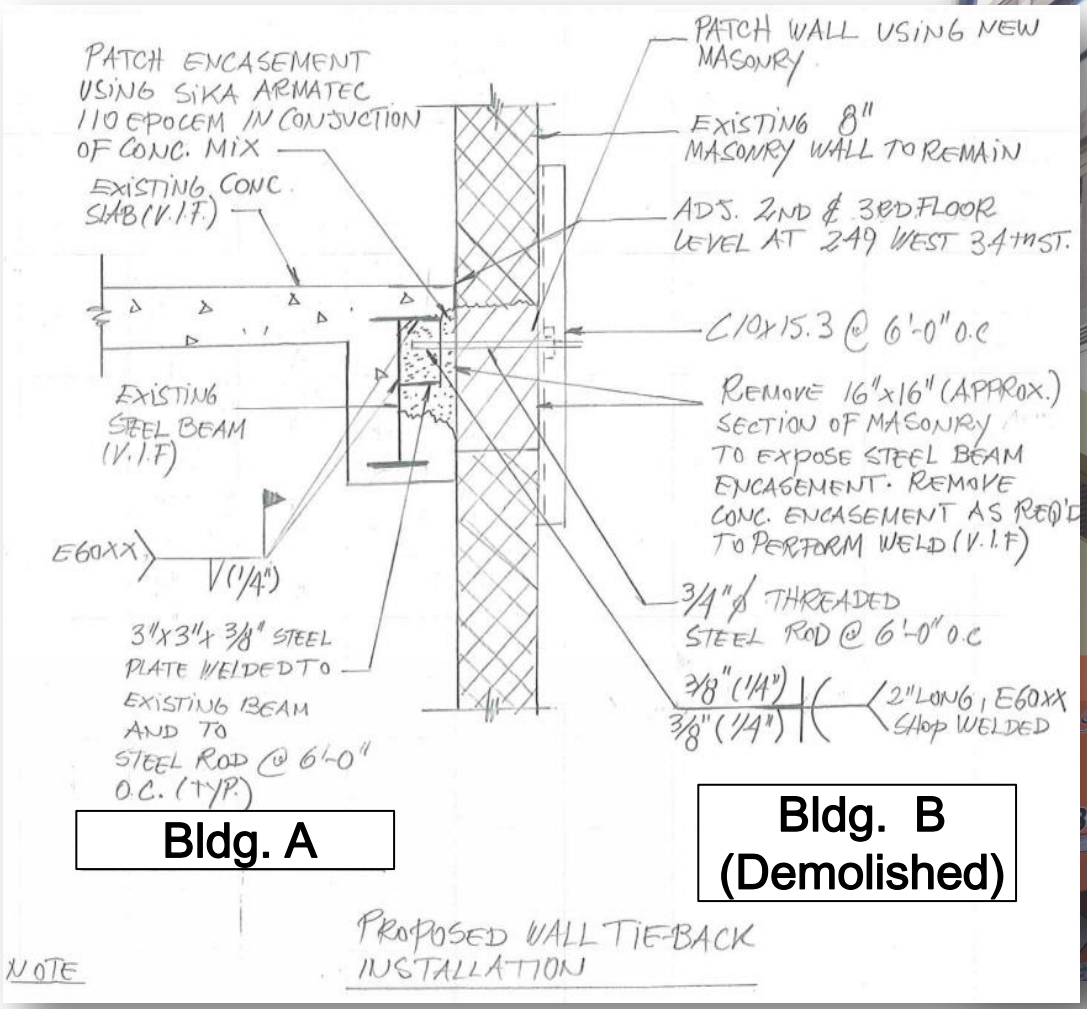
REMEDY/REQUIREMENTS: STOP ALL WORK ALONG THE PARTY WALL FOR INVESTIGATION ON HOW TO MOVE FOWARD. COORDINATED
STABILIZATION AND BRACING BETWEE Bldg. A and Bldg. B Y 8/10/16. WORK TO COMMENCE UNDER PERMIT BY 8/17/16.

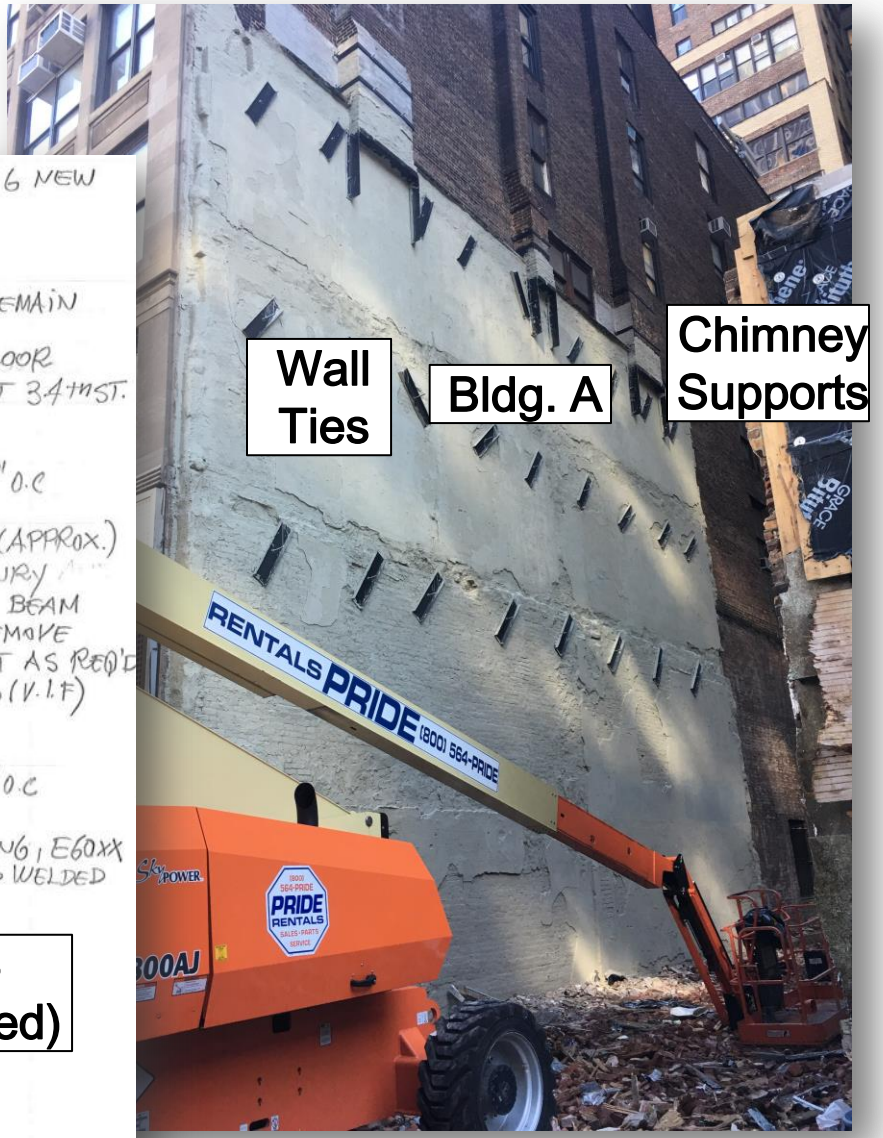
- Work with Owners to resolve the condition

CASE 2: FOLLOW UP

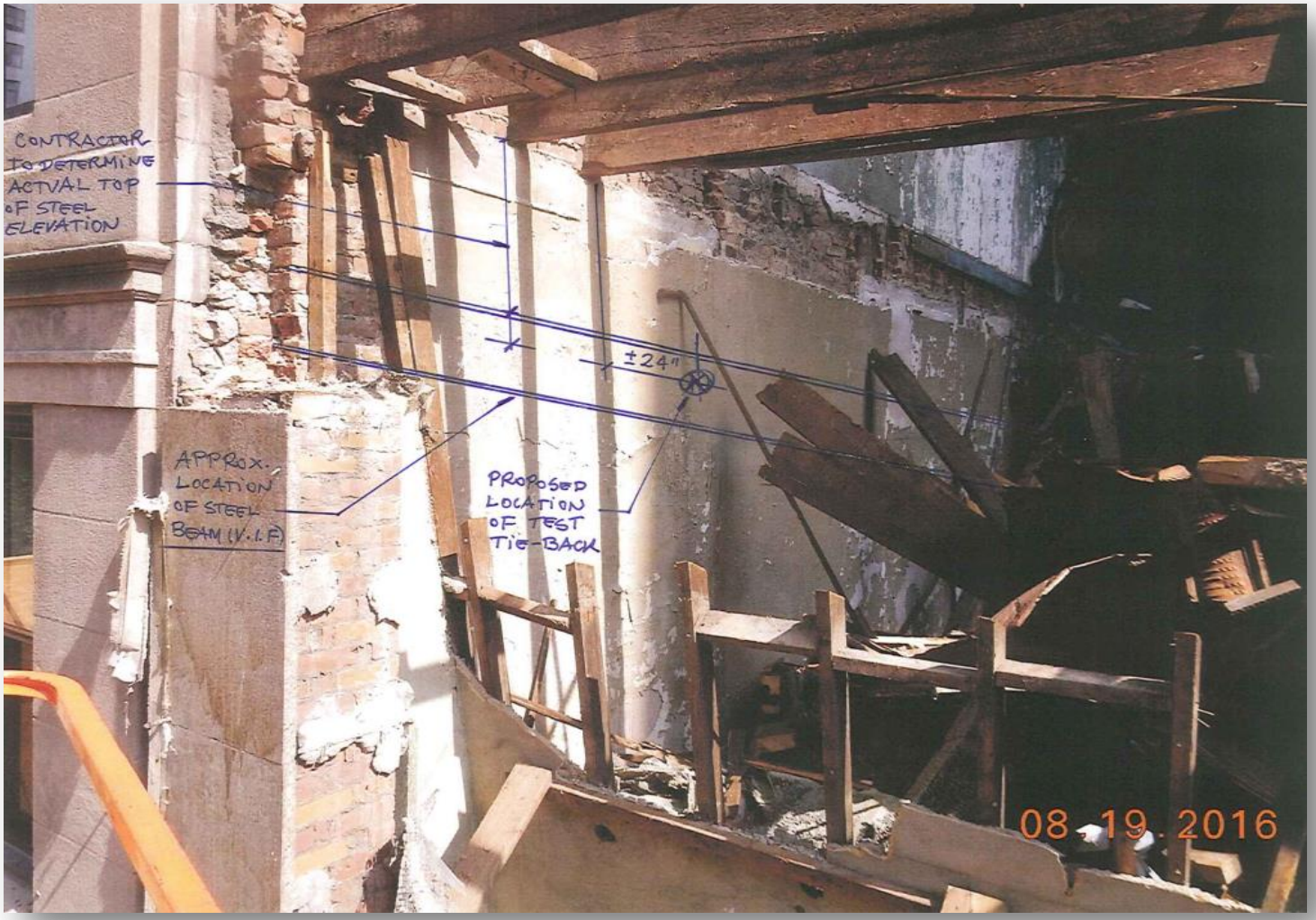


CASE 2: FOLLOW UP





CASE 2: FOLLOW UP

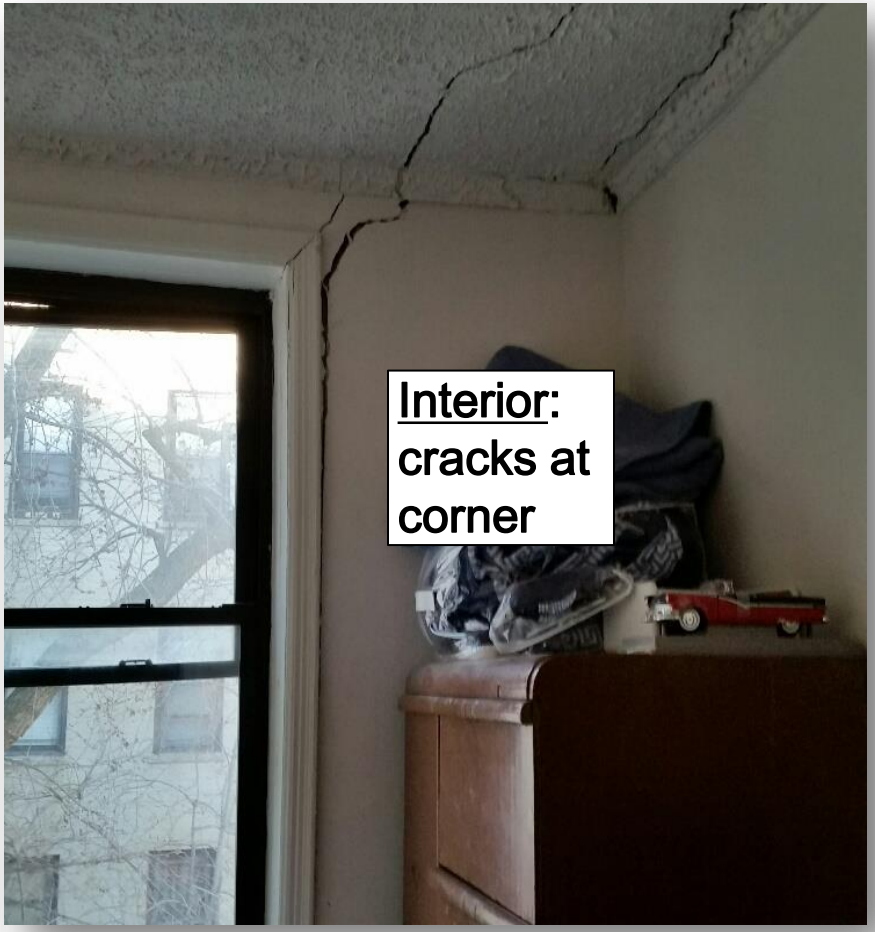


CASE 3 (NEW CONSTRUCTION)

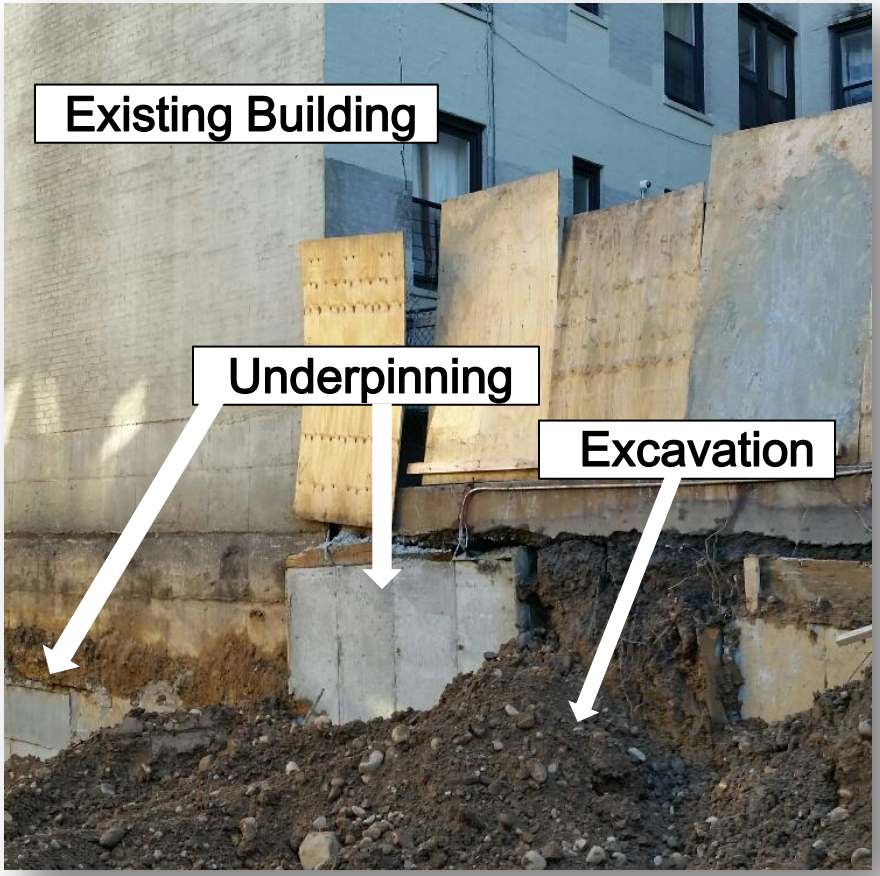
- Referral from ERT
- Report of a construction vehicle hitting the side of an existing building causing cracks from 1st floor to parapet
- Response: **IMMEDIATE**

NOTE: Reported - sound of vehicle hitting building; what may have actually been the sound of the building cracking

CASE 3: INSPECTION



CASE 3: INSPECTION



CASE 3: RESEARCH

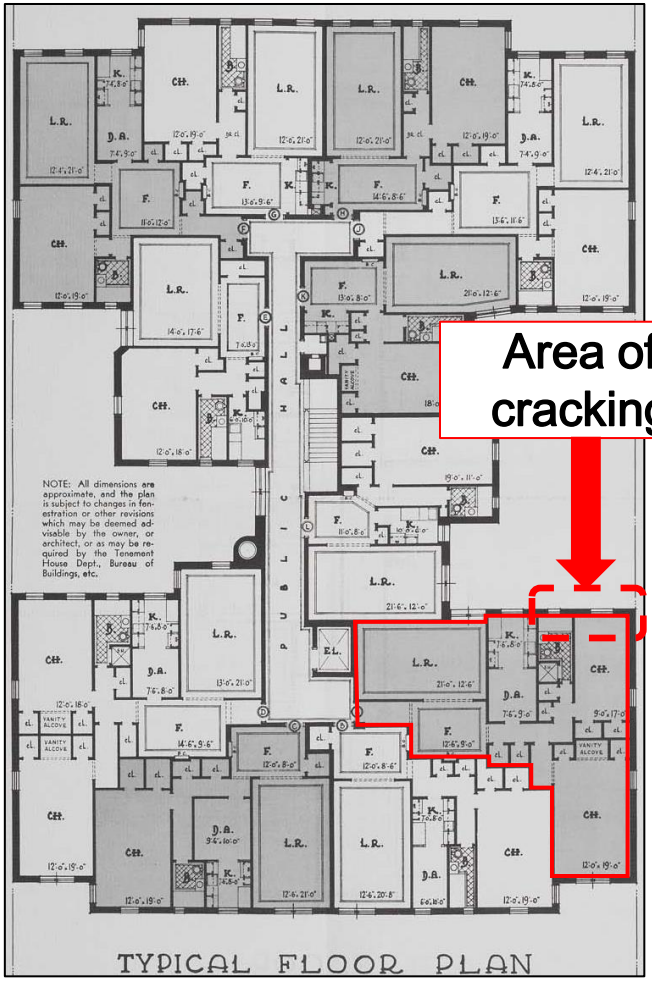
NB Site

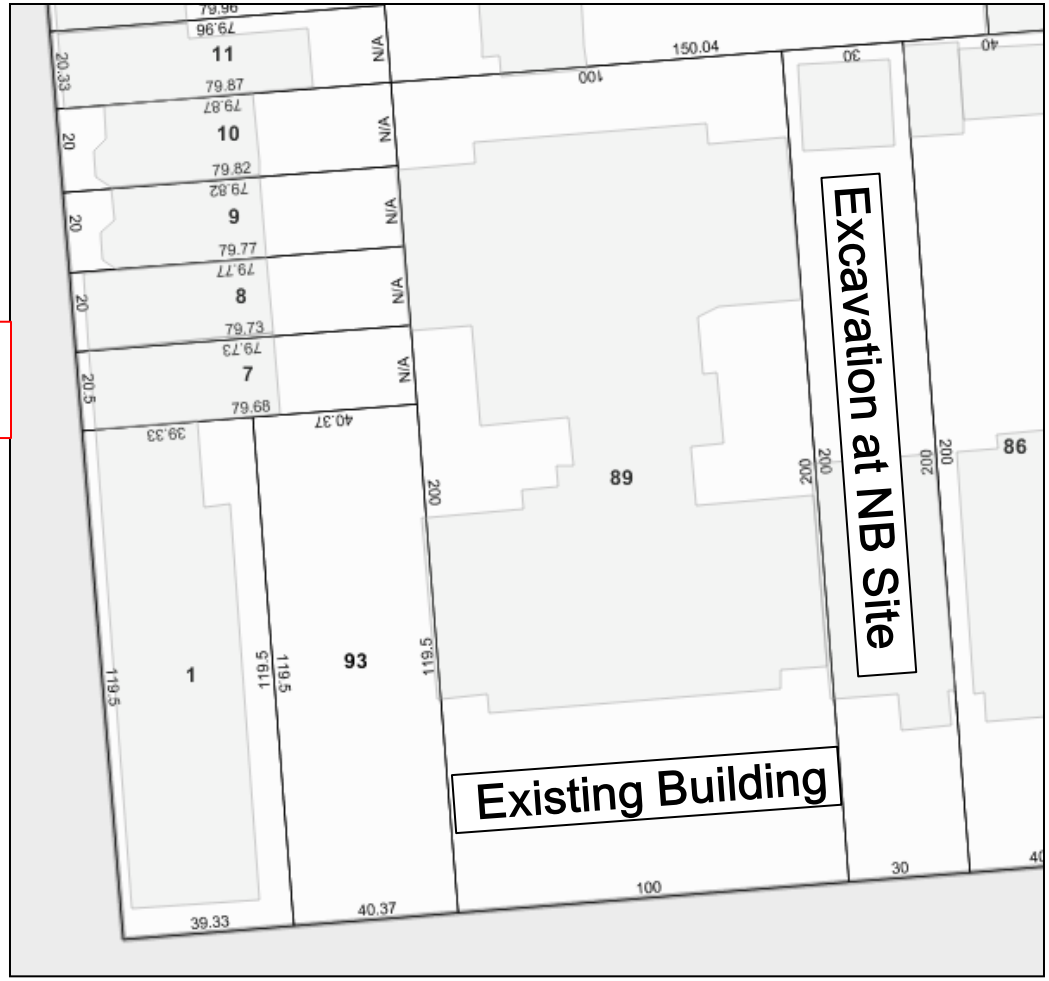
- DM permit issued on 11/29/16 for **demolition of existing building**
- NB Partial permit issued on 1/17/17 for **Proposed new eight (8) story and cellar, twenty eight (28) residential unit building**

Existing Building

- Built in 1939
- No open violations

CASE 3: ASSESSMENT

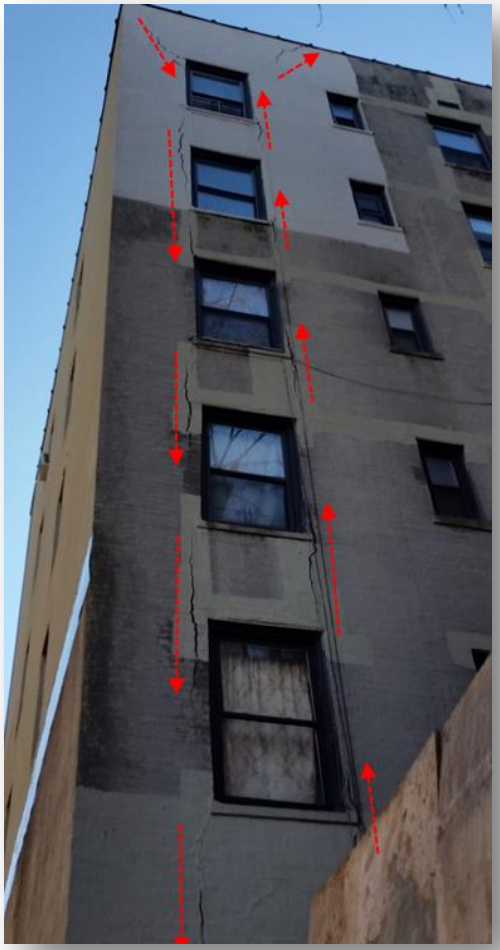


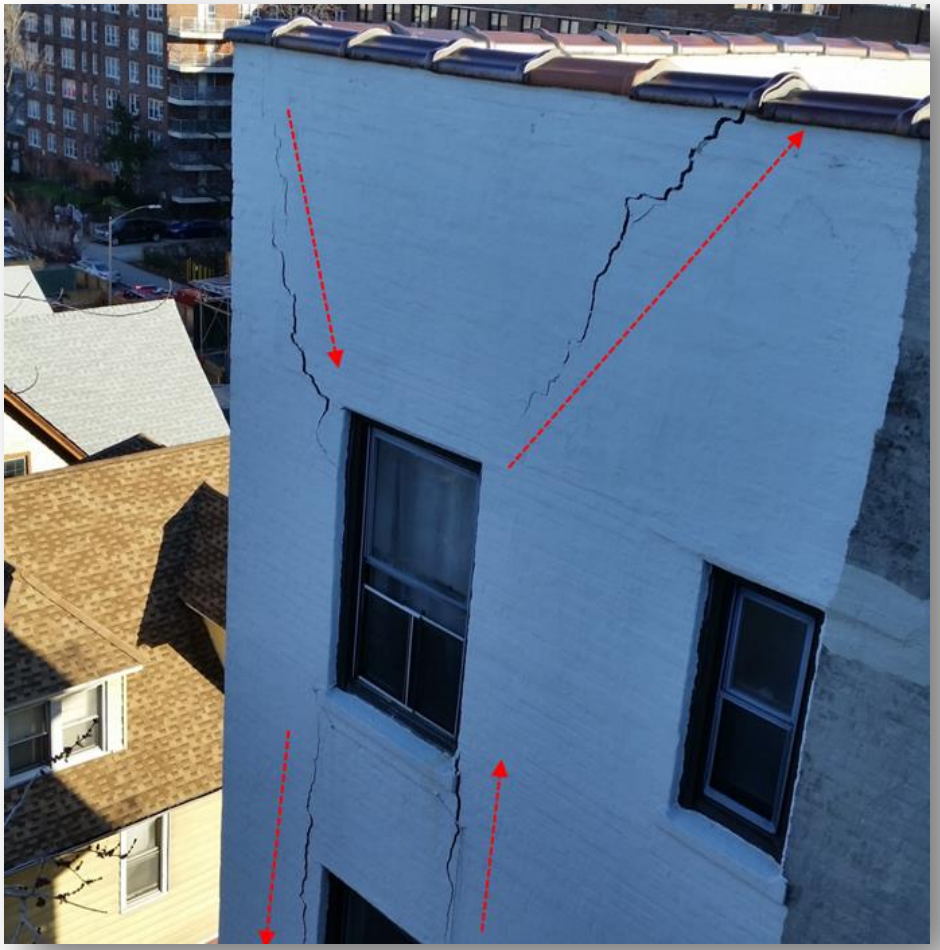


CASE 3: ASSESSMENT

- The underlying soil under line ‘A’ at the existing building became unstable due to ongoing excavation at NB site
- Recent underpinning was observed supporting existing building foundation wall
- Vertical support of this corner was not uniform and generated additional uneven loading at this corner
- Cracks on the exterior wall and inside the apartments were significant and affected the structural stability of line ‘A’ apartments

CASE 3: ASSESSMENT





CASE 3: ACTIONS

Existing Building

- Partial vacate at line ‘A’ apartments only

  NOTE: six (6) apartments vacated

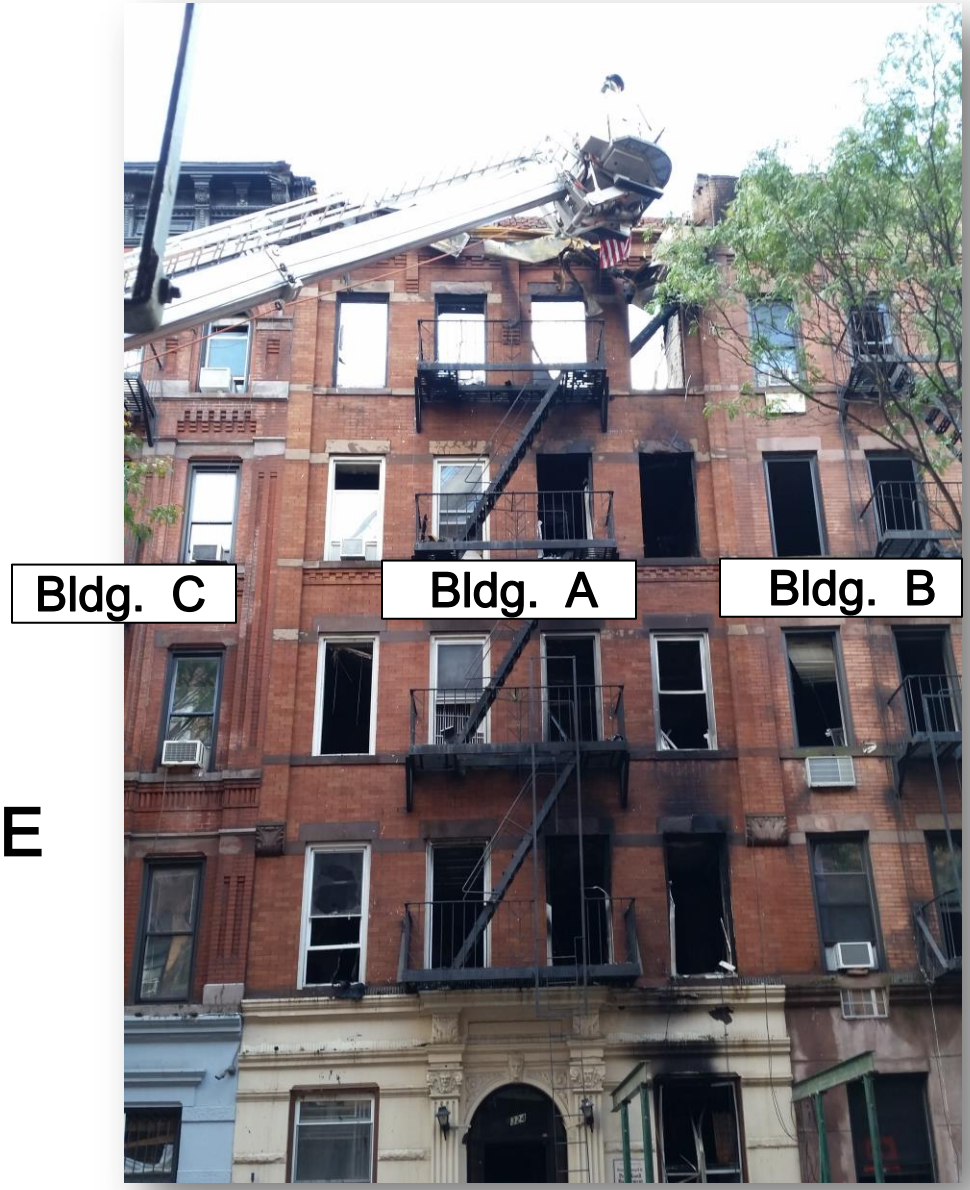
- Three (3) DOB Violations
  - Building monitoring
  - Temporary stabilization (strapping)
  - Permanent repairs

NB/Excavation Site

- Stop Work Order
  - Partially lifted to allow for stabilization work
- 14 ECB violations

CASE 4

- Referral from ERT
- 6 Alarm Fire in residential rowhouse
  - 1 Fatality
  - 17 Injuries
- Response: **IMMEDIATE**



CASE 4: RESEARCH

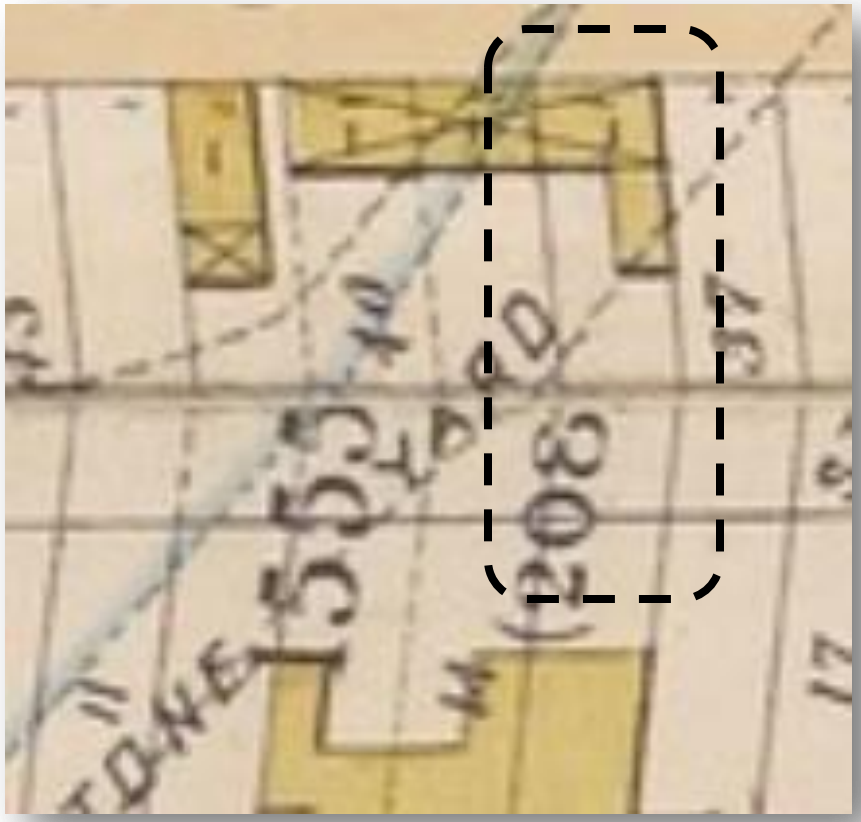
CASE 4: INSPECTION

- Roof and 5th floor partially collapsed (approximately 70%)
- 4th floor joists were charred and structurally compromised
- Rear of the 3rd floor partially collapsed (approximate 40%)
- 2nd floor joists charred and compromised

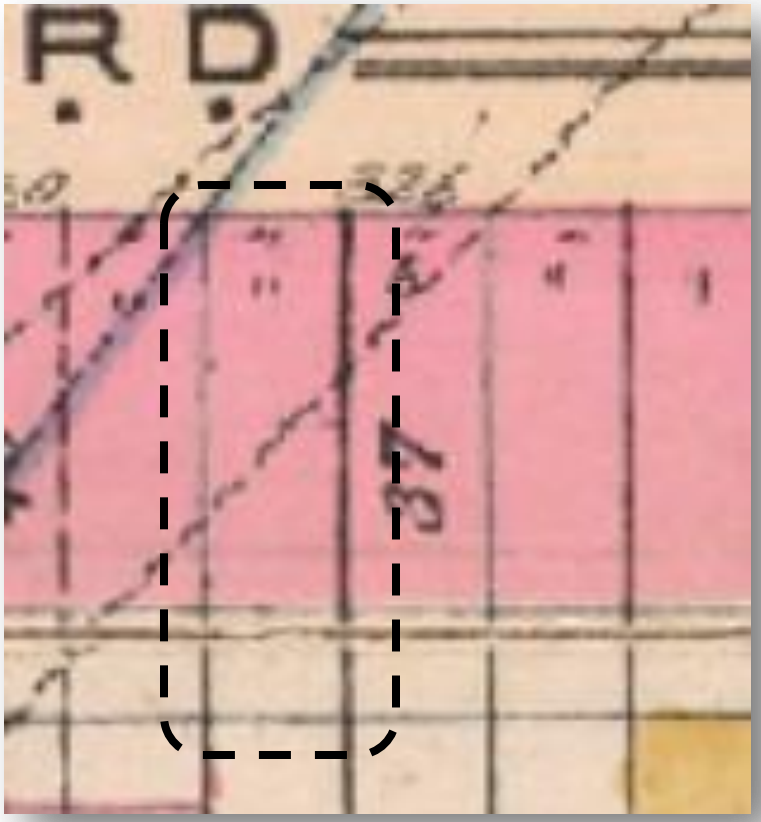
CASE 4: INSPECTIONS

- Roof framing burned and collapsed leaving the street front (north) wall unbraced and unstable above the 5th floor
- East and west parapet walls and light wells wall have partially collapsed due to the fire
- South wall also became free standing above the 4th floor
- Bulkhead support has sustained excessive damage due to the fire and the bulkhead is leaning

CASE 4: RESEARCH

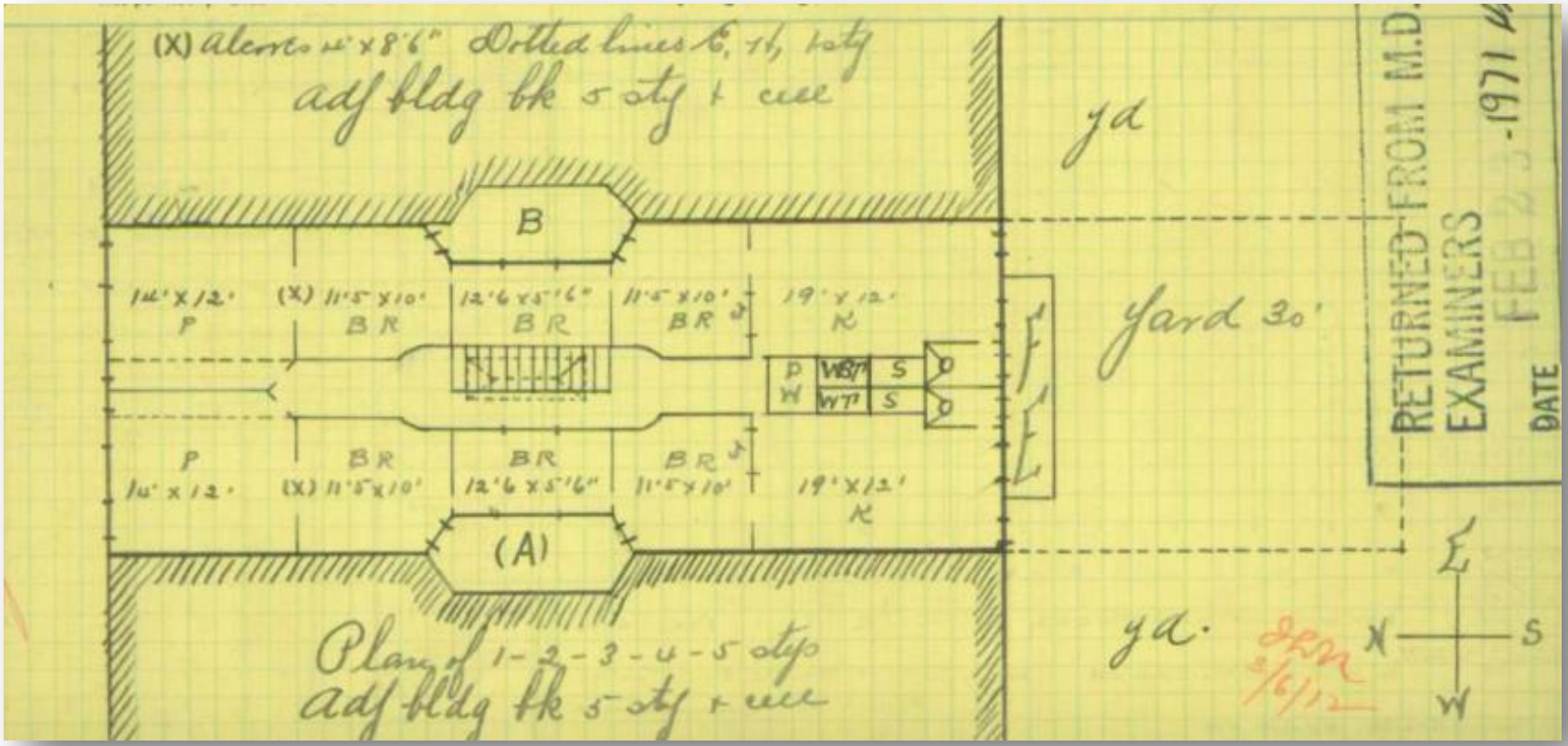


Bldg. Lot ca 1891



Bldg. Lot ca 1897

CASE 4: RESEARCH



CASE 4: ACTIONS

- Vacated fire building and adjoining building on either side
  - 40 apartments total
- DOB violation to fire building to effect emergency work
- DOB violation to each adjoining building for failure to maintain due to fire

CASE 4: CONCERNS

- FDNY had two key objectives
  1. Complete the search of the ground floor and basement for victims
  2. Sift through the soft debris as it is generated
- Contractor coordinated demolition and debris removal activities with FDNY

CASE 4: FOLLOW UP

- Worked with Owner's engineer on appropriate means and methods of demolition

- Adjoining party walls tied with steel channels

SUMMARY

- **FEU provides** the Agency with engineering competence for incidents, collapses, fires, weather events
  - Site management in real time
- Responds to incidents by stabilizing and making a property safe when owner fails to act
- Generally follow the same steps for each project, tailoring as required for any unique situations

This concludes the **American Institute of Architects Continuing Education Systems Course**.

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