LOT LINE CONSTRUCTION CODE REQUIREMENTS

presented by

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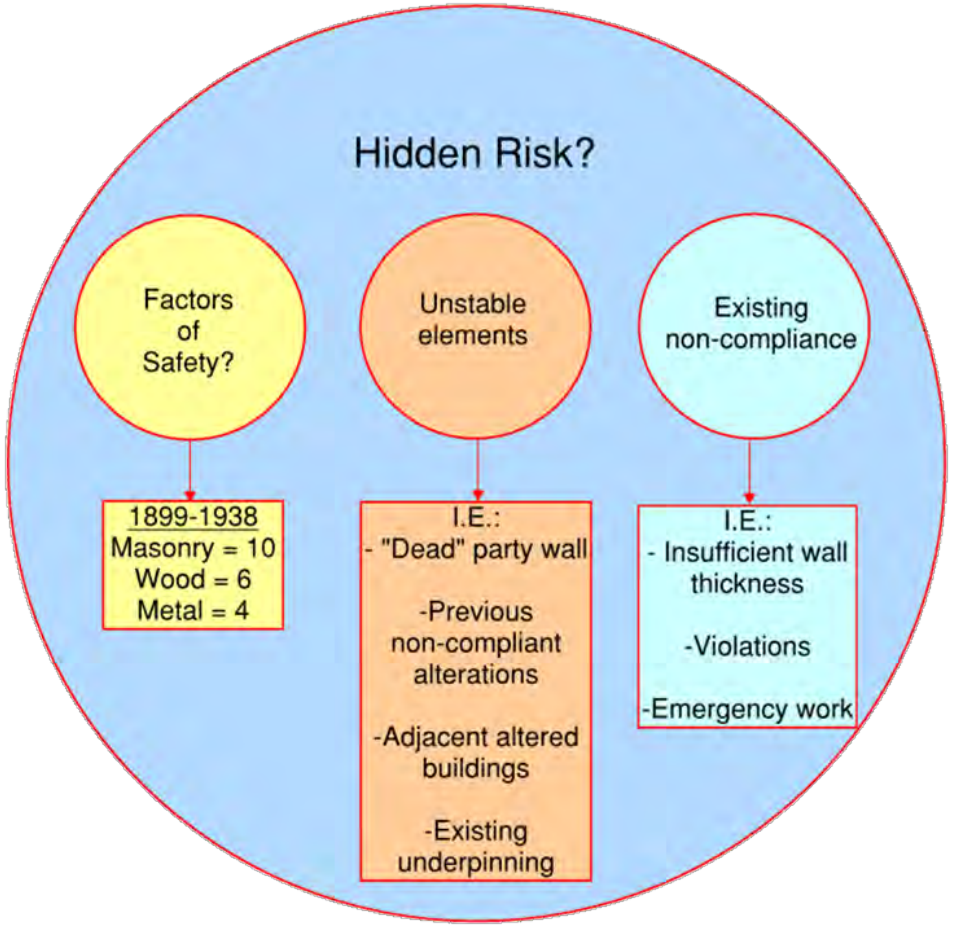
PRESENTATION DESCRIPTION

This presentation reviews portions of the 2022 NYC Building Code related to lot line construction including monitoring, special inspection, excavation, demolition, and site safety requirements. Building Code chapters to be discussed include Chapter 16, Chapter 17, Chapter 18 and Chapter 33. Examples and case studies are reviewed as well.

NYC CONSTRUCTION CODES: AVAILABLE ON DOB WEBSITE

https://www1.nyc.gov/site/buildings/codes/2022-construction-codes.page

LOT LINE CONSTRUCTION: HIDDEN RISK



LOT LINE CODE REQUIREMENTS

EXCAVATIONS, UNDERPINNING, FOUNDATIONS AND PROTECTION OF ADJOINING PROPERTIES

BC §1804.1 EXCAVATIONS NEAR FOUNDATIONS

SECTION BC 1804
EXCAVATION, GRADING AND FILL

1804.1 Excavations near foundations. Excavations for any purpose shall not reduce vertical or lateral support for any foundation without first evaluating if underpinning or protecting the foundation against detrimental lateral or vertical movement, or both, is required. Where required, underpinning or shoring shall be provided in accordance with Section 1817.

- Excavations may not reduce the vertical or lateral support of an adjacent building/ foundation
- Must evaluate if alternate/ new support and/ or shoring is required to safely accomplish the excavation
- Must be performed in accordance with BC 1817

BC § 1817 UNDERPINNING AND ALTERNATE METHODS OF SUPPORT

SECTION BC 1817
UNDERPINNING AND ALTERNATE METHODS OF SUPPORT OF BUILDINGS AND ADJACENT PROPERTY

1817.1 General. Where the proposed work may disturb, displace or otherwise affect the lateral or vertical support of property or buildings, an engineer shall evaluate the need for and methods to maintain the stability and integrity of the building(s), utilities or soil adjacent to such activity.

1817.2 Minimum requirements for undeveloped adjacent property. The minimum requirements for construction documents for support of adjacent property which does not contain a building, such as, but not limited to, empty lots, court yards, front yards, or rear yards, shall include the following information:

1. Existing grade of the adjacent property.
2. Plans, cross-sections, and elevations as necessary, to illustrate all unique conditions of the support of excavation, including the depth of the proposed excavation, the subsurface conditions, surcharge loading, the proposed method of support, sequence of construction, required material properties, and additional details as required by Section 3304.
3. Details and criteria for monitoring, including but not limited to criteria and thresholds for movements, and dewatering as specified in Chapters 17, 18 and 33.
4. The elevation of the water table, need for dewatering as noted in the Geotechnical Report, and the maximum permissible drawdown outside of the project site.

1817.3 Evaluation of adjacent buildings for suitable method of support. At the time of foundation plan approval, an engineer shall submit an evaluation report to the department assessing the condition of the existing building and the subsurface conditions of the construction site and adjacent property. The report shall also identify acceptable method(s) of support, including underpinning or alternate methods of support, for the building. This evaluation shall be performed in accordance with the requirements of Section 1817.3.1 through 1817.3.6.

- When the proposed work may affect the lateral or vertical stability of adjacent buildings or property a PE is required to evaluate
- Minimum requirements for construction docs for undeveloped property
- Evaluation report required assessing conditions of existing buildings and subsurface conditions
- Need to identify acceptable methods of support for the buildings based on the evaluation and site-specific conditions

BC § 1817.3.1 ASSESSMENT OF BUILDINGS

1817.3.1 Assessment of the building and the subsurface conditions: The engineer shall assess the condition of the existing building, and the subsurface conditions of the construction site and adjacent property, to an extent sufficient for determining acceptable method(s) of support, including underpinning or alternate methods of support. As necessary, the assessment shall be based on visual observations, calculations, review of the geotechnical report prepared for the project in accordance with Section 1803.6 and review of other available documentation. The investigation shall include, as necessary, but need not be limited to, the following items:

1. An evaluation of the vertical load path of the building as it relates to the location of the proposed underpinning or alternate method of support.
2. An evaluation of the lateral load path of the building as it relates to the location of the proposed underpinning or alternate method of support.
3. Calculations of the vertical and lateral loads at the foundations to be underpinned or supported by an alternate method of support.
4. A determination of the type and condition of the above grade elements to be supported or potentially affected by the work.
5. A survey of deviations from plumb or horizontal position of the building.
6. Identification of conspicuous structural defects, including but not limited to: bowing, significant cracking, structural degradation or unusual slenderness. A detailed description of such items shall be provided, with photographs and mapping if possible.
7. A determination of acceptable thresholds for maximum vertical and lateral movement, maximum permissible vibrations, the required monitoring and the protocols for exceedances.
8. A determination of the type and condition of the foundation elements to be supported or potentially affected by the work.
9. A test pit at each substantial change in foundation type or building geometry. Records of the test pits shall include the following:
   - 9.1. A description of the construction materials and condition of the footing, foundation wall and/or foundation system.
   - 9.2. The bottom elevation of the wall(s) and/or footing(s).
   - 9.3. The classification of the soil or rock the foundation bears upon.
   - 9.4. Photographs and sketches of the test pit.
10. An assessment of the allowable bearing pressure of the soils supporting the existing foundation(s) per Section 1806.
11. An assessment of potential reductions to the allowable bearing pressure due to the proposed excavation.
12. The lateral earth, surcharge, and water pressures that will be present on the elements of the proposed underpinning or alternate method of support.
13. An analysis of the subsurface conditions and their potential impacts on the underpinning or alternate method of support work such as, but not limited to: high water table and need for dewatering, loose soils, potentially running soils, presence of boulders, or other factors that could impact the design or construction of the underpinning or alternate method of support.
14. An assessment of the allowable bearing pressure of the soils supporting the underpinning or alternate method of support during the installation sequence and in the permanent condition.
15. An assessment of the anticipated settlement during the underpinning or alternate method of support, and soil and foundation work.
16. Any additional information requested by the commissioner.

- Minimum of 16 specific items identified for assessment of existing buildings
- Includes evaluation of: load path, existing conditions, system components and conditions, identification of defects, determination of allowable maximum movement thresholds, etc.
- Test pits required at <u>each</u> substantial change in foundation type or building geometry
- Additional requirements for rubble foundations and unreinforced masonry buildings (BC 1817.3.2 & 3.3)

BC § 3304.4.1.2 GEOTECHNICAL ANALYSIS & BC § 3309.4.3 PRECONSTRUCTION SURVEY

3304.4.1.2 Geotechnical analysis and relevant reports. The support of excavation construction documents shall be developed based upon site specific testing and analysis performed by a registered design professional who has demonstrated knowledge or experience in geotechnical evaluation. The support of excavation construction documents must incorporate all the conditions and findings identified in the geotechnical report required by Section 1803.6, the evaluation analysis required by Section 1817, and the preconstruction survey required by Section 3309.4.3.

1817.3 Evaluation of adjacent buildings for suitable method of support. At the time of foundation plan approval, an engineer shall submit an evaluation report to the department assessing the condition of the existing building and the subsurface conditions of the construction site and adjacent property. The report shall also identify acceptable method(s) of support, including underpinning or alternate methods of support, for the building. This evaluation shall be performed in accordance with the requirements of Section 1817.3.1 through 1817.3.6.

3309.4.3 Preconstruction survey. No excavation work to a depth of 5 feet to 10 feet (1524 mm to 3048 mm) within 10 feet (3048 mm) of an adjacent building, or an excavation over 10 feet (3048 mm) anywhere on the site shall commence until the person causing an excavation to be made has documented the existing conditions of all adjacent buildings in a preconstruction survey. In addition to the preconstruction survey, a geotechnical report in accordance with Section 1803.6, and an evaluation analysis in accordance with Section 1817, shall be prepared when required by Chapter 18.

- Sections tie together the new requirements of Chapter 18.
- Evaluation analysis/ report of adjacent buildings as required per BC § 1817.3
- The SOE drawings are to incorporate all conditions and findings that are identified (i.e., Geotechnical report, Evaluation analysis/ report, Preconstruction survey, etc.)

BC § 3304.10 DEWATERING

3304.10 Dewatering. [~~The person causing the soil or foundation work to be performed shall dewater the site, as needed, for the progress of the work. Measures shall be taken to prevent settlement, slope failure, and damage to adjacent buildings, structures, and property affected by dewatering operations.~~] The requirements of Section 3303.14 shall apply.

3303.14.5 Dewatering. The contractor or other entity performing the soil or foundation work shall dewater the site, as needed, for the progress of the work, and shall take all necessary measures to prevent settlement, slope failure, and damage to buildings, structures, and property affected by the dewatering operations.

3303.14.5.1 Dewatering plan. Where dewatering is performed to drawdown or control the level of the water table, the dewatering operation shall proceed in accordance with a site specific plan developed by a registered design professional. The dewatering plan must incorporate all the conditions and findings identified in the geotechnical report required by Section 1803.6, the evaluation analysis required by Section 1817, and the preconstruction survey required by Section 3309.4.3. At a minimum, the plan shall indicate:

1. Height of the water table, including all seasonal fluctuations;
2. Anticipated schedule of dewatering operations;
3. The location of wells, settlement tanks, observation points, and dewatering equipment;
4. Maximum discharge;
5. Permissible drawdown outside of the limits of the excavation;
6. Thresholds for anticipated settlement;
7. Thresholds for anticipated lateral movement; and
8. The program to monitor and control water table drawdown and settlement/movement of affected structures, property, and temporary construction installations. Program criteria to be specified shall include, but not be limited to, the monitoring frequency, plan to periodically test the discharge from the pumps to determine if the water being extracted contains unanticipated fine grain soil or sand, plan to account for fluctuations in the water table (due to seasonal conditions, weather, or other factors), reporting requirements for the monitoring program, and procedures to be implemented when thresholds are exceeded.

- Dewatering now refers to the minimum requirements outlined in BC § 3303.14.5 for a Dewatering Plan.
- This Dewatering Plan is required where dewatering and the drawdown of the water table is to be performed.
- The Dewatering Plan is to include the program to monitor and control the water table drawdown as well as monitoring affected structures.

BC §3309 PROTECTION OF ADJOINING PROPERTY

SECTION BC 3309
PROTECTION OF ADJOINING PROPERTY

3309.1 Protection required. Adjoining public and private property, including persons thereon, shall be protected from damage and injury during construction or demolition work. Protection must be provided for footings, foundations, party walls, chimneys, skylights and roofs. Provisions shall also be made to control water run-off and erosion during construction or demolition activities. Where the New York City Department of Environmental Protection has issued a stormwater construction permit for a covered development project, such run-off and erosion controls shall be installed and maintained in accordance with the rules of the Department of Environmental Protection and this code.

3309.1.1 Notification. Where a construction or demolition project will require access to adjoining property in accordance with this section, written notification shall be provided to the adjoining property owner at least 60 calendar days prior to the commencement of work. Such notification shall describe the nature of work, estimated schedule and duration, details of inspections or monitoring to be performed on the adjoining property, protection to be installed on the adjoining property, and contact information for the project. Where no response is received, a second written notification shall be made no more than 45 calendar days, and not less than 30 calendar days, prior to the commencement of work.

- Adjoining property (public and private) and persons thereon to be protected during construction and demolition work
- When access is required for a project written notification must be provided to the adjoining property at least 60 days prior to start of work
- Notification to include project details, schedule, inspections, monitoring, protection to be installed, etc.

BC §3309.2 LICENSE TO ENTER ADJOINING PROPERTY

3309.2 License to enter adjoining property. The responsibility of affording any license to enter adjoining property shall rest upon the owner of the adjoining property involved; and in case any tenant of such owner fails or refuses to permit the owner to afford such license, such failure or refusal shall be a cause for the owner to dispossess such tenant through appropriate legal proceedings for recovering possession of real property. Nothing in this chapter shall be construed to prohibit the owner of the property undertaking construction or demolition work from petitioning for a special proceeding pursuant to Section 881 of the *Real Property Actions and Proceedings Law*.

- License agreement required when crossing property line
- Must be obtained from the adjoining property owner
- Section 881 of the Real Property Actions and Proceedings Law is an option

BC §3309.4 SOIL OR FOUNDATION WORK AFFECTING ADJOINING PROPERTY

3309.4 Soil or foundation work affecting adjoining property. Whenever soil or foundation work occurs, regardless of the depth of such, the person who causes such to be made shall, at all times during the course of such work and at his or her own expense, preserve and protect from damage any adjoining structures, including but not limited to footings and foundations, provided such person is afforded a license in accordance with the requirements of Section 3309.2 to enter and inspect the adjoining buildings and property, and to perform such work thereon as may be necessary for such purpose. If the person who causes the soil or foundation work is not afforded a license, such duty to preserve and protect the adjacent property shall devolve to the owner of such adjoining property, who shall be afforded a similar license with respect to the property where the soil or foundation work is to be made.

3309.4.1 Additional safeguards during excavation. The following additional requirements shall apply during excavation:

1. The person causing the excavation shall support the vertical and lateral load of the adjoining structure by proper foundations, underpinning, or other equivalent means where the level of the foundations of the adjoining structure is at or above the level of the bottom of the new excavation.
2. Where the existing adjoining structure is below the level of the construction or demolition, provision shall be made to support any increased vertical or lateral load on the existing adjoining structure caused by the construction or demolition.
3. Where the construction or demolition will result in a decrease in the frost protection for an existing foundation below the minimums established in Section 1809.3.1, the existing foundation shall be modified as necessary to restore the required frost protection.

- Soil or Foundation work affecting adjoining property, **person causing the work** shall at all times preserve and protect from damage any adjoining structures
- Person causing the excavation shall support the vertical and lateral loads of the adjoining structure by proper means/support when excavating below bottom of foundation (i.e., SOE, underpinning, bracing/shoring, etc.)
- If adjoining structure foundation is below the proposed excavation, support of vertical and lateral loads imposed on the existing structure/ foundation is required

BC §3309.10 PROTECTION OF ROOFS

‡‡‡ **3309.10 Protection of roofs.** Whenever any building is to be constructed or demolished above the roof of an adjoining building, it shall be the duty of the person causing such work to protect from damage at all times during the course of such work and at his or her own expense the roof, skylights, other roof outlets, and equipment located on the roof of the adjoining building, and to use every reasonable means to avoid interference with the use of the adjoining building during the course of such work, provided such person causing such work is afforded a license in accordance with the requirements of Section 3309.2 to enter and inspect the adjoining building and perform such work thereon as may be necessary for such purpose; otherwise, the duty of protecting the roof, skylights, other roof outlets, and equipment on the roof of the adjoining building shall devolve upon the owner of such adjoining building.

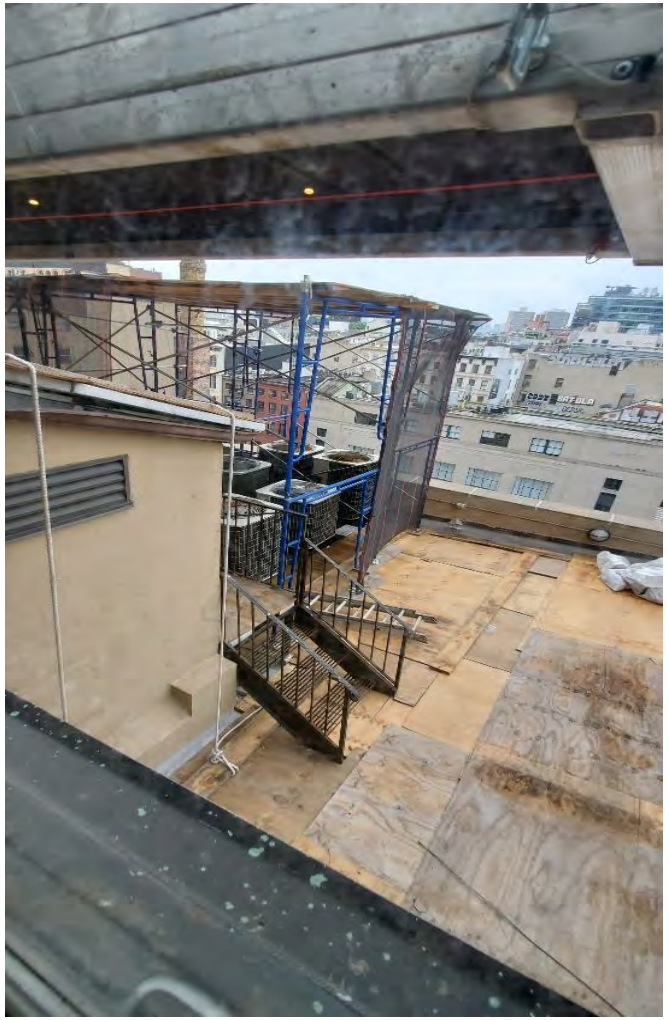
Adjoining roof protection shall be secured to prevent dislodgement by wind. Where construction or demolition work occurs at a height of at least 48 inches (1219 mm) above the level of the adjoining roof, adjoining roof protection shall consist of 2 inches (51 mm) of flame-retardant foam under 2 inches (51 mm) of flame-retardant wood plank laid tight and covered by flame-retardant plywood, or shall consist of equivalent protection acceptable to the commissioner, and shall cover all areas of the adjoining roof that are within a horizontal distance from the building being constructed or demolished equal to the height above the adjoining roof of the highest working level of the building being constructed or demolished, to a maximum of 20 feet (6096 mm), or to a greater maximum when ordered by the commissioner due to a unique hazard at the site.

Exceptions:

1. Adjoining roof protection is not required along an exposure where a site specific engineered enclosure system that is acceptable to the commissioner and meets the requirements of Section 3309.17 has been installed to cover the entire exposure where work is occurring.

2. Where vents, equipment, or similar obstructions are present on the roof, the roof protection shall be elevated to avoid interreference, or an equivalent elevated system, designed by a registered design professional, shall be installed.

3. Occupiable spaces on an adjoining roof, such as a roof terrace, observation deck, rooftop bar, or residential balcony, that will not be closed during the work, shall instead be protected in accordance with Section 3309.13.



- Protection of roofs, skylights, roof outlets, equipment required
- Required for height of the building above the adjoining roof (highest working level) or 20 feet maximum applied horizontally.
- Not required when a site specific engineered enclosure is provided as per BC 3309.17

BC § 3309.13: OVERHEAD PROTECTION OF ADJOINING SPACES AND EQUIPMENT

3309.13 Protection of adjoining equipment and spaces. Whenever a [~~major~~] building is constructed or demolished, [~~and provided such work requires a site safety plan in accordance with Section 3310,~~] it shall be the duty of the person causing such work to protect from damage, at all times during the course of such work and at his or her own expense, all mechanical, electrical, and similar equipment on the adjoining property [~~that are within 20 feet (508 mm) from an unenclosed perimeter of the major building~~], and to protect all [~~publically~~] publicly accessible spaces on the adjoining property [~~that are within 20 feet (508 mm) from an unenclosed perimeter of the major building~~], and also to use every reasonable means to avoid interference with the use of such equipment and spaces during the course of such construction or demolition work, provided such person causing such work is afforded a license in accordance with the requirements of Section 3309.2 to enter and inspect the adjoining property and perform such work thereon as may be necessary for such purpose; otherwise, the duty of protecting such adjoining equipment and spaces shall devolve upon the owner of such adjoining property.

Adjoining equipment and space protection shall be secured to prevent dislodgement by wind. Where the construction or demolition work requires a site safety plan in accordance with Section 3301.13 or 3310 and access to the equipment or space is not precluded, adjoining equipment and space protection shall be designed to provide a level of overhead protection equivalent to that provided by a sidewalk shed in accordance with Section 3307, and shall cover all adjoining equipment or spaces that are within a horizontal distance from the building being constructed or demolished equal to the height of the highest working level of the building being constructed or demolished, to a maximum of 20 feet (6096 mm), or to a greater maximum when ordered by the commissioner due to a unique hazard at the site.

[~~**Exception:**~~] **Exceptions:**

1. Equipment on an adjoining roof shall be protected in accordance with Section 3309.10.

2. Adjoining equipment and space protection is not required along an exposure where a site specific engineered enclosure system, acceptable to the commissioner, and meeting the requirements of Section 3309.17, has been installed to cover the entire exposure where work is occurring.

- Protection of adjoining equipment and public spaces is required for all building construction and demolition projects when working level is above, to a maximum of 20 feet horizontally
- As per 2022 Code, not limited to just major buildings.
- Adjoining equipment and publicly accessible spaces shall be protected to a level equal to that of a sidewalk shed (when a site safety plan is required. CS, SSC, SSM projects)
- Not required when a site specific engineered enclosure system is provided as per **BC 3309.17**

DEMOLITION: CHAPTER 33 BC §3306

BC § 3306.5.5 ASSESSMENT OF ADJOINING STRUCTURES

3306.5.5 Assessment of adjoining structures. Where a bearing masonry or wood framed building shares a party wall or party foundation with a building that is to undergo a full demolition, a demolition performed in conjunction with work that meets the requirements of Section 101.4.5 of Title 28 of the *Administrative Code*, a demolition that results in the demolition of more than 50 percent of the gross floor area of the building during the course of work over any 12-month period, or a demolition that results in the removal of one or more floors during the course of work over any 12-month period, the submittal documents required by Section 3306.5 shall be based upon an assessment of such bearing masonry or wood framed building. The assessment shall be performed by a registered design professional. The assessment shall, at a minimum, consist of an interior and exterior visual inspection of the structure where demolition operations are to occur. The results of the assessment shall be documented in an assessment report prepared by the person who performed the assessment. If the assessment was performed by a registered design professional other than the registered design professional who prepares the submittal documents, the report shall be provided to the registered design professional who prepares the submittal documents.

Existing Conditions:

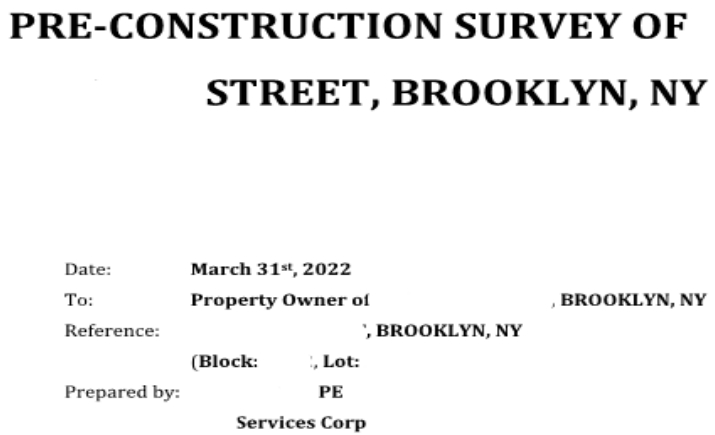
At the time of the inspection, it was observed that the front door of the building was open (see image #7). The stoop stair giving access to the building was in state of disrepair, with its railing missing and stone steps broken (see images #3 and #6). Exposure 1 wall had sings of disrepair, with ornamental brown stone cracked and locally delaminating (see images #3 and #5)

At the interior of the building, it was observed that the building was in state of extreme disrepair and full of debris. No access to the rear of the building was possible and only the 1st floor front building was inspected. At this area, it was observed that the second-floor joists were in a state of severe disrepair (see images #9, #11 and #12). There were visible holes at the 1st floor flooring by the entrance to the building. (see image #8). The interior stair from 1st to 2nd floor was partially collapsed (see image #12). No access to other parts of the building was possible.

- New requirement as per 2022 code
- In addition to an assessment being required for the building to be demolished, an assessment is required for an **Adjoining bearing masonry or wood framed building with**, full demo, demo with alt of 110%, 50% or more gross floor, one or more floors, etc.
- The assessment is to be performed by an RDP
- The assessment shall include at minimum a visual inspection of the **interior** and **exterior** where demo operations are to occur
- Assessment results to be documented in a report by RDP or RDP preparing design documents. Report must be provided to RDP responsible for the design documents

BC § 3306.5.7 INCORPORATE ALL OTHER RELEVANT REPORTS

3306.5.7 Incorporate all other relevant reports. The demolition submittal documents must incorporate all the conditions and findings identified in the geotechnical report when such report is required by Section 1803.6, the evaluation analysis when such analysis is required by Section 1817, the assessment reports required by Section 3306.5.4 and 3306.5.5, and the preconstruction survey when such survey is required by Section 3309.4.3.



PRE-CONSTRUCTION SURVEY OF

STREET, BROOKLYN, NY

Date: **March 31st, 2022**
To: **Property Owner of , BROOKLYN, NY**
Reference: **', BROOKLYN, NY**
(Block: , Lot:
Prepared by: **PE**
Services Corp

The demolition documents need to include the information obtained from other relevant reports and exploratory work such as:

- Geotechnical report (BC 1803.6)
- Evaluation Analysis (BC 1817)
- Assessment reports of the existing conditions (BC 3306.5)
- Preconstruction survey (BC 3309.4.3)

BC § 3306.9.16 TEMPORARY WEATHER PROTECTION

3306.9.16 Temporary weather protection. Temporary weather protection shall be installed and maintained by the demolition contractor, as necessary, to protect building systems or elements that may be susceptible to exposure to the weather during periods where the permanent weather protection has been breached, diminished, or is not yet in place. Such building systems or elements include, but are not limited to, walls, party walls, roofs, areas of missing brick, loose lain brick, and exposed electrical conduit.

- Temporary weather protection to be installed and maintained by the demolition contractor.
- BC § 3309.9 remains for permanent weatherproofing

MONITORING REQUIREMENTS: CHAPTERS 17, 18 & 33

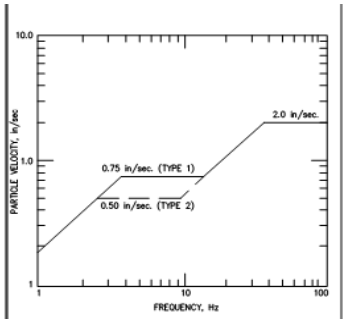


FIGURE A - USBM - VIBRATION CRITERIA THRESHOLD LIMITS

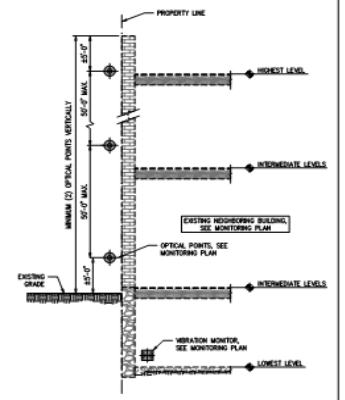
(AFTER SISKIND ET AL., 1980)

THE FIGURE PROVIDES A "THRESHOLD DAMAGE" LIMIT, CATEGORIZED BY BOTH FREQUENCY AND PARTICLE VELOCITY.

"THRESHOLD DAMAGE" IS DEFINED AS COSMETIC DAMAGE THROUGHOUT THE STRUCTURE SUCH AS LOOSENING OF PAINT, SMALL PLASTER CRACKS AT JOINTS BETWEEN CONSTRUCTION ELEMENTS AND LENGTHENING OF OLD CRACKS.

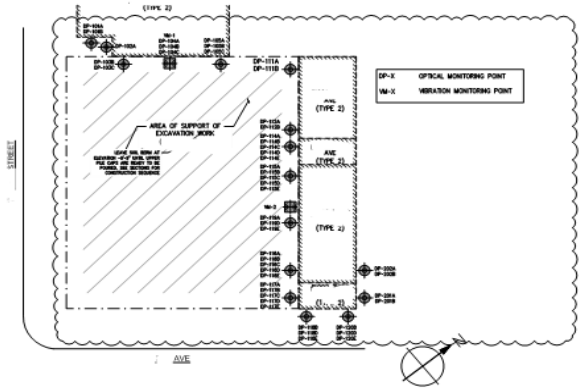
TYPE 1 INDICATES BUILDINGS WITHOUT BRICK/MASONRY FACADE AND NO INTERIOR PLASTER PARTITION WALLS.

TYPE 2 INDICATES HISTORIC BUILDINGS OR BUILDINGS WITH BRICK/MASONRY FACADE AND/OR INTERIOR PLASTER PARTITION WALLS.



TYPICAL MONITORING SECTION

SCALE: NTS



BUILDING MONITORING PLAN

SCALE: 1/16" = 1'-0"

SURVEY AND MONITORING NOTES:

1. DURING THE COURSE OF EXCAVATION AND PILE INSTALLATION, THE FOLLOWING SHALL BE MONITORED PER SECTION 3309 OF THE 2014 NYC BUILDING CODE AND THESE DRAWINGS.
   1.1. STRUCTURES THAT ARE WITHIN A DISTANCE FROM THE EDGE OF THE EXCAVATION THAT IS EQUAL TO OR LESS THAN THE MAXIMUM DEPTH OF THE EXCAVATION OR WITHIN A LATERAL DISTANCE OF 25 FEET FROM THE EDGE OF THE LOT WHERE THE EXCAVATION IS OCCURRING.
   1.2. LANDMARK/HISTORIC STRUCTURES THAT ARE CONTIGUOUS TO OR WITHIN A LATERAL DISTANCE OF 90 FEET FROM THE EDGE OF THE LOT WHERE AN EXCAVATION IS OCCURRING.
2. THE OWNER SHALL HIRE A PROFESSIONAL ENGINEER LICENSED IN THE STATE OF NEW YORK TO PERFORM A PRE-CONSTRUCTION CONDITION SURVEY OF ALL APPLICABLE STRUCTURES (SEE NOTE 1) IN ACCORDANCE WITH SECTION 3309 OF THE 2014 NYC BUILDING CODE. THE SURVEY SHALL BE COMPLETED PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.
   2.1. CRACK-GAUGES SHALL BE INSTALLED ON ANY OBSERVED EXISTING CRACKS AND OTHER CRITICAL/SENSITIVE AREAS AS IDENTIFIED BY THE OWNER'S ENGINEER WHO PERFORMED THE BUILDING PRE-CONSTRUCTION CONDITION SURVEY.
3. MONITOR ALL REQUIRED BUILDINGS FOR VERTICAL AND LATERAL MOVEMENT. REFER TO MONITORING PLAN ON THIS SHEET FOR MONITORING POINTS LOCATION. PROVIDE A MINIMUM OF FOUR OPTICAL MONITORS PER BUILDING FACE (TWO AT TOP AND TWO AT BOTTOM), U.O.N. OBTAIN BASELINE READINGS OF THE MONITORING POINT PRIOR TO AND DURING EXCAVATION AND NEW CONSTRUCTION. BASELINE SURVEY SHALL INCLUDE ESTABLISHING VERTICAL AND HORIZONTAL BENCHMARKS OF ALL ADJACENT BUILDINGS
4. FREQUENCY MONITORING WILL VARY DURING PROGRESS OF WORK. PERFORM OPTICAL SURVEYS (BY OTHERS) AT FREQUENCYS INDICATED IN THESE DRAWINGS. (IF MOVEMENT IS DETECTED THE INTERVAL WILL BE INCREASED AS NECESSARY BY THE ENGINEER)
5. VIBRATION MONITORS SHALL BE 3-COMPONENT SEISMOGRAPHS CAPABLE OF MEASURING PARTICLE VELOCITY DATA IN THREE MUTUALLY PERPENDICULAR DIRECTIONS. SEISMOGRAPHS MUST BE CAPABLE OF AUTOMATED REAL TIME NOTIFICATION FOR ALERT AND ALLOWABLE PEAK PARTICLE VELOCITY (PPV) LIMITS AND MUST HAVE REMOTE READOUTS THAT CAN BE MONITORED CONTINUOUSLY DURING PILE INSTALLATION, EXCAVATION AND PLACING COMPACTED BACKFILL WITHIN 50 FEET OF A MONITOR POINT. ANNUAL FACTORY CALIBRATION IS REQUIRED THROUGHOUT THE DURATION OF THE WORK.
6. THE LOCATION OF ALL SURVEY POINTS AND VIBRATION STATIONS ARE SUGGESTED UNDER THESE DRAWINGS AND SHALL BE FINALIZED BY SURVEYOR/MONITORING CONTRACTOR. A SURVEY POINT AND VIBRATION STATION PLAN, IN ACCORDANCE WITH THESE DRAWINGS, SHALL BE SUBMITTED TO THE CONSTRUCTION MANAGER AND ENGINEER BY THE SURVEYOR/MONITORING CONTRACTOR FOR REVIEW AND APPROVAL 2 WEEKS PRIOR TO COMMENCEMENT OF WORK. THE PLANS SHALL SHOW THE LOCATION OF ALL INSTALLED MONITORING POINTS AND THE SURVEY BENCHMARKS THAT WILL BE USED FOR OPTICAL SURVEY MONITORING.
   6.1. ALL MONITORING DATA SHALL BE PRESENTED TO THE CONSTRUCTION MANAGER, ENGINEER AND NYCT INSPECTOR (IF APPLICABLE) WITHIN 24 HOURS OF THE READINGS. FOR VIBRATIONS, THE PEAK VECTOR SUM OF THE PARTICLE VELOCITIES SHALL BE PLOTTED AGAINST TIME AS A HISTOGRAM FOR EACH GEOPHONE LOCATION. IN ADDITION, PROVIDE A PLOT OF THE FULL WAVEFORM FOR EACH EVENT ABOVE THE ALLOWABLE VALUE.
7. BUILDING MOVEMENT AND VIBRATION CRITERIA (STANDARD STRUCTURES):
   7.1. THE OWNER SHALL HIRE A SURVEYOR LICENSED IN THE STATE OF NEW YORK TO MONITOR MOVEMENTS AND TILTING OF ALL REQUIRED BUILDINGS (SEE NOTE 1) AND ANY TEMPORARY RETAINING WALLS AND/OR SHORING REQUIRED FOR THE SUPPORT OF EXCAVATION IN ACCORDANCE WITH THESE DRAWINGS.

NOTE:
DEWATERING SHALL CEASE WITHIN 24 HOURS IF OPTICAL MONITORING READINGS REGISTER ADDITIONAL BUILDING MOVEMENT (MEASURED RELATIVE TO MONITORING LOCATION AT THE START OF DEWATERING) EXCEED THE "ALERT LEVELS" NOTED ON THIS PLAN.

LEGEND
- INDICATES VIBRATION POINT
- INDICATES OPTICAL POINT
- XX ST./AVE. (TYPE #) INDICATES NEIGHBORING BUILDING ADDRESS AND BUILDING TYPE. SEE FIGURE A - USBM - VIBRATION CRITERIA THRESHOLD LIMITS.

PROJECT ROLE	COMPANY
STRUCTURAL ENGINEER:	
SOE ENGINEER:	
MONITORING CONSULTANT:	TBD

MONITORING PROTOCOL (STANDARD STRUCTURES)

MONITORING TYPE	MONITORING FREQUENCY (FOR ALL OPTICAL POINTS U.O.N. BELOW)		MAXIMUM ALLOWABLE	ALERT LEVEL	REQUIRED ACTION IF THRESHOLDS ARE EXCEEDED
OPTICAL	DURING FOUNDATION WORK	CONTINUOUS OPTICAL MONITORING	VERTICAL MOVEMENT = 0.50" HORIZONTAL MOVEMENT = 0.25"	VERTICAL MOVEMENT = 0.40" HORIZONTAL MOVEMENT = 0.20"	IF THE MOVEMENT REACHES THE ALERT LEVEL MOVEMENT, STOP WORK AND IMMEDIATELY NOTIFY THE CONSTRUCTION MANAGER AND ENGINEER. THE WORK SHALL RESUME UPON APPROVAL BY THE CONSTRUCTION MANAGER AND APPROVED REMEDIAL MEASURES AND/OR MODIFIED CONSTRUCTION PROCEDURES BY THE ENGINEER/CONTRACTOR. UPON RESUMING WORK, IF THE BUILDING MOVEMENT EXCEEDS THE MAXIMUM ALLOWABLE MOVEMENT, STOP WORK IMMEDIATELY AND INFORM THE CONSTRUCTION MANAGER AND ENGINEER. THE WORK SHALL RESUME UPON APPROVAL BY THE CONSTRUCTION MANAGER AND APPROVED REMEDIAL MEASURES AND/OR MODIFIED CONSTRUCTION PROCEDURES BY THE ENGINEER/CONTRACTOR.
	DURING UNDERPINNING OPERATIONS	CONTINUOUS OPTICAL MONITORING			
	DURING DEWATERING OPERATIONS	CONTINUOUS OPTICAL MONITORING			
	ALL OTHER OPERATIONS UNTIL THE GROUND FLOOR IS CONSTRUCTED	CONTINUOUS OPTICAL MONITORING			
	AFTER GROUND FLOOR AND UNTIL THE ROOF IS CONSTRUCTED	(1) TIME PER MONTH UP TO 6 MONTHS			
VIBRATION	CONTINUOUS REAL TIME VIBRATION MONITORING DURING PILE INSTALLATION, EXCAVATION AND PLACING COMPACTED BACKFILL WITHIN 50 FEET OF A MONITOR POINT. READING SHALL BE TAKEN UNDER THE DIRECTION OF THE VIBRATION CONTRACTOR/CONSULTANT.		THE MAXIMUM ALLOWABLE PEAK PARTICLE VELOCITY (PPV) SHALL BE BASED ON TYPE 1 OR TYPE 2 BUILDING CONSTRUCTION AS SHOWN IN "FIGURE A - USBM - VIBRATION CRITERIA THRESHOLD LIMITS" AT THE FREQUENCY SHOWN IN THIS FIGURE. THIS LIMIT APPLIES WITH NO DISTANCE CRITERIA.	50% OF THE MAXIMUM ALLOWABLE	IF THE VIBRATION PPV REACHES THE ALERT LEVEL PPV, INFORM THE CONSTRUCTION MANAGER AND ENGINEER. THE MAXIMUM ALLOWABLE PPV SHALL BE REVISED IF THE ALERT LEVEL MOVEMENTS OR CRACKING IS DETECTED. IF THE VIBRATION PPV EXCEEDS THE MAXIMUM ALLOWABLE PPV, STOP WORK IMMEDIATELY AND INFORM THE CONSTRUCTION MANAGER AND ENGINEER. THE WORK SHALL RESUME UPON APPROVAL BY THE CONSTRUCTION MANAGER AND APPROVED REMEDIAL MEASURES AND/OR MODIFIED CONSTRUCTION PROCEDURES BY THE ENGINEER/CONTRACTOR.
CRACKS	(2) TIMES PER WEEK DURING ALL OPERATIONS UNTIL GROUND FLOOR IS CONSTRUCTED. (1) TIME PER MONTH UP TO 6 MONTHS AFTER GROUND FLOOR AND UNTIL THE ROOF IS CONSTRUCTED		CRACK MOVEMENT TO BE ANALYZED IN CONJUNCTION WITH OPTICAL AND VIBRATION MONITORING DATA		REQUIRED ACTION TO BE DETERMINED BY CONSTRUCTION MANAGER AND ENGINEER AND SHALL BE BASED ON CRACK LOCATION AND SEVERITY OF CRACK MOVEMENT

BC § 1705.25.8.1 MONITORING: STRUCTURAL STABILITY

MONITORING SUMMARY & PROTOCOL				
MONITORING TYPE	DESCRIPTION	ANALYSIS/INSPECTION FREQUENCY	WARNING LIMIT	THRESHOLD LIMIT / REQUIRED ACTION
DISPLACEMENT OF STRUCTURES ADJACENT TO AND/OR WITHIN THE AREA OF INFLUENCE OF EXCAVATION.	MANUAL OPTICAL SURVEYING WITH ELECTRONIC TOTAL STATION	ONCE (1) DAILY DURING FACADE DEMOLITION. IF MOVEMENT OCCURS, INCREASE THE FREQUENCY OF THE READINGS AS RECOMMENDED BY BUILDING PROTECTION PLAN OR THE ENGINEER.	TWO (2) CONSECUTIVE READINGS OF ½" DISPLACEMENT IN ANY DIRECTION OR ONE (1) READING OF ¾"	IF VERTICAL OR LATERAL BUILDING MOVEMENT REACHES TWO (2) CONSECUTIVE READINGS OF ¾" OR ONE (1) READING OF 1", IMMEDIATELY NOTIFY THE CONSTRUCTION MANAGER, OWNER AND ENGINEER. IF IT REACHES 1", IMMEDIATELY NOTIFY THE CONSTRUCTION MANAGER, OWNER, ENGINEER AND STOP WORK. THE WORK SHALL RESUME UPON APPROVAL BY THE CONSTRUCTION MANAGER, OWNER, ENGINEER OF APPROVED REMEDIAL MEASURES AND/ OR MODIFIED CONSTRUCTION PROCEDURES.
EXISTING STRUCTURAL CRACK	MANUAL OBSERVATION AND RECORDING OF MEASUREMENT	CRACK MONITORS SHOULD BE READ ONCE (1) DAILY DURING FACADE DEMOLITION.	RECORDED MOVEMENT TO BE ANALYZED IN CONJUNCTION WITH VIBRATION AND OPTICAL MONITORING DATA	IF ANY INDIVIDUAL CRACK GAUGE EXCEEDS 2MM IMMEDIATELY INFORM THE CONSTRUCTION MANAGER, OWNER, ENGINEER AND STOP WORK. THE WORK SHALL RESUME UPON APPROVAL BY THE CONSTRUCTION MANAGER, OWNER ENGINEER OF APPROVED REMEDIAL MEASURES AND/ OR MODIFIED CONSTRUCTION PROCEDURES.

1705.25.8.1 Monitoring. The design documents for structural stability shall include any requirements for monitoring of the subject structure and/or adjacent structures, as determined by the registered design professional responsible for the design. The monitoring plan shall be specific to the buildings to be monitored and operations to be undertaken, and shall specify the scope and frequency of monitoring, acceptable tolerances, and reporting criteria for when tolerances are exceeded, including when the department is required to be notified. The monitoring plan shall include provisions for daily monitoring, at a minimum, until the structural stability protection methods are no longer necessary. Such monitoring can be accomplished by remote means, in-person monitoring or any combination thereof.

1705.25.8.1.1 Additional monitoring requirements for demolition. The design documents for structural stability shall identify and specify the monitoring required for the demolition operation and be specific to all phases of the demolition operation. These specifications must be part of the requirements identified for special inspection.

- Shall specify buildings to be monitored and operations
- Specify scope and frequency
- Acceptable tolerances
- Reporting criteria for when tolerances are exceeded
- Shall indicate when the department is to be notified

BC §1817.9 MONITORING: UNDERPINNING AND ALTERNATE METHODS OF SUPPORT

1817.9 Monitoring. When excavation, foundation construction, underpinning, or an alternate method of support is required, adjacent structures and properties shall be monitored in accordance with a plan prepared by the engineer. The engineer shall develop the scope of the monitoring program, including location and type of instruments, frequency and duration of readings, frequency of reporting, maximum allowable time to report readings (timely reporting), reporting requirements, and permissible movement and vibration criteria. This scope shall take into account the buildings or property to be monitored and the conditions thereof. The monitoring program shall include necessary actions to address exceedances. These actions shall include notification of the commissioner. Monitoring of historic and landmarked structures shall be subject to special requirements as determined by the department. Where the building to be monitored is subject to underpinning or alternate methods of support, the monitoring plan shall be determined by the engineer designing such work.

- Applies to excavation, foundation, underpinning/ alternate methods of support
- Adjacent structures and properties shall be monitored as per a plan prepared by a **PE.**
- PE shall specify scope, types, locations, frequencies, thresholds/ acceptable tolerances & permissible movements, reporting requirements, protocols/ actions for exceedances
- Design PE for underpinning/ alternate support design is responsible for developing that monitoring plan
- Shall indicate when the department is to be notified

BC §3309.4.4 SOIL OR FOUNDATION WORK AFFECTING ADJOINING PROPERTY: MONITORING

3309.4.4 Monitoring. During the course of excavation work the following shall be monitored in accordance with Section 3309.16:

1. Buildings that are within a distance from the edge of the excavation that is equal to or less than the maximum depth of the excavation.
2. Historic structures that are contiguous to or within a lateral distance of 90 feet (27 432 mm) from the edge of the lot where an excavation is occurring.

Exception: Monitoring is not required for excavations to a depth of five feet (1523 mm) or less, provided:

1. The excavation occurs more than 5 feet (1524 mm) from all footings and foundations; or
2. Where the excavation occurs within five feet (1524 mm) or less from a footing or foundation, such excavation does not occur below the level of the footing or foundation.

3309.4.5 Potential hazard. When, in the opinion of the commissioner, a potential hazard exists as a result of soil or foundation work, elevations of the adjacent buildings shall be recorded or other monitoring procedures shall be implemented by a registered design professional at intervals of 24 hours or less as determined by the commissioner to ascertain if movement has occurred.

- During excavation work monitoring is required for:
  - Buildings within the depth of the excavation horizontally
  - Historic structures within 90 feet of the project lot lines
- Refers to BC 3309.16 for additional monitoring plan requirements
- RDP to determine site specific monitoring requirements
- PE responsible for adjacent structures and properties as per BC 1817.9
- DOB can order monitoring if potential hazard exists

BC § 3309.6 SUBSURFACE OPERATIONS AFFECTING ADJACENT PROPERTY: MONITORING

3309.6 Subsurface operations affecting adjacent properties. Whenever subsurface operations, other than excavation or fill, are conducted that may impose loads or movements on adjoining property, including but not limited to the driving of piles, compaction of soils, or soil solidification, the effects of such operations on adjoining property and structures shall be monitored in accordance with Section 3309.16.

Exception: Monitoring during underpinning or alternate methods of support of buildings and adjacent property shall be in accordance with Section 1817.

3309.6.1 Change in ground water level. Where placement of a foundation will cause changes in the ground water level under adjacent buildings, the effects of such changes on the stability and settlement of the adjacent foundations shall be investigated and provision shall be made to prevent damage to such buildings.

3309.6.2 Potential hazard. When, in the opinion of the commissioner, a potential hazard exists as a result of subsurface operations, elevations of the adjacent buildings shall be recorded by a registered design professional at intervals of 24 hours or less as determined by the commissioner to ascertain if movement has occurred.

- Other subsurface operations, other than excavations, that may impose load on adjacent properties shall require monitoring
- Includes installation of piles, compaction of soils, soil solidification/ improvement operations
- Refers to BC 3309.16 for monitoring plan requirements
- RDP to determine site specific monitoring requirements
- PE responsible for monitoring plan of adjacent structures and properties as per BC 1817.9 **if** work affects lateral or vertical support of adjacent buildings or property
- DOB can order monitoring if a potential hazard exists

BC § 3309.16: MONITORING PLAN

3309.16 Monitoring plan. Where monitoring is required by Section 3309, such monitoring shall be in accordance with a monitoring plan developed by a registered design professional and acceptable to the commissioner. The monitoring plan shall be specific to the structures to be monitored and operations to be undertaken, and shall specify the scope and frequency of monitoring, acceptable tolerances, and reporting criteria for when tolerances are exceeded. Monitoring plans shall also comply with the applicable requirements of Chapter 18 and Sections 3303, 3304, and 3306.

- RDP to determine the site-specific monitoring requirements
- Must be specific to the operations being performed and the project scope of work
- Must be specific to the structures being monitored including being coordinated with the specific project phases of work
- Monitoring plan must specify the scope, structures, types, frequency, tolerances and protocols/ reporting criteria for exceedances
- Please note that the expanded monitoring plan requirements for Chapter 18 (BC § 1817.9) apply to underpinning and alternate methods of support of buildings **and adjacent property**. SOE affecting adjacent property is included. PE to develop the monitoring plan

BC § 3306.12 MONITORING OF ADJOINING STRUCTURES DURING DEMOLITION

3306.12 Monitoring of adjoining structures during demolition. Where a bearing masonry or wood framed building shares a party wall or party foundation with a building that is to undergo a full demolition, a demolition performed in conjunction with work that meets the requirements of Section 101.4.5 of Title 28 of the *Administrative Code*, a demolition that results in the demolition of more than 50 percent of the gross floor area of the building during the course of work over any 12-month period, or a demolition that results in the removal of one or more floors during the course of work over any 12-month period, such bearing masonry or wood framed building shall be monitored during the demolition operation. The monitoring shall be in accordance with a monitoring plan prepared or accepted by the registered design professional who prepared the submittal documents in accordance with Section 3306.5. The monitoring plan shall be acceptable to the commissioner and shall include but not be limited to, the monitoring frequency, reporting requirements for the monitoring program, anticipated movement and settlement thresholds, and procedures to be implemented when thresholds are exceeded.

New as of 2022 Code: The adjacent attached bearing masonry or wood framed building shall be monitored during demolition operations.

1. Full demolition of a building sharing a party wall and/ or a party foundation with an unreinforced masonry/ bearing masonry or wood framed structure.
2. Demolition performed in conjunction of an alteration to meet New Building requirements (increasing floor area by 110%).
3. Demolition of more than 50 percent of the gross floor area of a building over a 12-month period.
4. Demolition that results in the removal of one or more floors during the course of work over a 12-month period.
5. Monitoring plan by or accepted by the RDP that prepared the submittal documents.

SPECIAL INSPECTIONS: STRUCTURAL STABILITY

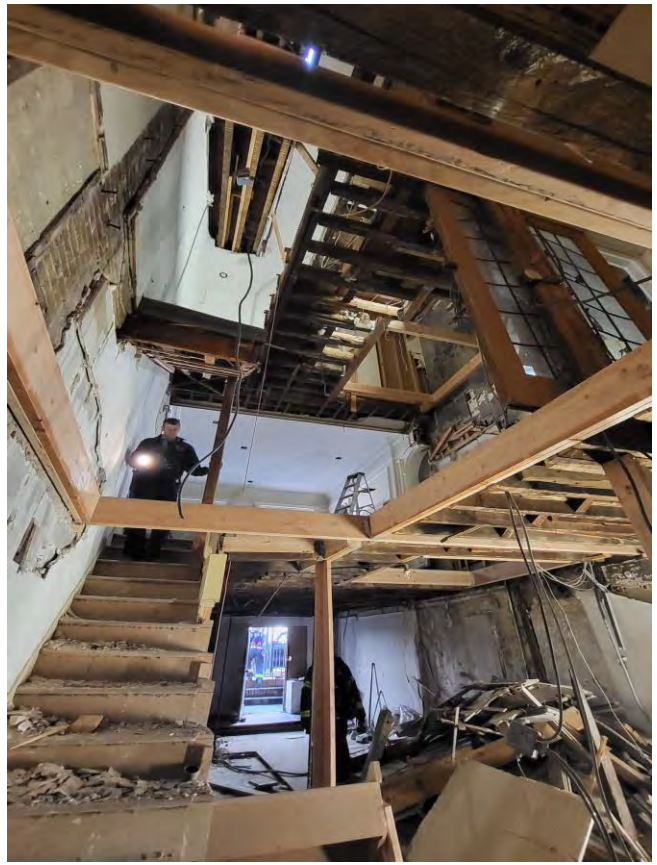
[~~1704.20~~] 1705.25 Structural stability. [~~Special inspection for structural stability~~] Special inspection for structural stability is an inspection of a structure to verify the ability of such structural system to remain in position, or revert to the original position or another stable equilibrium position acceptable by this code, without incurring damage to the structural system from the activity or load to which it had been subjected until the completion of construction. Such special inspection shall be required for construction work as specified in this section or elsewhere in this code. Structural materials and methods of construction utilized in temporary protections shall be subject to special inspection when such materials and methods of construction would be subject to special inspection as a permanent installation in accordance with the applicable sections of this chapter, including but not limited to special [~~inspection~~] inspections for concrete, [~~welding~~] structural steel, and [~~pile driving.~~] deep foundation installation. The registered design professional responsible for plans for a new building, alteration, or other work requiring structural stability inspections shall identify those areas on the plans submitted to the department in accordance with Section 1704.1.1.1. The means and methods of implementing the structural stability measures shall be prepared by a registered design professional and filed with the department where required in this section and elsewhere in this code.

Exception: Alterations consisting of the replacement of existing exterior [~~window or door~~] lintels located less than 75 feet (22 860 mm) above curb level spanning less than 4 feet ([~~1219~~] 1220 mm) and existing interior headers spanning less than 4 feet ([~~1219~~] 1220 mm), provided the size of the existing span is not increased, shall be exempt from special inspection for structural stability.

Changes from 2014 NYC Building Code

- Definition of the inspection has been added
- Clarifications to temporary protection inspections
- The RDP for NB/Alt shall **identify** areas on plan where structural stability inspections are required.
- An RDP shall prepare and file means and methods for implementing the structural stability measures as required

SPECIAL INSPECTIONS: STRUCTURAL STABILITY – ALTERATIONS TO EXISTING STRUCTURES & CONSTRUCTION OPERATIONS



1705.25.1 Alterations to existing structures. Alterations to existing structures in which loads are transferred from one structural system of structural elements to another, such as installation of columns or girders, replacement of existing bearing walls, the creation of openings or slots in existing walls, girders or floors, alteration of arches, rigid frames, trusses in frame buildings, where the stability or integrity of a structural system is to be temporarily diminished, or where otherwise required by the commissioner, shall be subject to special inspections in accordance with Sections 1705.25.7 through 1705.25.10.

1705.25.2 Construction operations influencing adjacent structures. Where construction operations have the potential to affect structurally the condition or occupancy of the subject structure and/or an adjacent structure, the structural stability of such structures shall be subject to special inspections in accordance with Sections 1705.25.7 through 1705.25.10.

- Loads that are transferred from one structural system to another. Where the integrity of the structure is temporarily diminished
- Construction operations influencing adjacent structures.

  *NOTE: This can be **ANY** type of construction operation that affects structural stability.*

SPECIAL INSPECTIONS: STRUCTURAL STABILITY -SUPPORT OF EXCAVATION & UNDERPINNING

‡‡‡ **1705.25.3 Excavations.** Methods employed to protect the sides of excavations that require construction documents in accordance with Section 3304.4.1, and blasting for the purpose of excavation shall be subject to special inspections in accordance with Sections 1705.25.7 through 1705.25.10.

1705.25.3.2 New foundations. In addition to the special inspection for structural stability, any new foundation elements installed as part of support of excavation operations shall be subject to special inspection as a permanent installation in accordance with the applicable sections of this chapter, including, but not limited to, special inspection for concrete, structural steel, and deep foundation installation.

1705.25.4 Underpinning and alternate methods of support of buildings and adjacent property. Underpinning of structures and alternate methods of support of buildings and adjacent property shall be subject to special inspections in accordance with Sections 1705.25.7 through 1705.25.10.

1705.25.4.1 New foundations. In addition to the special inspection for structural stability, any new foundation elements installed as part of underpinning operations shall be subject to special inspection as a permanent installation in accordance with the applicable sections of this chapter, including, but not limited to, special inspection for concrete, structural steel, and deep foundation installation.

- Excavations that require construction documents shall be subject to a structural stability special inspection (**continuous** as per **BC 1705.25.8.4**)
- Underpinning and alternate methods of support require a structural stability special inspection (**continuous** as per **BC 1705.25.8.3**)
- New foundations that are installed permanently during excavation or underpinning are subject to those relevant special inspections (i.e., concrete, structural steel, deep foundations)

SPECIAL INSPECTIONS: SUPPORT OF EXCAVATION & UNDERPINNING – ADDITIONAL DESIGN DOCUMENT REQUIREMENTS

1705.25.8.3 Additional requirements for design documents for underpinning and alternate methods of support of buildings and adjacent property. Design documents for underpinning and alternate methods of support of buildings and adjacent property shall comply with the requirements of Section 1817. Such drawings shall indicate a project-specific required minimum interval for special inspections. A written statement of what the special inspection must include shall be provided on the design documents. The minimum special inspection interval must be incorporated into the sequence of operations. Building components and phases of operations deemed to be structurally critical must be identified for inspection. A monitoring protocol must be provided in accordance with the requirements of Section 1705.25.8.1.1. At a minimum, underpinning shall be subject to continuous special inspection for structural stability of the structure being underpinned while work is occurring.

1705.25.8.4 Additional requirements for design documents for protection of the sides of excavations and blasting. Design documents for protection of the sides of excavations and blasting methods of support of buildings and adjacent property shall indicate a project-specific required minimum interval for special inspections. A written statement of what the special inspection must include shall be provided on the design documents. The minimum special inspection interval must be incorporated into the sequence of operations. Building components and phases of operations deemed to be structurally critical must be identified for inspection. A monitoring protocol must be provided in accordance with the requirements of Section 1705.25.8.1.1. At a minimum, protection of the sides of excavations and blasting work shall be subject to continuous special inspection for structural stability of the structure or adjacent property being affected while work is occurring.

- Design Documents must comply with BC 1817
- Written statement on design docs noting what the special inspection must include
- Must indicate project specific minimum inspection intervals into the sequence of operations
- Structurally critical building components must be identified
- Applies to underpinning/ alternate methods of support and support of excavation

SPECIAL INSPECTIONS: DEMOLITION

1705.25.5 Demolition. Demolition operations shall be subject to special inspection in accordance with Sections 1705.25.5.1 and 1705.25.5.2 as applicable to the operations.

1705.25.5.1 Mechanical means and methods of demolition. Where mechanical demolition equipment, other than handheld devices, is to be used in the full or partial demolition of a building from within the building, or is to be used within the building to remove debris or move material, such demolition operation shall be subject to special inspection in accordance with Sections 1705.25.7 through 1705.25.10. The special inspector shall visit the site a minimum of three times: before demolition operations start, during demolition, and at the conclusion of demolition. Additionally, the special inspector shall visit the site at minimum intervals identified in the design documents and set forth in Section 1705.25.8.2.

1705.25.5.2 Other means of demolition. Where full or partial demolition of a weakened structure as specified in Section 3306.7 or the demolition of a masonry wall with a height to thickness ratio of 16 or greater is proposed, or the demolition of a floor structure directly supported by such wall, such demolition operation shall be subject to special inspection in accordance with Sections 1705.25.7 through 1705.25.10. The special inspector shall visit the site a minimum of three times: before demolition operations start, during demolition, and at the conclusion of demolition. Additionally, the special inspector shall visit the site at minimum intervals identified in the design documents and set forth in Section 1705.25.8.2.

- Inspections are required when non-handheld mechanical equipment is used
- Inspection required when mechanical equipment used to remove/ move debris
- Demolition of weakened structures
- Demolition of slender masonry walls H/T = 16 or higher, or floors supported by such walls

SPECIAL INSPECTIONS: DEMOLITION

1705.25.8.2 Additional requirements for design documents for demolition. Design documents for demolition shall indicate a project-specific required minimum interval for special inspections. A written statement of what the special inspection must include shall be provided on the design documents. The minimum special inspection interval must be incorporated into the demolition sequence. Building components and phases of demolition deemed to be structurally critical must be identified for inspection. A monitoring protocol must be provided in accordance with the requirements of Section 1705.25.8.1.1.

- Design documents must indicate a project specific minimum inspection interval
- Written statement on design documents noting what the special inspection must include
- The minimum special inspection interval must be incorporated into the **demolition sequence**
- Structurally critical components and phases must be identified for inspection

SPECIAL INSPECTIONS: STRUCTURAL STABILITY – INSPECTION PROGRAM

1705.25.7 Inspection program. Prior to commencement of work requiring special inspection per Section 1705.25, the special inspector shall review the approved construction documents, related reports, and contractor's sequence of operations and confirm that all areas of work requiring special inspection per Section 1705.25 have design documents addressing the structural stability temporary protections and sequence. A written statement shall be included in the design documents prepared in accordance with Section 1705.25.8, indicating:

1. The portions of work requiring design documents in accordance with Section 1705.25.8.
2. The names and addresses of the licensed professionals that have been engaged to supply design documents for applicable work.
3. Where filing of plans is required, the application and permit numbers for the design documents for the applicable work.
4. A schedule of special inspections, at agreed intervals, including adequate frequency to assure the contractor's continued compliance with the proposed designs and sequence of construction operations. At a minimum, the site must be inspected twice, once at a pre-construction meeting with the contractor and once during construction operations.

- Inspections refer to BC 1705.25.7 though **BC 1705.25.10** when required
- Includes review of all design documents (i.e., drawings, sketches, shop drawings) **BC 1705.25.8**
- Monitoring required for subject and adjacent structures **BC 1705.25.8.1**
- Inspection shall occur at agreed upon intervals **BC 1705.25.9**
- Records shall be maintained in the special inspection logbook **BC 1705.25.10**

LOT LINE CASE STUDIES

NO SUPPORT OF EXCAVATION

Example 1 – Observations

- 20’+ deep unsupported shear cut of soil with a lower layer of uncertified rock. No Support of Excavation installed
- Surcharge from storage on adjacent lot
- Work contrary to filed drawings
- No inspections

NO SUPPORT OF EXCAVATION

Example 1 – Observations
(continued)

- Existing foundation wall on project site not braced
- Neighboring adjoining footing elevation not known
- Unknown connection between wall and foundation/ rock
- No preconstruction report or survey
- No monitoring

NO SUPPORT OF EXCAVATION

Example 1 – Outcome for the Adjoining Properties

- Full and partial vacate orders required on all exposures 2, 3 and 4 due to structural stability hazards
- Emergency backfill/ berm work required to stabilize the site
- Vacate orders not rescinded until the site was backfilled/ stabilized

NO SUPPORT OF EXCAVATION

Example 1 – Outcome for the Construction Site

- Emergency backfill order
- Emergency monitoring order
- Stop work order
- Engineering audit
- Enforcement action taken against the contractor

SUPPORT OF EXCAVATION FAILURE

Example 2 – Observations

- +/-21 feet of supported soil
- Soldier piles and wood lagging with spacer plates, walers, rakers
- No continuation of rakers to soldier piles; Stop at walers
- Adjoining buildings within the influence of the system
- Work largely in compliance with the design

SUPPORT OF EXCAVATION FAILURE

Example 2 – Observations

- Buckling overstress/ failure of the steel spacer plates
- Plates may have been designed for concentric axial loading and not clear if consideration for additional forces/ unbalanced loads were accounted for
- SOE system largely displaced creating a public safety hazard and damage to adjoining property

SUPPORT OF EXCAVATION FAILURE

Example 2 – Outcome for the Adjoining Property

- Full and partial vacate orders required adjacent to the failure location. Occupants displaced
- Damaged building required immediate emergency shoring
- Damaged building required permanent foundation and superstructure repairs

SUPPORT OF EXCAVATION FAILURE

Example 2 –
Outcome for the Construction Site

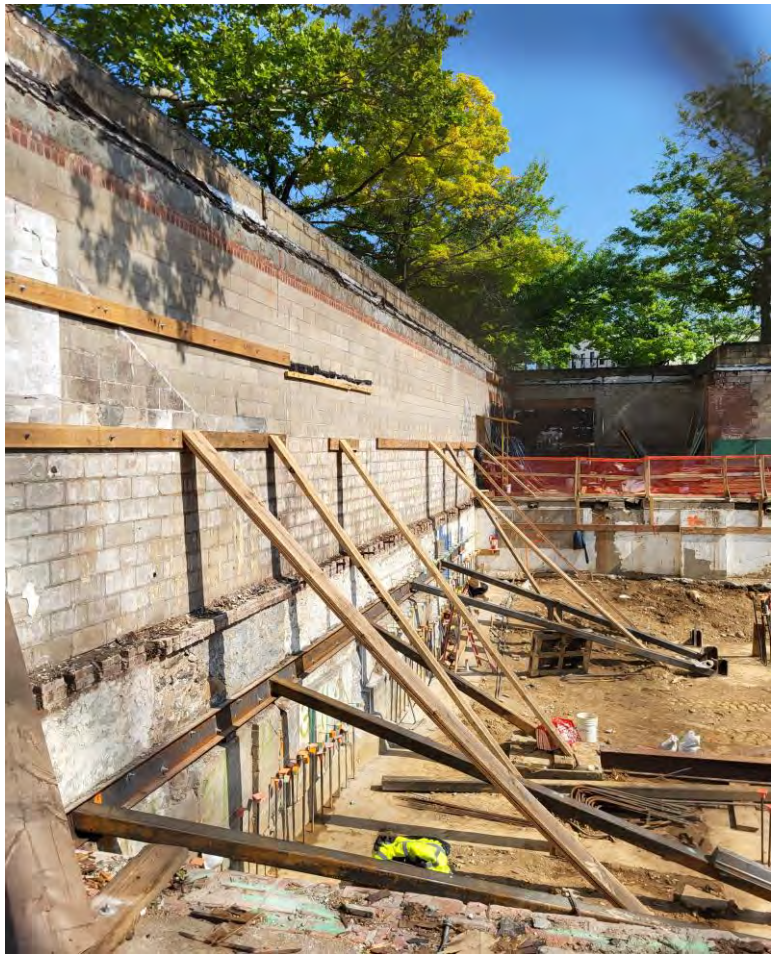
- Emergency backfill order
- Emergency monitoring order
- Stop work order
- Engineering audit
- Forensic Investigation Order to the Owner
- Peer Review Order to the Owner
- Enforcement actions

LOT LINE PARTIAL DEMOLITION

Example 3 – Observations

- The architectural and partial demolition drawings were not coordinated. **AC § 28-104.7.1**
- Roof framing that was bracing the top of the wall was removed
- Ground floor framing removed
- Cellar slab removed

LOT LINE PARTIAL DEMOLITION



Example 3 – Observations

- The permit holder did not have a bracing design to allow for maintaining the masonry wall. **BC §3306.5.1**
- Inadequate bracing was installed
- Bracing appeared to have been installed largely after floor removal

LOT LINE PARTIAL DEMOLITION

Example 3 – Outcome for the Adjoining Property

- Public park required a vacate order until the wall was stabilized
- Long duration closure of public resource

LOT LINE PARTIAL DEMOLITION

Example 3 – Outcome for the Adjoining Property

- Public park required a vacate order until the wall was stabilized
- Long duration closure of public resource

LOT LINE PARTIAL DEMOLITION

Example 3 – Outcome for the Construction Site

- Immediate Emergency stabilization and monitoring orders
- Engineering audit
- Stop work order
- Enforcement actions

LOT LINE SOE INSTALLATION EQUIPMENT FAILURE

Example 4 – Observations

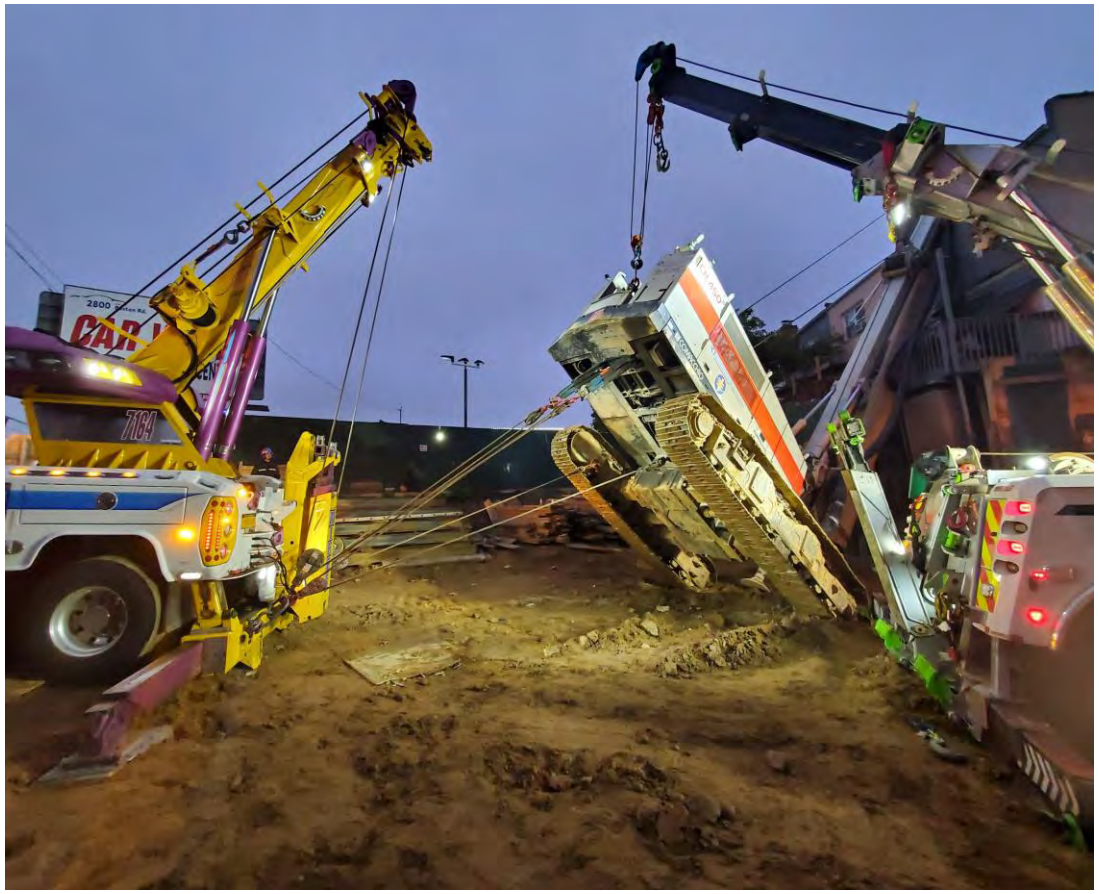
- Drill rig equipment failure during case removal
- Caused equipment to overturn striking an adjacent occupied building

LOT LINE SOE INSTALLATION EQUIPMENT FAILURE

Example 4 – Outcome for the Adjoining Property

- Full Vacate order due to the structurally compromised condition
- Permitted repairs and stabilization required

LOT LINE SOE INSTALLATION EQUIPMENT FAILURE



Example 4 – Outcome for the Construction Site

- Stop work order along the impacted exposure
- Review of safety procedures and means and methods
- Engineering audit
- No work allowed until adjacent property was stabilized
- Enforcement actions including failure to safeguard

FORMWORK

FORMWORK

- Structural elements can be found adjacent to existing lot line construction
- When considering design and placement of these structural elements, it is crucial to evaluate intended or unintended impact on adjoining structures
- Formwork systems deflect when loaded. The anticipated deformation must be accounted for when locating structural elements and/or accounted by the formwork designer when specifying systems. The structural separation mandated by code must be maintained.

FORMWORK: 2014 & 2022 NYC BUILDING CODE

- **BC §3305.3** discusses concrete formwork minimum requirements
- **BC §3305.3.1.1** – safe support of loads –
  - Must support all vertical and lateral loads imposed.
- **BC§3305.3.1.2** – vertical and lateral loads
  - There must be an adequate load path for the formwork.
    - Carried to the ground
    - Carried by new construction once it has adequate strength (evaluated for use)
    - Carried by existing structures (see **BC§3305.3.1.2.1**)

FORMWORK: 2014 & 2022 NYC BUILDING CODE

- **BC §3305.3.1.2.1** – Use of existing structures to support vertical or lateral loads
  - Evaluation by a RDP to determine adequacy of the existing structure to support the loads imposed.
  - The RDP shall prepare design drawings documenting:
    - Findings of the evaluation
    - Location of formwork elements
    - Interface between the formwork and the existing structure

FORMWORK: 2022 NYC BUILDING CODE

- **This is an addition
- **BC§3305.3.1.2.1** – Use of existing structures to support vertical or lateral loads - Continued
  - Use of Stay-Form (or similar) product against an existing structure, against insulation in a seismic gap, or against other elements has the potential to transfer loads to an existing structure.
    - Must assume a load is imposed
    - RDP evaluation is required
      - Follow the requirements of **BC §3305.3.1.2.1**
      - Where it is determined by the RDP after evaluation that loads are not imposed, document the findings in the design drawings.

FORMWORK: 2022 NYC BUILDING CODE

2022 NYC BC updated the ACI 318 Section referenced

3305.3.2 Design of concrete formwork. Design of formwork, including but not limited to forms, proprietary formwork products, shores, and shoring foundations, shall comply with ACI 318, Section 26.11, and the requirements of Sections 3305.3.2.1 through 3305.3.2.8 of this code.

3305.3.2.1 Design drawings. Site-specific formwork design drawings prepared by a registered design professional shall be required in the following cases:

1. For concrete formwork in a structure classified as a major building;
2. Wherever the shore or form height exceeds 14 feet (4267 mm);
3. Wherever the total vertical load on the forms exceeds 150 pounds per square foot (732 kg/m^2);
4. Wherever power buggies are used;
5. Wherever multi-stage shores are used;
6. Wherever the slab thicknesses or beam heights equal or exceed 10 inches (254 mm);
7. Wherever there are concentrated loads exceeding 2000 pounds (907 kg) imposed on the formwork; or
8. Wherever there are loads imposed on existing structures in accordance with Section 3305.3.1.2.1.

Exception: Design drawings prepared by a registered design professional are not required for formwork installed in conjunction with slabs supported directly on grade or footings where such slab or footing does not impart any load on an adjacent structure.

FORMWORK: 2022 NYC BUILDING CODE

3305.3.2.3 Lateral concrete pressure. Design of forms, ties and bracing shall satisfy the minimum lateral pressures of fresh concrete specified in Table 3305.3.2.3. Maximum rate of placement shall be shown on the design drawings.

TABLE 3305.3.2.3
MINIMUM LATERAL PRESSURES TO BE ASSUMED FOR FRESH CONCRETE WEIGHING 150 POUNDS PER CUBIC FOOT[a,b,c]

TYPE OF WORK	MINIMUM LATERAL PRESSURE ASSUMED (PSF)	LIMITATIONS
Columns: Ordinary work with normal internal vibration	$p = 150 + (9000R/T)$	Maximum 3,000 psf or $150h$, whichever is less
Walls: Rate of placement at 7 feet per hour or less	$p = 150 + (9000R/T)$	Maximum 2,000 psf or $150h$, whichever is less
Walls: Rate of placement at greater than 7 feet per hour	$p = 150 + (43400/T) + (2800R/T)$	Maximum 2,000 psf or $150h$, whichever is less
Slabs	$p = 150h$	None

For SI: 1 inch = 25.4 mm, 1 foot per second = 0.305 m/s, 1 pound per cubic foot = 16.02 kg/m^3, 1 pound per square foot = 4.882 kg/m^2, °C = (°F-32)/1.8.

where:

R = rate of placement, feet per hour.

T = temperature of concrete in the forms, °F.

h = height of fresh concrete above point considered, feet.

a. Allowances for change in lateral pressure shall be made for concrete weighing other than 150 pcf; for concrete containing pozzolanic additions or cements other than Type I, for concrete having slumps greater than 6 inches, or for concrete consolidated by revibration or external vibration of forms.

b. Where retarding admixtures are employed under hot weather conditions, an effective value of temperature less than that of the concrete in the forms shall be used in the above formula.

c. If retarding admixtures are used in cold weather, the lateral pressure may be assumed as that exerted by a fluid weighing 150 pcf.

FORMWORK: 2022 NYC BUILDING CODE

3305.3.3 Formwork inspection and observation. Formwork shall be inspected and observed in accordance with the requirements of Sections 3305.3.3.1 through 3305.3.3.3.

3305.3.3.1 Inspection by contractor. Formwork, including shores, reshores, braces and other supports, shall be inspected prior to placement of reinforcing steel to verify the adequacy and proper installation of the formwork, and where construction documents and form design drawings are provided, that the formwork conforms to the construction documents and form design drawings. Subsequently, during and after concreting, periodic inspections shall be performed to detect incipient problems, and the elevations, camber, and vertical alignment of formwork systems shall be inspected using tell-tale devices. Such inspections shall be performed by a qualified person designated by the contractor; nothing shall prohibit the concrete safety manager from performing such inspection where so designated. The results of such inspections shall be documented in an inspection report signed and dated by the qualified person who performed the inspection. The names of the persons responsible for such inspections and the foreman in charge of the formwork shall be posted in the field office.

FORMWORK: 2022 NYC BUILDING CODE

3305.3.3.2 Formwork observation. In addition to the inspections by the contractor required pursuant to Section 3305.3.3.1, visual observations of the formwork for the general conformance with the design intent shall be performed by:

1. The formwork designer;
2. An employee of the formwork designer under his or her direct supervision;
3. A registered design professional retained by the formwork designer; or
4. An employee of such retained registered design professional under the direct supervision of such retained registered design professional.

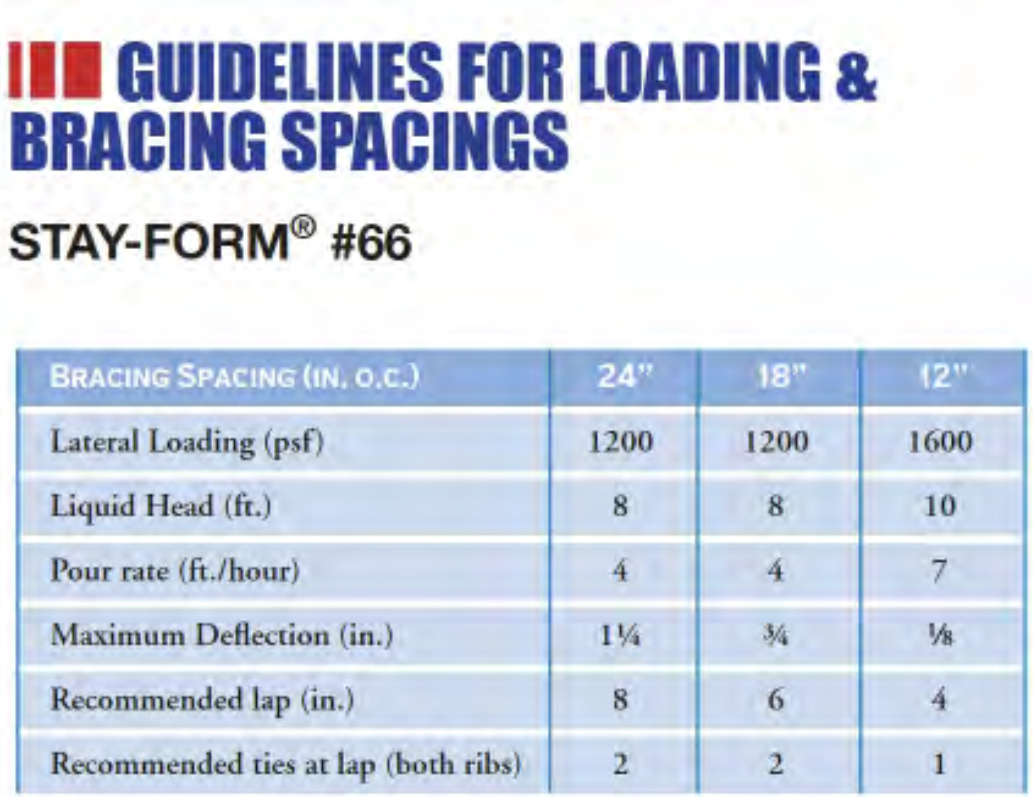
Exceptions: Formwork observation pursuant to Section 3305.3.3.2 shall not be required for:

1. Formwork that does not require design drawings pursuant to Section 3305.3.2.1; and
2. One- two- and three-family dwellings and accessory uses to such buildings.

3305.3.3.2.1 Intervals. Formwork shall be observed at intervals permitting observation of representative configurations throughout the project duration. The formwork designer shall maintain a log of such observations at the construction site. At a minimum, observations shall be made:

1. Immediately after formwork related incidents or violations are issued; and
2. When concrete construction operations are significantly modified such as changes to form materials, concrete placement cycle, or form and support layout prior to use of the change.

FORMWORK CASE STUDY: FAILURE



GUIDELINES FOR LOADING & BRACING SPACINGS

STAY-FORM® #66

BRACING SPACING (IN. O.C.)	24"	18"	12"
Lateral Loading (psf)	1200	1200	1600
Liquid Head (ft.)	8	8	10
Pour rate (ft./hour)	4	4	7
Maximum Deflection (in.)	1¼	¾	⅛
Recommended lap (in.)	8	6	4
Recommended ties at lap (both ribs)	2	2	1

- Example from **Stay-Form** specifications
- With 24” brace spacing, a pour rate of 4 ft/hour, you can anticipate to see 1 ¼” of deflection of the formwork

FORMWORK CASE STUDY: FAILURE

GUIDELINES FOR LOADING & BRACING SPACINGS

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Recommended ties at lap (both ribs)	2	2	1

Questions for Consideration

- How does this impact your structural separation?
  - 1” from property line required for each 50 feet of height or use rational analysis to justify a smaller separation with a minimum of 1” along the full height
  - BC § 1613.7 2014 NYCBC
  - BC § 1613.4 2022 NYCBC
- Will this impose load on the adjoining structure?

FORMWORK: STRUCTURAL SEPARATION

Example 1

- RDP must consider the impact of existing elements – chimney, external wall restraint – when locating their permanent structure
- We commonly see designers not account for formwork placement requirements when locating structural elements
- Commonly impacted elements: slab edges, columns and shear walls

FORMWORK: FOUNDATION WALL

Example 2 – Questions for Consideration

- Will this impose load on the adjoining structure?
- Has a RDP provided a structural assessment of the ability of the rubble foundation wall to withstand the lateral pressure from fresh concrete?

FORMWORK: FOUNDATION WALL

Example 2 – Observations

- Occupied adjoining structure
- One-sided formwork was used contrary to the formwork drawings
- No RDP structural assessment of the ability of the rubble foundation wall to withstand the lateral pressure from fresh concrete
- Significant failure of the foundation wall

FORMWORK: FOUNDATION WALL

Example 2 – Outcome for the Damaged Property

- Adjoining structure was vacated due to a structurally compromised condition – long-term displacement of resident(s) **AC§28-207.4**
- Emergency stabilization required **AC§28-105.4.1**
- Permanent restoration of the party wall required **AC§28-301.1**

FORMWORK: FOUNDATION WALL

Example 2 – Outcome for the Construction Site

- Engineering audit including review of formwork design
- Site specific formwork was required due to loads imposed. **BC§3305.3.2.1**
- Full stop work order **BC§3301.2**; **BC§3305.3.1.2.1**
- Remedial actions to repair/certify new wall

FORMWORK: SHEAR WALL

Example 3 – Question for Consideration

Blindside form utilized at shear wall location

- Does this have the potential impose load on the adjoining structure?

FORMWORK: SHEAR WALL

Example 3 – Questions for Consideration

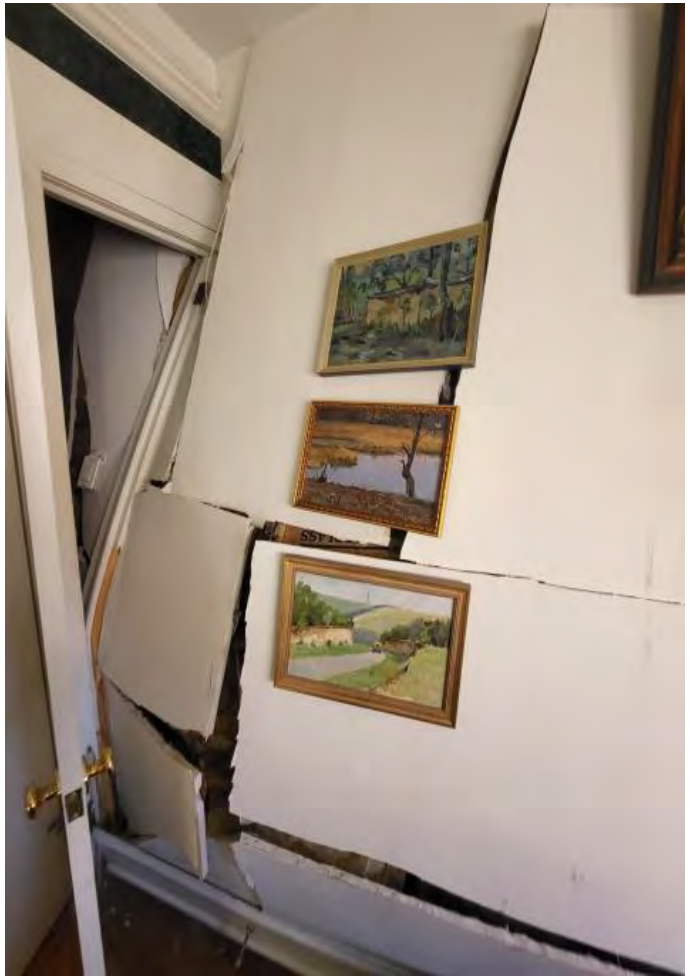
- Does my project require project specific formwork design by a RDP? **BC§3305.3.2.1**
- Has a RDP provided an evaluation for the use of stay form or equivalent form system with the potential to transfer loads? **BC§3305.3.1.2.1**

FORMWORK: SHEAR WALL

Example 3 – Questions for Consideration

- Has the anticipated deflection of the formwork system been considered? **BC§3305.3.2.1**
- Was an inspection/observation of the formwork performed prior to pour? **BC§3305.3**

FORMWORK: SHEAR WALL



Example 3 – Observations

- Occupied adjoining structure
- Significant displacement +/-2’ and failure of unreinforced masonry bearing wall
- Structural integrity and egress compromised

FORMWORK: SHEAR WALL

Example 3 – Outcome for the Damaged Property

- Adjoining structure was vacated due to a structurally compromised condition – long-term displacement of resident(s) **AC§28-207.4**
- Emergency stabilization required **AC§28-105.4.1**
- Permanent restoration of the party wall required **AC§28-301.1**

FORMWORK: SHEAR WALL

Example 3 – Outcome for the Construction Site

- Engineering audit including review of formwork design
- Site specific formwork was required due to loads imposed and beam depth exceeding 10” **BC§3305.3.2.1**
- Stop work order on concrete operations and specifically adjoining the damaged structure **BC§3301.2**; **BC§3305.3.1.2.1**
- Investigation/remediation of wall with failed formwork

FORMWORK: SHEAR WALL

Example 3 – Outcome for the Construction Site

- Site specific formwork drawings were not prepared for the shear walls that had the potential to impose load. **BC§3305.3.2.1**
- Formwork inspection by the contractor was required prior to pour. The inadequate formwork drawings would not have allowed for an adequate inspection. **BC§3305.3.3.1**

RESOURCES: LOT LINE CONSTRUCTION

- BIS
  - Actions
  - CO
  - Emergency declaration history
  - Enforcement history
  - Adjoining building application information
- DOB Now
  - Adjoining building application information

RESOURCES: LOT LINE CONSTRUCTION

- NYPL Digital Tax Maps
  - http://spacetime.nypl.org/maps-by-decade/#/
  - https://digitalcollections.nypl.org/collections/atlases-of-new-york-city#/?tab=navigation
- https://www.oldnyc.org/
- LPC GIS Maps
  - http://www1.nyc.gov/site/lpc/designations/maps.page

RESOURCES: LOT LINE CONSTRUCTION

- **http://www.oasisnyc.net/**
  - NY Digital Tax Maps
  - ACRIS
  - Aerial Timeline

- **https://zola.planning.nyc.gov**
  - HPD I-cards
  - Google Street View

build safe | live safe

NYC Buildings