



DESIGN



INVESTIGATE



REHABILITATE



Mitigating and Remediating Damage to Properties Adjacent to Construction in Congested Urban Environments

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Adjacent Construction

- What is it?
 - Construction in close-proximity to adjacent structures
 - Lot-Line construction
 - Additions/Extensions
- What is an adjacent structure?
 - Building
 - Utilities (above or below ground)
 - Roads/Sidewalks
 - Buried Structures (tunnels, mass transit)



Code Requirements

- Protection Required by Building Codes
 - IBC Chapter 33 – Safeguards During Construction
 - Section 3307 – Protection of Adjoining Property
 - NYCBC Section 3309

3307.1 Protection required. Adjoining public and private property shall be protected from damage during construction, remodeling and demolition work. **Protection must be provided for footings, foundations, party walls, chimneys, skylights and roofs.** Provisions shall be made to control water runoff and erosion during construction or demolition activities. The person making or causing an excavation to be made shall provide written notice to the owners of adjoining buildings advising them that the excavation is to be made and that the adjoining buildings should be protected. Said notification shall be delivered not less than 10 days prior to the scheduled starting date of the excavation.

Code Requirements – Nothing New

the level of the footings.

Whenever an excavation of either earth or rock for building or other purposes shall be intended to be, or shall be carried to the depth of more than ten feet below the curb, the person or persons causing such excavation to be made shall at all times, from the commencement until the completion thereof, if afforded the necessary license to enter upon the adjoining land, and not otherwise, at his or their own expense, preserve any adjoining or contiguous wall or walls, structure or structures from injury, and support the same by proper foundations, so that the said wall or walls, structure or structures, shall be and remain practically as safe as before such excavation was commenced, whether the said adjoining or contiguous wall or walls, structure or structures, are down more or less than ten feet below the curb. If the necessary

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building code

1906 NYC Building Code

Design Considerations: Pre-Construction

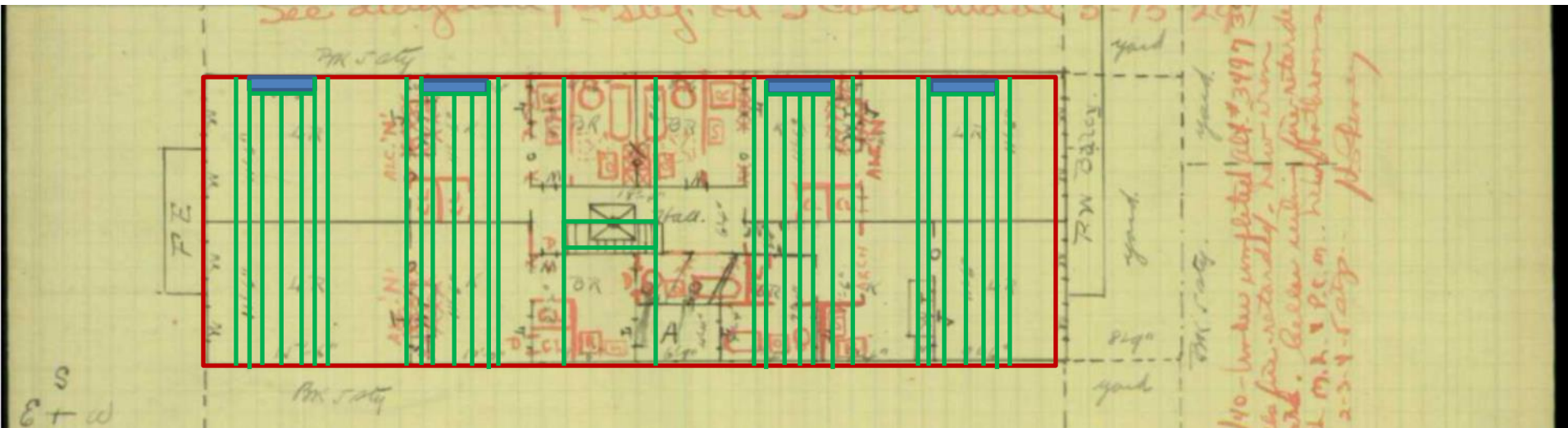
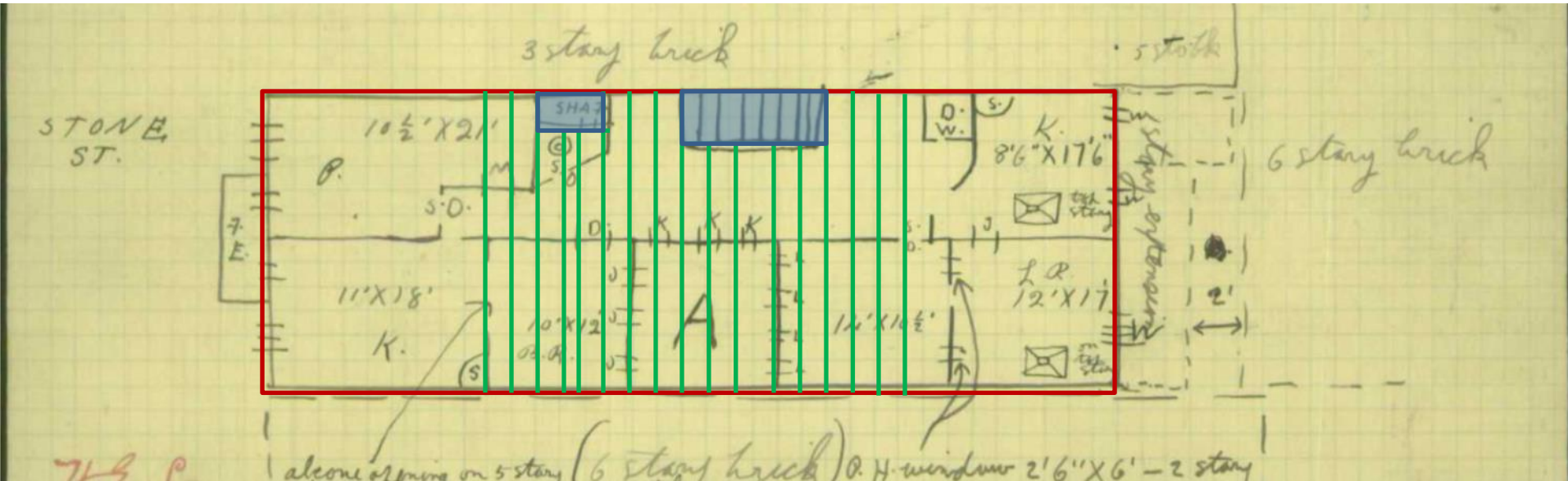
- Adjacent Structure Concerns
 - Separate buildings or adjoining (party) walls
 - Structure construction type (unreinforced masonry, concrete, steel)
 - Stability (orientation of framing, mechanical connections)
 - Weatherproof integrity
 - Contractor Means & Methods (Vibration, Noise, Dust)
 - **General Condition of Structure**
- **Need to understand the existing building in order to manage risk**

Design Considerations - Unreinforced Masonry

- Typically Empirically Designed (1700's to early 1900's)
- Party wall construction often encountered
 - Wall supports floor framing of adjacent buildings
 - Typically rely on framing on both sides of wall to provide lateral support.
- General lack of mechanical connection between framing and walls
- Need to consider how interruptions in framing affect stability
 - Stairwells, chimneys, etc.
- Soft Stories



Typical Floor Plans – Masonry Walk-Ups



Unreinforced Masonry

Typical Floor Joist Mechanical Connection



Unreinforced Masonry: Façades

- Minimal joining of masonry
- Facades tend to peel away from return wall
- May require reinforcing prior to construction



Stabilization & Weatherproofing Typical Wall Exposure During Demolition



Design Considerations

- New Development or Renovations
 - Excavation Depth
 - Support of excavation
 - Underpinning
 - Dewatering
 - New Building Height
 - Roof Protections
 - Weatherproofing between buildings (seismic gap)
 - Chimney Extensions
 - Roof Protections
 - Means & Methods
 - Vibrations
 - Noise and Dust
 - Other...



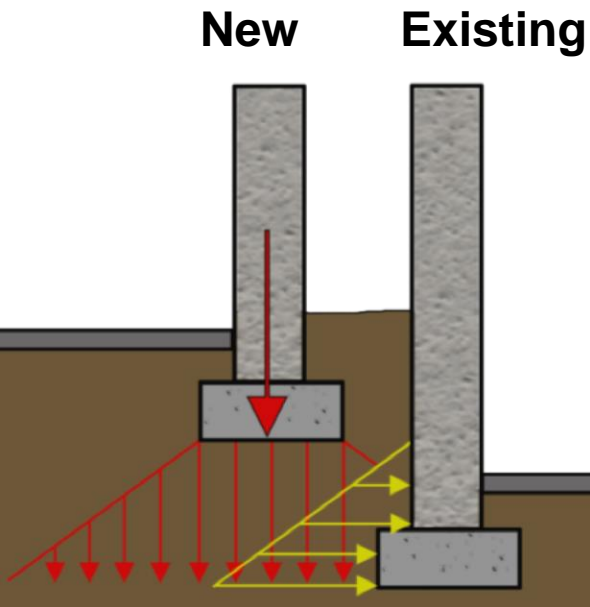
Common Sources of Damage

- Excavation
 - SOE Installation
 - Underpinning
- Dewatering
- Vibration
 - Demolition
 - Blasting
 - Pile Driving
 - Drilling



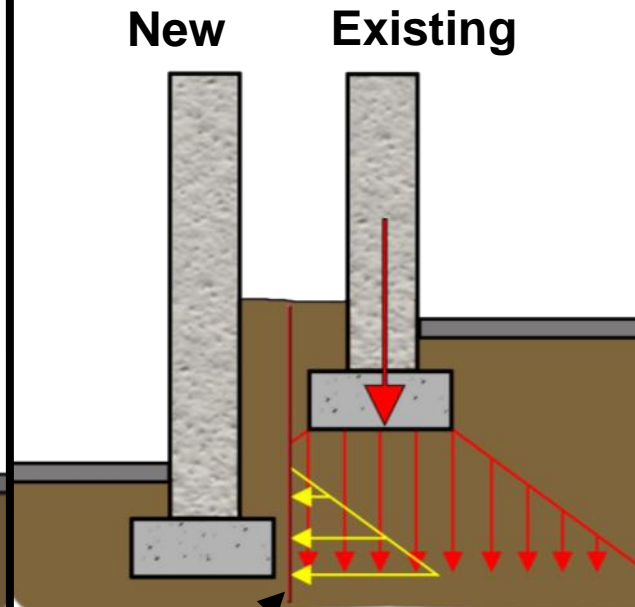
Risks from Excavation – Depth of New Construction...

New Above Existing

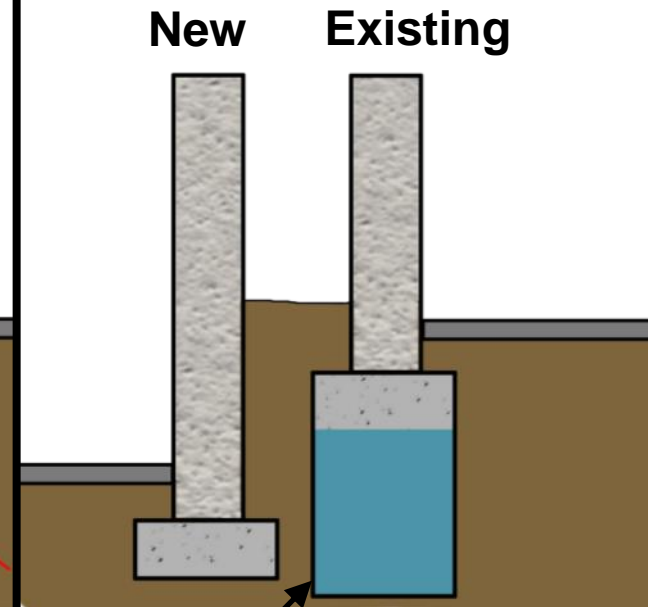


Increased Lateral Load
on Existing Building

New Below Existing

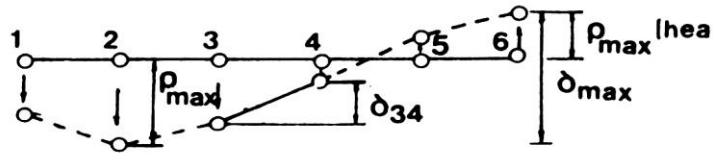


Earth Support

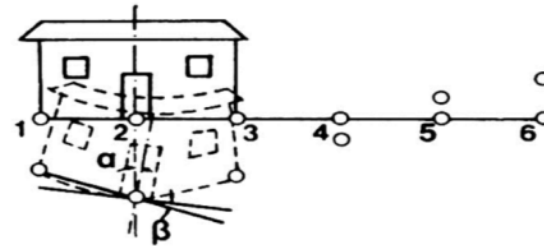


Underpinning

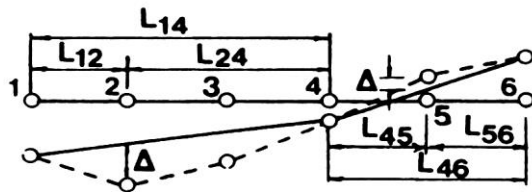
Excavation Effects: Settlement



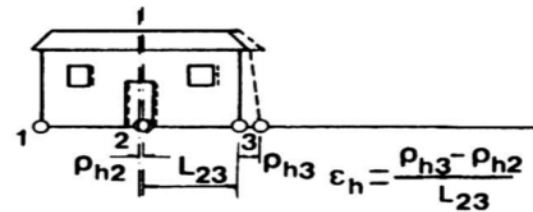
a) Settlement and Differential Settlement



c) Tilt and Angular Distortion (Relative Rotation)

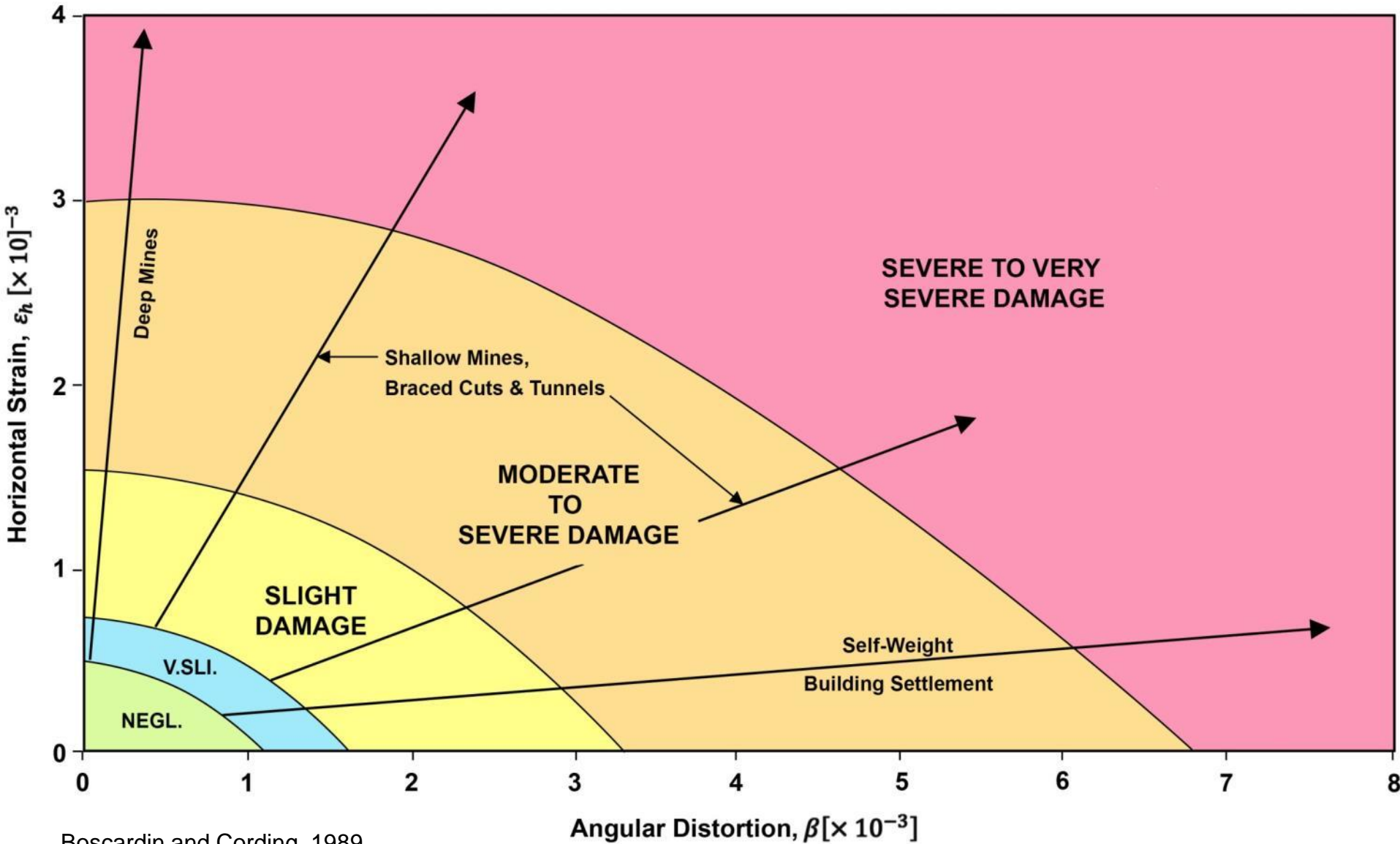


b) Relative Deflection and Deflection Ratio



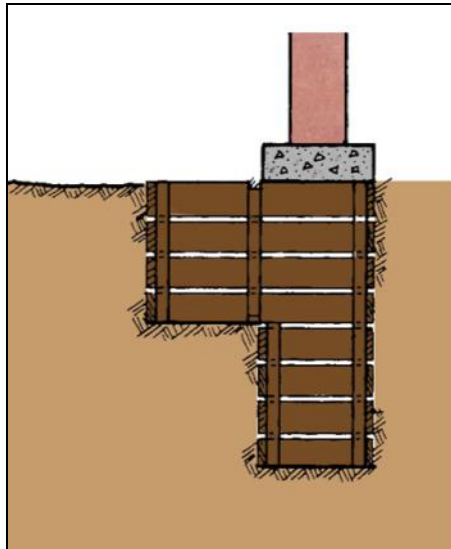
d) Horizontal Displacement and Horizontal Strain

Damage Potential



Underpinning – Things to Consider...

- Underpinning is never required – Need vs. Want
 - There is always an alternate solution!
- Permission needed to underpin neighbor's wall
 - Trespass
- Anything deeper than 4' typically needs lateral support
- Settlement will occur



Support of Excavation - Considerations

- Depth of excavation relative to depth of adjacent structure
- Type of adjacent foundation
- Groundwater elevation
- Contractor means and methods



Support of Excavation: Considerations

- Types of SOE
 - Soldier pile & lagging
 - Steel sheet pile
 - Secant or tangent pile wall
 - Slurry Wall
 - Jet-grout or soil-mix wall
 - Soil nail wall
- The proper system depends on a number of factors
- A combination of systems may be required



Support of Excavation – Means & Methods

- Performed in proper sequence
- Equipment used
- Effects of Drilling
- Vibrations



Groundwater



- Need to consider effects of dewatering on adjacent structures
- Dewatering can lead to significant changes in soil stress
- Leakage through SOE can be catastrophic to adjacent structures
 - Near instantaneous settlement

Vibration Effects

- Contractor Means & Methods
 - Equipment Used
 - Materials Encountered
- Limit Vibration Intensity
 - Establish appropriate limits
- Adjacent structure type will affect response
 - May need to evaluate response

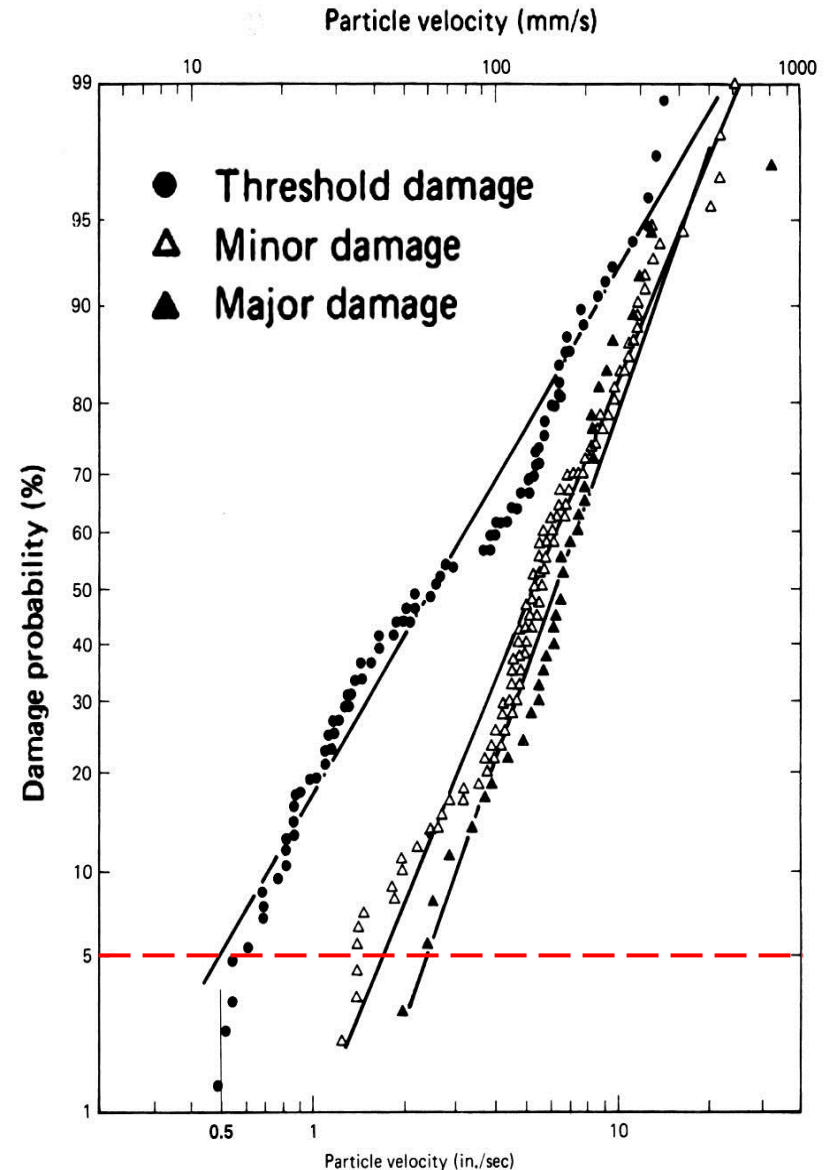


Figure 12-3 Damage data: probability analysis. (From Siskind et al., 1980b.)

Vibration Response

- Response from rock removal activities; drilling, blasting, hammering
- Consider building and appurtenance responses

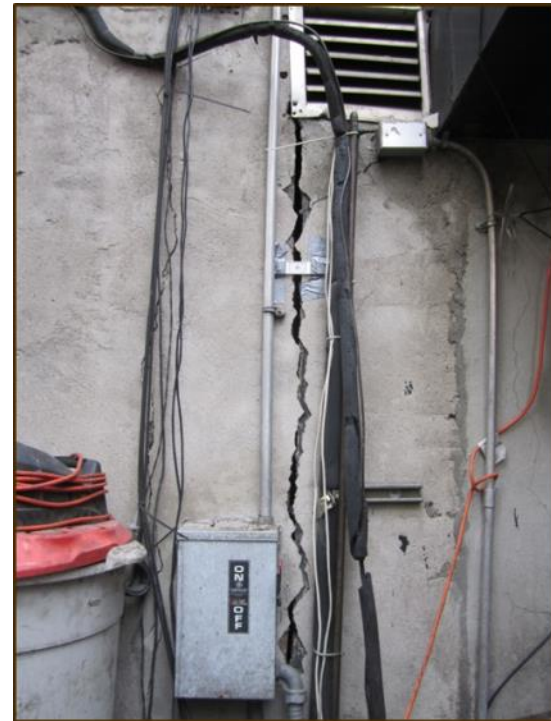


Pre-Construction Surveys

- Document existing condition of adjacent properties prior to construction
- A useful tool to help resolve claims for minor damages



Before Construction



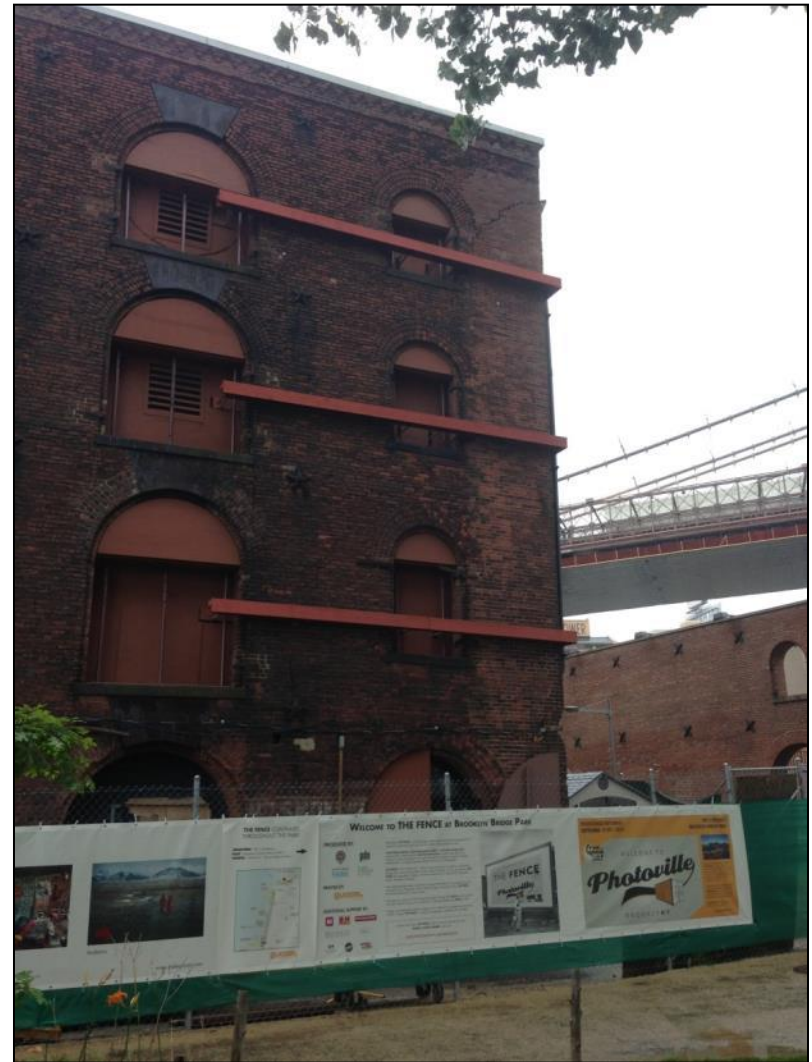
During Construction

Preemptive Stabilization

- Condition warrants stabilization before construction can continue
- Temporary or permanent
- Who pays for it?



Façade Stabilization



Preemptive Stabilization

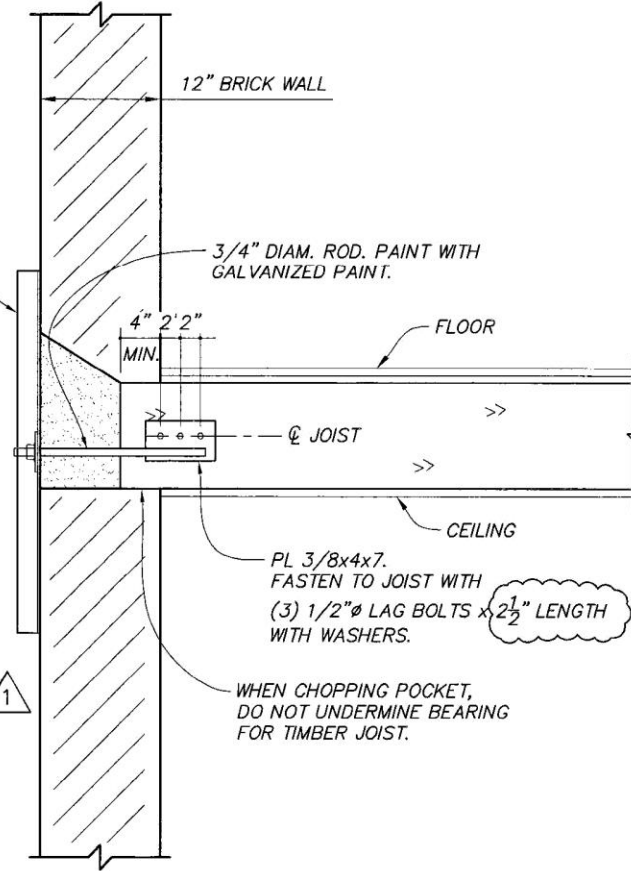


Preemptive Stabilization

MAIN BUILDING

C8x11.5 x 3'-0"
CHANNEL GALVANIZED.
EXPOSED ENDS SHALL BE
PAINTED WITH GALVANIZED PAINT.

1. POCKET SHALL EITHER BE MADE BY SAWCUTTING WITH DEMOLITION SAW OR CHOPPING WITH CHIPPING GUN.
2. POCKET SHALL BE MADE AS SMALL AS POSSIBLE TO MAINTAIN THE INTEGRITY OF THE WALL.
3. IF A SOUND EXISTING TIE IS FOUND WITHIN THE PORTION OF MAIN BUILDING (TEMPORARILY EXPOSED) THE NEW TIE CAN BE OMITTED AT THAT LOCATION, UPON ACCEPTANCE BY THE ENGINEER.
4. LAG BOLTS SHALL BE PRE-DRILLED WITH 5/16" DIAMETER x 2" PILOT HOLE.
5. AFTER ROD INSTALLATION, INFILL POCKET WITH BRICK MASONRY



WHEN CHOPPING POCKET,
DO NOT UNDERMINE BEARING
FOR TIMBER JOIST.

PL 3/8x4x7.
FASTEN TO JOIST WITH
(3) 1/2" ϕ LAG BOLTS x 2 1/2" LENGTH
WITH WASHERS.

IN AREA
IF
REPAIR
EXISTING
IS FOUND

WALL TIE DETAIL
Scale : 1" = 1'-0"

CELLAR OF CRONIN
133 W 11TH STREET

Monitoring during Construction

- Typically monitor for:
 - Vibration
 - Movement
 - Groundwater Levels
- Establish Monitoring Plan
 - Indicate type and locations of monitoring equipment
 - Frequency of readings
 - Threshold criteria
 - Action plan if criteria exceeded
- Monitoring helps to manage risk



Damage





Getty images

When damage does occur:

- Assessment
 - Level of damage
 - Elements affected
 - Cause
- Major structural damage is often the result of building settlement
 - Large cracks in masonry
 - Slippage of floor joists



Stabilization

- Temporary bracing and shoring often required



Repairs

- Permanent stabilization
- Masonry repairs
- Partial rebuilding



Permanent Stabilization

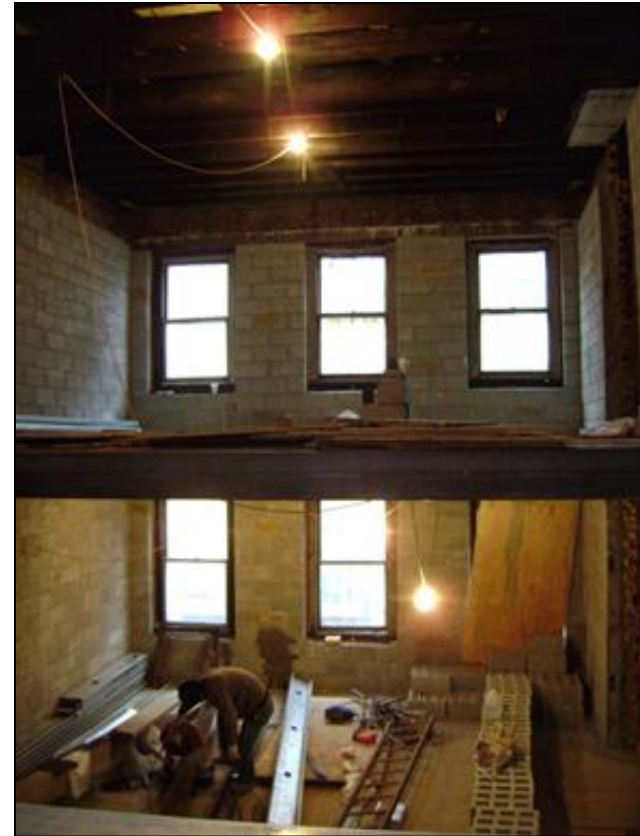


- Tie floor framing into exterior walls

Masonry Repairs



Masonry Repairs/Strengthening



- Liner Walls
 - CMU, CIP, Shotcrete
- Fiber-Reinforcing

Façade Pinning



- Pin façade elements back to structure
- Numerous methods
 - Mechanical Anchors
 - Epoxy Anchors



Concrete Repairs



- Crack injection
- Patch repairs

Summary

- Proper Prior Planning...
 - Assess damage potential prior to construction
 - Develop appropriate protections
 - Implement Protections
 - Monitor
- Stabilize & repair if damage does occur
- Communication is key to successful project

QUESTIONS?

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Custom Shows















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