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DIGITAL CONSTRUCTION SAFETY CONFERENCE

CONSTRUCTION SAFETY: OUTRIGGER SCAFFOLD (THRUST OUT) PLATFORMS & SUPPORTED SCAFFOLDS

PRESENTED BY

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Construction Safety Engineering

NYC Buildings

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PRESENTATION OVERVIEW

Construction Safety is critical to a successful project. External construction equipment including supported scaffolds and outrigger/thrust out platforms have been erected to facilitate the construction of buildings throughout New York City (NYC). When implemented properly, the equipment can be effectively used to complete projects. When improperly implemented, the safety of workers and the public is compromised. As it relates to this topic, this presentation reviews critical aspects of the NYC Construction Codes, engineering considerations, common deficiencies and case studies.

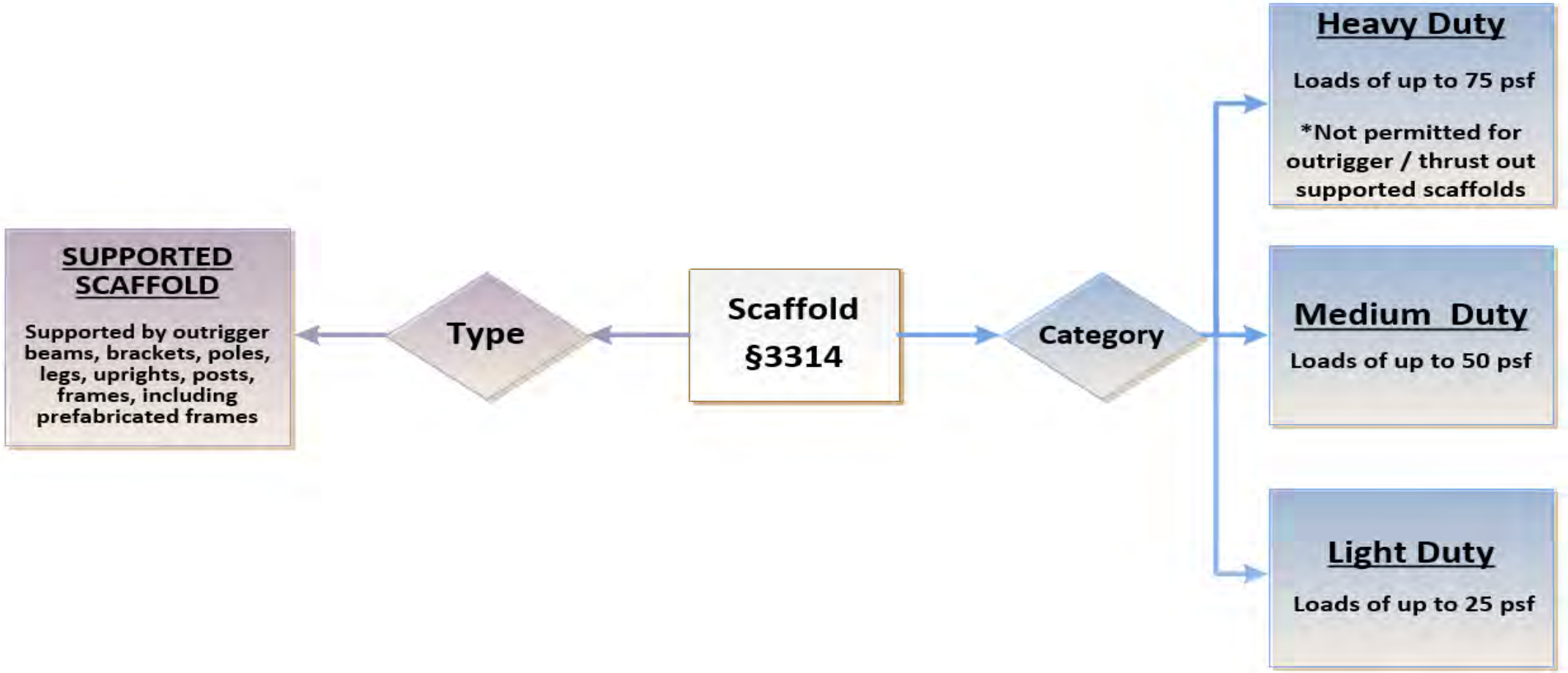
FOCUS

- Participants will review construction safety code requirements for outrigger/thrust out platforms.
- Participants will review construction safety code requirements for supported scaffolds.
- Participants will review common errors and omissions that have been observed throughout design, inspection and construction for outrigger/thrust out platforms and supported scaffolds.
- Participants will review case studies to demonstrate the impact that these systems have on public safety.

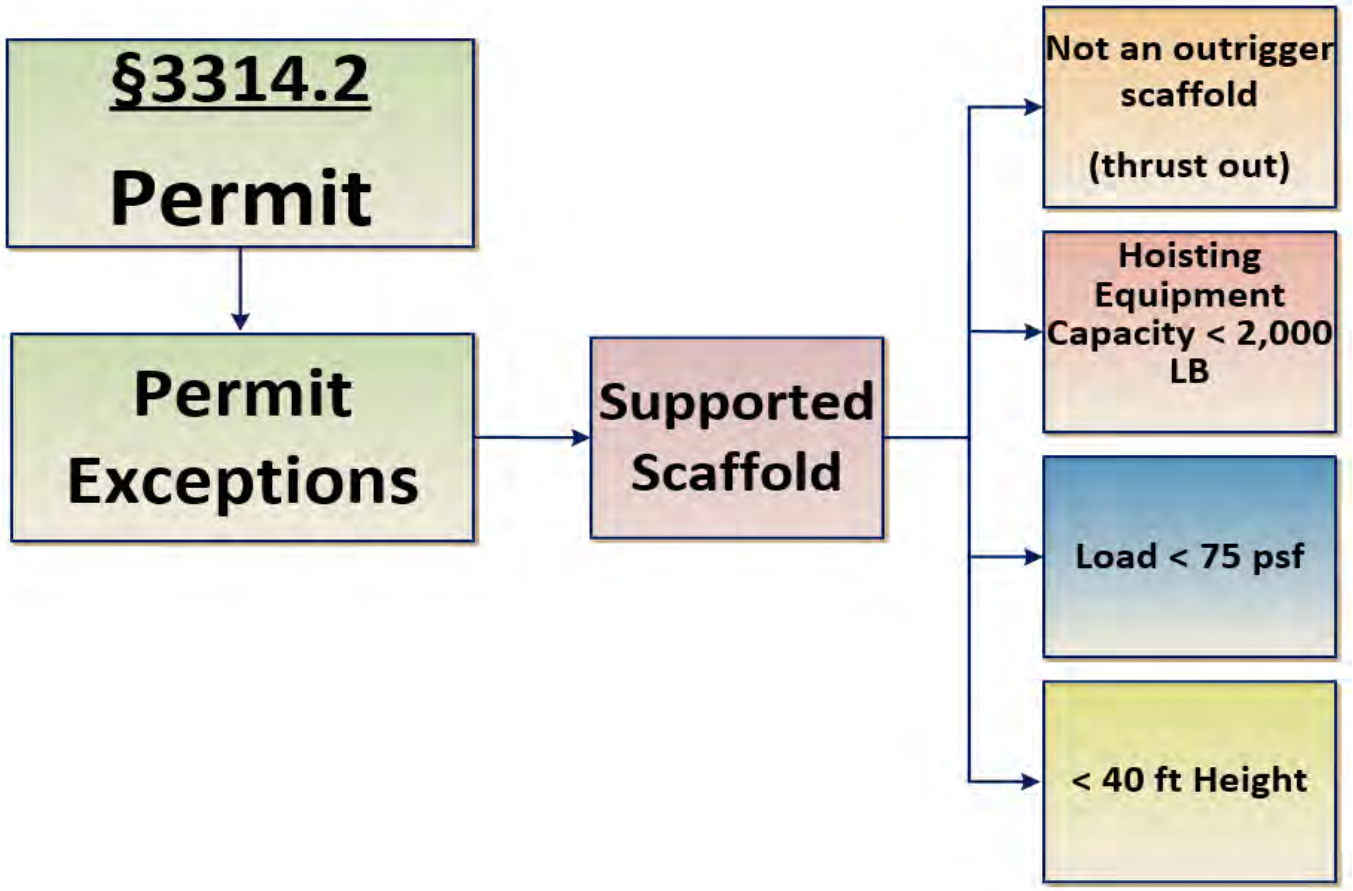
SUPPORTED SCAFFOLD & OUTRIGGER (THRUST OUT) SCAFFOLD

Notable Code Requirements

NOTABLE SCAFFOLD CODES
SCAFFOLD TYPES & CATEGORIES



NOTABLE CODE REQUIREMENTS



NOTABLE CODE REQUIREMENTS

- Design is always required for outrigger/thrust out scaffolds

3314.3 Design. Scaffolds shall be designed, as follows.

3314.3.1 Supported scaffolds and outrigger scaffolds (thrust out). Supported scaffolds and outrigger scaffolds (thrust out) shall be designed by a registered design professional. Where the scaffold is to be located upon a sidewalk shed, the requirements of Section 3307.6.4.2.2 shall also apply.

Exception: Design is not required for a supported scaffold, provided:

1. The scaffold is not an outrigger scaffold (thrust out);

1604.2 Strength. Buildings and other structures, and parts thereof, shall be designed and constructed to support safely the factored loads in load combinations defined in this code without exceeding the appropriate strength limit states for the materials of construction. Alternatively, buildings and other structures, and parts thereof, shall be designed and constructed to support safely the nominal loads in load combinations defined in this code without exceeding the appropriate specified allowable stresses for the materials of construction. Loads and forces for occupancies or uses not covered in this chapter shall be subject to the approval of the commissioner.

1604.3 Serviceability. Structural systems and members thereof shall be designed to have adequate stiffness to limit deflections and lateral drift. See Section 12.12.1 of ASCE 7-10 for drift limits applicable to earthquake loading.

NOTABLE CODE REQUIREMENTS

§3314.3.3 Supported Scaffold Drawing Requirements

-Structural members, as well as the founding of the scaffold, including but not limited to sidewalk sheds, floors, roofs, or ground.
-Plan view and an elevation view, with full dimensions, detailing.
-The location.
-Connections and attachments to structure (anchorages, fastenings, tie-ins, tie-backs, and lifelines).
-Structural modifications to structure
-Netting with specific type and manufacturer indicated, overhead protection, or any other equipment attached to the scaffold
-Hoisting equipment
-Platform levels, support centers, offsets, maximum number of levels loaded simultaneously, maximum loads imposed.

Additional Notable Drawing Requirements

AC 28-104.7.1
Drawings to be of sufficient clarity

AC 28-104.7.8
Material Identification

§107.7.3
Detailed drawings

AC 28-104.7.7
Special inspections and progress inspections

§107
Structural plans

NOTABLE CODE REQUIREMENTS

Drawing Requirements

§28-101.2 Intent. The purpose of the New York city construction codes is to provide reasonable minimum requirements and standards, based upon current scientific and engineering knowledge, experience and techniques, and the utilization of modern machinery, equipment, materials, and forms and methods of construction, for the regulation of building construction in the city of New York in the interest of public safety, health, welfare and the environment, and with due regard for building construction and maintenance costs.

§28-104.7.1 Scope. Construction documents shall be complete and of sufficient clarity to indicate the location and entire nature and extent of the work proposed, and shall show in detail that they conform to the provisions of this code and other applicable laws and rules; if there exist practical difficulties in the way of carrying out the strict letter of the code, laws or rules, the applicant shall set forth the nature of such difficulties.

107.7 Structural plans. Structural plans shall include the data and information described in this section and in Chapter 16. Structural calculations shall be made available to the department upon request.

107.7.3 Detailed drawings. Drawings shall show sizes, sections, and locations of members, and such other information as may be required to indicate clearly all structural elements and special structural engineering features.

NOTABLE CODE REQUIREMENTS

- **Drawing Requirements**
  - Special Inspections - Examples
    - Post installed anchors
    - Base building structural modifications (structural steel bolting/welding/details, concrete, etc.)

§28-104.7.7 Identification of special and progress inspections. Whenever work or materials are subject to special inspection, as provided in this code, such work or materials shall be listed on the title sheet of the construction documents, or the sheet immediately following, as subject to special or progress inspection.

NOTABLE CODE REQUIREMENTS

- **Drawing Requirements**
  - Identification of Materials - Examples
    - Frames, side bracket, tie-back
    - Steel (IE outrigger platforms)
    - Wood (IE planking/guardrails)
    - Anchors (IE tie-downs and tie-backs)
    - Netting

§28-104.7.8 Identification of materials. Construction documents shall identify all materials proposed to be used, including identification of the test standard to which they conform, and where applicable, supporting information or test data from the manufacturer attesting to such conformance.

NOTABLE CODE REQUIREMENTS

3314.4.4 Safeguards. The safeguards required by Sections 3314.4.4.1 through 3314.4.4.8 shall be observed at all times.

3314.4.4.1 Safe working order. Scaffolds, all components of and attachments to the scaffold, and all supports and anchorages of the scaffold shall be provided to the site in a safe working order by their respective owner, with no known hazardous conditions, defective repairs, or maintenance problems that could compromise the safety of the public and property.

3314.4.4.2 Loads. At no time shall a scaffold be loaded beyond the capacity of the scaffold or the ground or structure upon which it rests or is supported. Loads shall not be concentrated so as to cause stresses in excess of the allowable values designated for the applicable material described in this code.

3314.4.4.3 Capacity. Each scaffold, and its components, shall be capable of supporting, without failure, its own weight and at least four times the maximum intended load applied or transmitted to it. Where applicable, scaffolds and their connections to the building or structure shall be designed to meet the anticipated loads during construction or demolition work, including wind loads as prescribed in Chapter 16. Each suspension rope, including connecting hardware, used on nonadjustable suspended scaffolds shall be capable of supporting, without failure, at least six times the maximum intended load applied or transmitted to the rope.

NOTABLE CODE REQUIREMENTS

3314.4.4.4 Stable and secure. The scaffold and all materials and equipment located on or used from the scaffold shall be kept stable and secure at all times to prevent the scaffold from losing balance, overturning, or collapsing, and to prevent any object from falling from the scaffold.

3314.4.4.5 Dislodgement. Material and equipment susceptible to dislodgment shall not be stored on a scaffold while work is not being performed.

3314.4.4.6 Winds. Where sustained winds or wind gusts at the site exceed 30 miles per hour, the use and operation of scaffolds located on the roof of a building, exterior to a building or structure, on a working deck, or in an area with an unenclosed perimeter shall cease. If the manufacturer or designer of the scaffold recommends work to cease at a lower wind speed, such recommendation shall instead apply. Wind speed shall be determined based on data from the nearest United States weather bureau reporting station, or an anemometer located at the site, freely exposed to the wind, and calibrated in accordance with ASTM D5096-02.

3314.4.4.7 Use during installation, repairs, maintenance, adjustments, or removal. Only personnel, materials, and uses authorized by the person responsible for supervising the installation, repair, maintenance, adjustment, or removal of a scaffold shall be located on and using the scaffold during such work.

3314.4.4.8 Noncombustible construction. With the exception of the planking, the following scaffolds shall be constructed of noncombustible materials:

1. Exterior scaffolds exceeding 75 feet (22 860 mm) in height.
2. Interior scaffolds exceeding 21 feet (6.4 m) in height.
3. All scaffolds used in the alteration, repair, or partial demolition of buildings in Occupancy Groups I-1 to I-4.

NOTABLE CODE REQUIREMENTS

- **§3314.9.1Height to Base Ratio**

  A supported scaffold with a height to base ratio (including outrigger supports, if used) of more than **four to one (4:1)** shall be restrained from tipping by guying, tying, bracing or equivalent means as follows:

  - Guys, ties or braces shall be installed at locations where horizontal members support both inner and outer legs.
  - Guys, ties, or braces shall be installed according to the manufacturer's recommendations, or as designed in accordance with Section 3314.3, or at a minimum, the first guy, tie or brace shall be installed at a horizontal member and not more than a distance 4 times the least plan dimension from the base support and be repeated vertically at locations of horizontal members every 20 feet or less thereafter for scaffolds 3 feet wide or less and every 26 feet or less thereafter for scaffolds greater than 3 feet wide…and at horizontal intervals not to exceed 30 feet measured from one end (not both) towards each other.`

NOTABLE CODE REQUIREMENTS

- Outrigger (thrust out) platforms: Limited to medium duty, 50psf
- Outrigger (thrust out) beam
  - 6” bearing in each direction at fulcrum point
  - Secured against movement at:
    - inboard end **and**
    - fulcrum point

3314.14 Outrigger scaffolds (thrust out). Outrigger scaffolds (thrust out) shall not be used for loading in excess of 50 pounds per square foot (244.1 kg/m^2) (medium duty).

3314.14.1 Outrigger beams. The fulcrum point of the beam shall rest on a secure bearing at least 6 inches (152 mm) in each horizontal dimension. The beam shall be secured against movement and shall be securely braced against tipping at both the fulcrum point and the inboard end.

3314.14.2 Inboard supports. The inboard ends of outrigger beams shall be securely fixed to resist all vertical, horizontal and torsional forces. Pull-out tests for adhesive and expansions anchors, if used, shall be approved by the commissioner.

NOTABLE CODE REQUIREMENTS

- Loads are imposed letter for the supported scaffold onto the outrigger system is required. §3314.3.4

3314.3.4 Loads imposed. Where a supported scaffold sits on a sidewalk shed or other temporary structure, the scaffold drawings shall be accompanied by a loads imposed letter signed, sealed, and dated by a registered design professional. The letter shall detail the loads to be imposed by the scaffold onto the base structure and indicate that the registered design professional has reviewed the adequacy of the base structure to sustain the load imposed.

- Although not specifically required by code, it is likely that the Department will request a loads imposed letter for impact on the base building. AC28-103.8

§28-103.8 Matters not provided for. Any matter or requirement essential for fire or structural safety or essential for the safety or health of the occupants or users of a structure or the public, and which is not covered by the provisions of this code or other applicable laws and rules, shall be subject to determination and requirements by the commissioner in specific cases.

NOTABLE CODE REQUIREMENTS

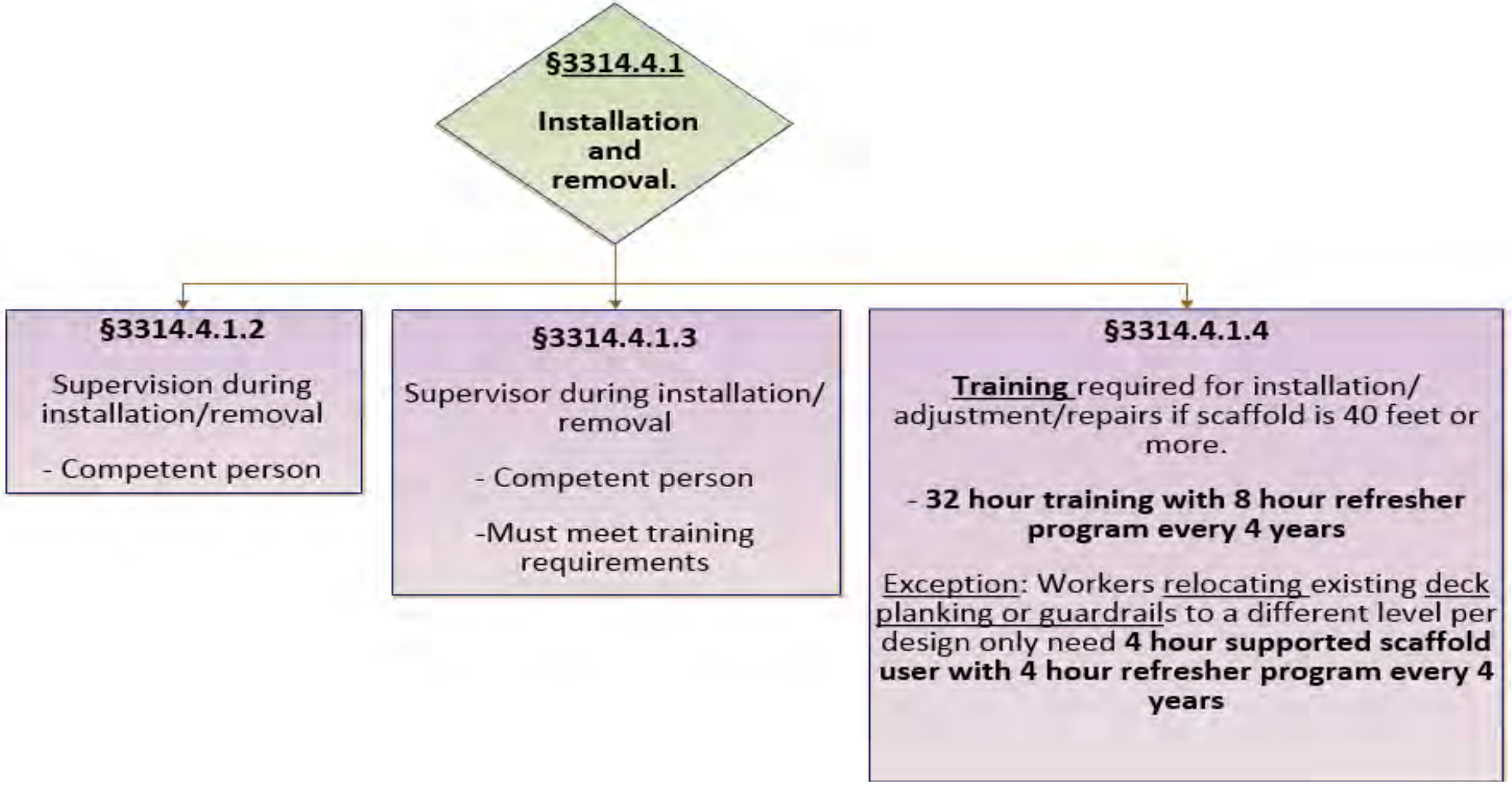
- Loads imposed are important
- The support conditions are important

3314.6 Footings and anchorage. The footings and anchorage for every scaffold shall be sound and rigid, capable of carrying the maximum load without excessive settlement or deformation and secure against movement in any direction. Supports such as barrels, boxes, loose brick, loose stone, or other unstable materials shall not be used.

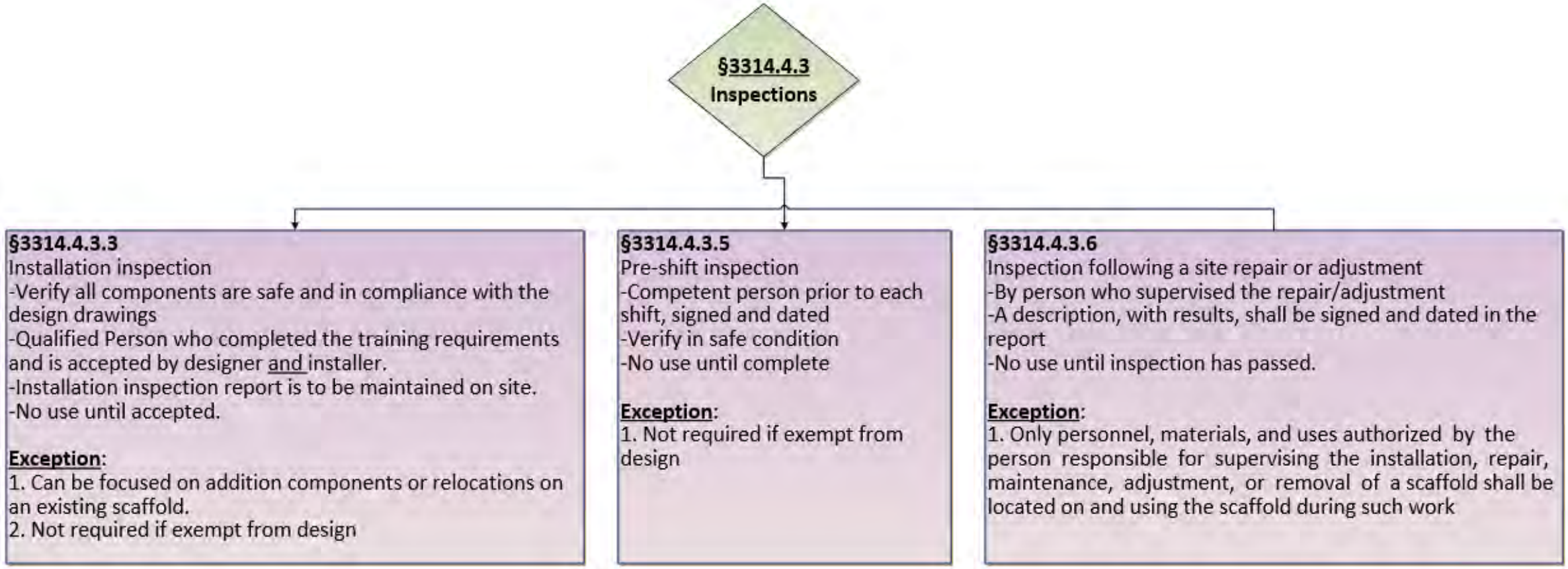
3314.6.4 Scaffolds supported on structure. Loads from supported and suspended scaffolds imposed on an existing roof or floor or similar structure shall:

1. Not be concentrated so as to cause stresses in excess of the allowable values designated for the applicable material described in this code; or
2. Be distributed with dunnage or shoring so as to prevent such load from exceeding the allowable values designated for the applicable material described in this code.

NOTABLE CODE REQUIREMENTS



NOTABLE CODE REQUIREMENTS



NOTABLE CODE REQUIREMENTS

- Installation inspection reports are required
  - Qualified person with associated training

3314.4.3.3 Installation inspection for supported scaffolds. Upon completion of the installation of a supported scaffold, the scaffold, all components of and attachments to the scaffold, and all supports and anchorages of the scaffold shall be inspected prior to use to verify that they are in a safe condition and, where design is required, installed in accordance with the design drawings. Such inspection shall be performed by a qualified person who has completed the training required by Section 3314.4.5.1 and who is designated by the designer, the installer, or a third party acceptable to both the designer and the installer. The results of the inspection shall be documented in an installation inspection report signed and dated by the person who performed the inspection. The scaffold shall not be used until it has passed such inspection and the installation inspection report has been completed.

Exceptions:

1. Where additional components or attachments are installed to an existing supported scaffold, or where existing deck planking or guardrails are relocated to a different level, the installation inspection and installation inspection report shall be limited to such components or attachments and related anchorages.
2. An inspection and report is not required for a supported scaffold that, pursuant to Section 3314.3.1, is not required to be designed.

NOTABLE CODE REQUIREMENTS

- Pre-shift Inspection - Prior to each shift
- Competent person
  - Inspection report signed and dated

3314.4.3.5 Pre-shift inspection for a supported scaffold. Prior to each shift the supported scaffold shall be inspected by the competent person supervising the use of the scaffold in accordance with Section 3314.4.2.2 to verify the scaffold remains in a safe condition for use. The results of the inspection shall be documented in a pre-shift inspection report signed and dated by the person who performed the inspection. The scaffold shall not be used until it has passed such inspection and the pre-shift inspection report has been completed.

NOTABLE CODE REQUIREMENTS

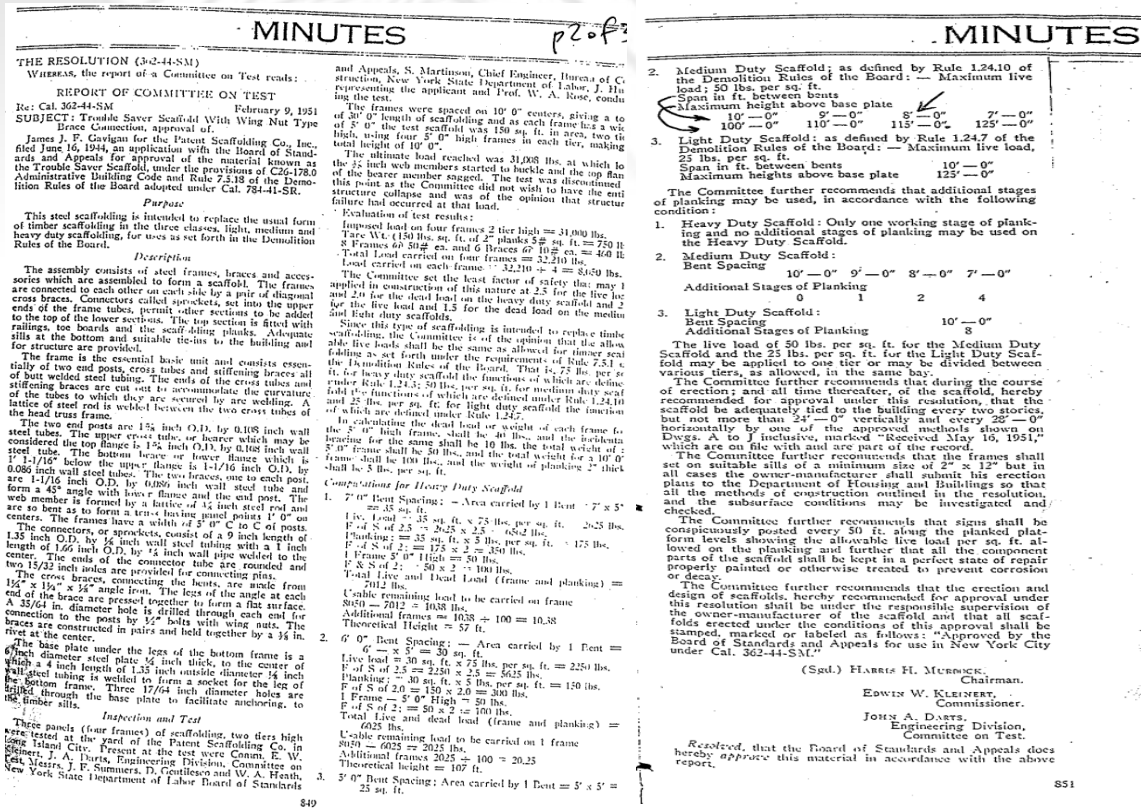
- Inspection after repair/adjustment
- Competent person
  - Inspection report signed and dated

3314.4.3.6 Inspection following a site repair or adjustment. Following a repair or adjustment to a scaffold at a site, the portion adjusted or repaired shall be inspected by the person who supervised the adjustment or repair in accordance with Sections 3314.4.6 or 3314.4.7 to verify the adequacy of such adjustment or repair. A description of the adjustment or repair, and the results of the inspection, shall be recorded, signed, and dated by such supervisor and kept with the inspection report required by Sections 3314.4.3.4 or 3314.4.3.5. The scaffold shall not be used until it has passed such inspection and the results of the inspection have been documented.

Exceptions:

1. The scaffold may be used prior to the inspection where authorized in accordance with Section 3314.4.4.7.
2. An inspection and report is not required for a nonadjustable suspended scaffold that, pursuant to Section 3314.3.2, is not required to be designed.

BSA362-44-SM



MINUTES

THE RESOLUTION (362-44-SM)

WHEREAS, the report of a Committee on Test reads:

REPORT OF COMMITTEE ON TEST

Re: Cal. 362-44-SM February 9, 1951

SUBJECT: Trouble Saver Scaffold With Wing Nut Type Brace Connection, approval of.

James J. F. Gavigan for the Patent Scaffolding Co., Inc., filed June 16, 1944, an application with the Board of Standards and Appeals for approval of the material known as the Trouble Saver Scaffold, under the provisions of C26-178.0 Administrative Building Code and Rule 7.5.18 of the Demolition Rules of the Board adopted under Cal. 784-41-SR.

Purpose

This steel scaffolding is intended to replace the usual form of timber scaffolding in the three classes, light, medium and heavy duty scaffolding, for uses as set forth in the Demolition Rules of the Board.

Description

The assembly consists of steel frames, braces and accessories which are assembled to form a scaffold. The frames are connected to each other on each side by a pair of diagonal cross braces. Connectors called sprockets, set into the upper ends of the frame tubes, permit other sections to be added to the top of the lower sections. The top section is fitted with railings, toe boards and the scaffolding planks. Adequate sills at the bottom and suitable tie-ins to the building and for structure are provided.

The frame is the essential basic unit and consists essentially of two end posts, cross tubes and stiffening braces all of butt welded steel tubing. The ends of the cross tubes and stiffening braces are cut out to accommodate the curvature of the tubes to which they are secured by arc welding. A lattice of steel rod is welded between the two cross tubes of the head truss frame.

The two end posts are 1¾ inch O.D. by 0.108 inch wall steel tubes. The upper cross tube, or bearer which may be considered the top flange is 1¾ inch O.D. by 0.108 inch wall steel tube. The bottom bearer or lower flange which is 1' 1-1/16" below the upper flange is 1-1/16 inch O.D. by 0.086 inch wall steel tubes. The two braces, one to each post, are 1-1/16 inch O.D. by 0.086 inch wall steel tube and form a 45° angle with lower flange and the end post. The web member is formed by a lattice of ¼ inch steel rod and are so bent as to form a truss having panel points 1' 0" on centers. The frames have a width of 5' 0" C to C of posts.

The connectors, or sprockets, consist of a 9 inch length of 1.35 inch O.D. by ⅛ inch wall steel tubing with a 1 inch length of 1.66 inch O.D. by ¼ inch wall pipe welded to the center. The ends of the connector tube are rounded and two 15/32 inch holes are provided for connecting pins.

The cross braces, connecting the bents, are made from 1¼" x 1¼" x ¼" angle iron. The legs of the angle at each end of the brace are pressed together to form a flat surface. A 35/64 in. diameter hole is drilled through each end for connection to the posts by ½" bolts with wing nuts. The braces are constructed in pairs and held together by a ⅛ in. rivet at the center.

The base plate under the legs of the bottom frame is a 6" inch diameter steel plate ¼ inch thick, to the center of which a 4 inch length of 1.35 inch outside diameter ⅛ inch wall steel tubing is welded to form a socket for the leg of the bottom frame. Three 17/64 inch diameter holes are drilled through the base plate to facilitate anchoring, to the timber sills.

Inspection and Test

Three panels (four frames) of scaffolding, two tiers high were tested at the yard of the Patent Scaffolding Co. in Long Island City. Present at the test were Comm. E. W. Kleinert, J. A. Darts, Engineering Division, Committee on Test, Messrs. J. F. Summers, D. Gentilesco and W. A. Heath, New York State Department of Labor Board of Standards and Appeals, S. Martinson, Chief Engineer, Bureau of Construction, New York State Department of Labor, J. Hu representing the applicant and Prof. W. A. Rose, conducting the test.

The frames were spaced on 10' 0" centers, giving a total of 20' 0" length of scaffolding and as each frame has a width of 5' 0" the test scaffold was 150 sq. ft. in area, two tiers high, using four 5' 0" high frames in each tier, making a total height of 10' 0".

The ultimate load reached was 31,008 lbs. at which load the ½ inch web members started to buckle and the top flange of the bearer member sagged. The test was discontinued at this point as the Committee did not wish to have the entire structure collapse and was of the opinion that structure failure had occurred at that load.

Evaluation of test results:

Imposed load on four frames 2 tier high = 31,000 lbs.
Tare Wt. (150 lbs. sq. ft. of 2" planks 5# sq. ft. = 750 lb
8 Frames 60 50# ea. and 6 Braces 67 10# ea. = 460 lb
Total Load carried on four frames = 32,210 lbs.
Load carried on each frame = 32,210 ÷ 4 = 8050 lbs.

The Committee set the least factor of safety that may be applied in construction of this nature at 2.5 for the live load and 2.0 for the dead load on the heavy duty scaffold and 2 for the live load and 1.5 for the dead load on the medium and light duty scaffolds.

Since this type of scaffolding is intended to replace timber scaffolding, the Committee is of the opinion that the allowable live loads shall be the same as allowed for timber scaffolding as set forth under the requirements of Rule 7.5.1 of the Demolition Rules of the Board. That is, 75 lbs. per sq. ft. for heavy duty scaffold the functions of which are defined under Rule 1.24.3; 50 lbs. per sq. ft. for medium duty scaffold the functions of which are defined under Rule 1.24.10 and 25 lbs. per sq. ft. for light duty scaffold the functions of which are defined under Rule 1.24.7.

In calculating the dead load or weight of each frame for the 5' 0" high frame, shall be 40 lbs., and the platform bracing for the same shall be 10 lbs. the total weight of a 5' 0" frame shall be 50 lbs., and the total weight for a 10' 0" frame shall be 100 lbs., and the weight of planking 2" thick shall be 5 lbs. per sq. ft.

Computations for Heavy Duty Scaffold

1. 7' 0" Bent Spacing: — Area carried by 1 Bent = 7' x 5' = 35 sq. ft.
   Live Load = 35 sq. ft. x 75 lbs. per sq. ft. = 2625 lbs.
   F of S of 2.5 = 2625 x 2.5 = 6562 lbs.
   Planking: = 35 sq. ft. x 5 lbs. per sq. ft. = 175 lbs.
   F of S of 2: = 175 x 2 = 350 lbs.
   1 Frame 5' 0" High = 50 lbs.
   F S S of 2: = 50 x 2 = 100 lbs.
   Total Live and Dead Load (frame and planking) = 7012 lbs.
   Usable remaining load to be carried on frame 8050 — 7012 = 1038 lbs.
   Additional frames = 1038 ÷ 100 = 10.38
   Theoretical Height = 57 ft.
2. 6' 0" Bent Spacing: — Area carried by 1 Bent = 6' — x 5' = 30 sq. ft.
   Live load = 30 sq. ft. x 75 lbs. per sq. ft. = 2250 lbs.
   F of S of 2.5 = 2250 x 2.5 = 5625 lbs.
   Planking: = 30 sq. ft. x 5 lbs. per sq. ft. = 150 lbs.
   F of S of 2.0 = 150 x 2.0 = 300 lbs.
   1 Frame — 5' 0" High = 50 lbs.
   F of S of 2: = 50 x 2 = 100 lbs.
   Total Live and dead load (frame and planking) = 6025 lbs.
   Usable remaining load to be carried on 1 frame 8050 — 6025 = 2025 lbs.
   Additional frames 2025 ÷ 100 = 20.25
   Theoretical height = 107 ft.
3. 5' 0" Bent Spacing: Area carried by 1 Bent = 5' x 5' = 25 sq. ft.

2. Medium Duty Scaffold; as defined by Rule 1.24.10 of the Demolition Rules of the Board: — Maximum live load; 50 lbs. per sq. ft.
   Span in ft. between bents
   Maximum height above base plate

10' — 0"	9' — 0"	8' — 0"	7' — 0"
100' — 0"	110' — 0"	115' — 0"	125' — 0"

3. Light Duty Scaffold; as defined by Rule 1.24.7 of the Demolition Rules of the Board: — Maximum live load, 25 lbs. per sq. ft.
   Span in ft. between bents 10' — 0"
   Maximum heights above base plate 125' — 0"

The Committee further recommends that additional stages of planking may be used, in accordance with the following condition:

1. Heavy Duty Scaffold: Only one working stage of planking and no additional stages of planking may be used on the Heavy Duty Scaffold.
2. Medium Duty Scaffold:
   Bent Spacing

10' — 0"	9' — 0"	8' — 0"	7' — 0"
Additional Stages of Planking			
0	1	2	4

3. Light Duty Scaffold:
   Bent Spacing 10' — 0"
   Additional Stages of Planking 8

The live load of 50 lbs. per sq. ft. for the Medium Duty Scaffold and the 25 lbs. per sq. ft. for the Light Duty Scaffold may be applied to one tier or may be divided between various tiers, as allowed, in the same bay.

The Committee further recommends that during the course of erection; and all time thereafter, of the scaffold, hereby recommended for approval under this resolution, that the scaffold be adequately tied to the building every two stories, but not more than 24' — 0" vertically and every 28' — 0" horizontally by one of the approved methods shown on Dwgs. A to J inclusive, marked "Received May 16, 1951," which are on file with and are part of the record.

The Committee further recommends that the frames shall set on suitable sills of a minimum size of 2" x 12" but in all cases the owner-manufacturer shall submit his erection plans to the Department of Housing and Buildings so that all the methods of construction outlined in the resolution, and the subsurface conditions may be investigated and checked.

The Committee further recommends that signs shall be conspicuously posted every 50 ft. along the planked platform levels showing the allowable live load per sq. ft. allowed on the planking and further that all the component parts of the scaffold shall be kept in a perfect state of repair properly painted or otherwise treated to prevent corrosion or decay.

The Committee further recommends that the erection and design of scaffolds, hereby recommended for approval under this resolution shall be under the responsible supervision of the owner-manufacturer of the scaffold and that all scaffolds erected under the conditions of this approval shall be stamped, marked or labeled as follows: "Approved by the Board of Standards and Appeals for use in New York City under Cal. 362-44-SM."

(Sgd.) HARRIS H. MURDOCK,
Chairman.
EDWIN W. KLEINERT,
Commissioner.
JOHN A. DARTS,
Engineering Division,
Committee on Test.

Resolved, that the Board of Standards and Appeals does hereby approve this material in accordance with the above report.

Please note:

- Board of Standards and Appeals (BSA)
- 362-44-SM does not apply when a registered design professional signs and seals plans.

SUPPORTED SCAFFOLD

SUPPORTED SCAFFOLD

COMMON ERRORS & OMMISSIONS

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NYC Buildings

COMMON DESIGN/DRAWING ERRORS & OMISSIONS

- Plans are not project specific – **AC28-104.7.1**
  - Plans do not account for building geometry.
- Scaffold support not coordinated with sidewalk shed, building, or outrigger platform, etc. – **§3314.3.3, #9**
- Anchorage to compromised walls – **§3314.3.3, #2**
- Anchorage to walls not tested – **§1704.32**; **BB2016-005**
  - Remember special inspections for post installed anchors are required. A factor of safety of 4 for all components is required.
- Netting/enclosures not identified – **§3314.3.3, #4**

COMMON PERMIT HOLDER ERRORS & OMISSIONS

- Work contrary to approved plans – **AC28-105.12.2**
  - Greater number of working platforms than allowed.
  - Missing diagonal and cross bracing
  - Tie-backs missing
- Guardrails and debris netting not installed or maintained **§3314.8**
- Working platform not fully planked **§3314.5**
- Planks not tied down (dislodgement) **§3314.9.4**

COMMON INSPECTION ERRORS & OMISSIONS

- Material false statements on the inspection report(s). **AC28-211.1**
- Failure to notify the registered design professional/permit holder of a non-conformance. **§3314.4.3.3**
- No inspections conducted. **§3314.4.3.3**

CUT FRAMES

3301.1.3 Manufacturer specifications. All equipment shall be used in accordance with the specifications of the manufacturer, where such specifications exist, and the requirements of this code. Where there is a discrepancy, the stricter requirement shall apply.

3301.2 Safety measures and standards. Contractors, construction managers, and subcontractors engaged construction or demolition operations shall institute and maintain all safety measures required by this chapter and provide all equipment or temporary construction necessary to safeguard the public and property affected by such contractor's operations.

- Manufacturer/Code specifications must be followed (stricter applies)
- Equipment shall be maintained safe

CUT FRAMES

3301.5 Unsafe conditions and equipment. Any structure, temporary construction, operation, or equipment found to be defective or unsafe, and posing a risk to the public and property, shall be immediately secured and corrected, or removed from the site.

3301.6 Design, sizes, and capacity of materials, structures, temporary construction, and equipment. Design, sizes, and capacities of materials, structures, temporary construction, and equipment shall be in accordance with the requirements of Sections 3301.6.1 through 3301.6.3.

3301.6.1 Design. Whenever design is specifically required by the provisions of this chapter, such design shall be in accordance with the requirements of this code and executed by, or under, the supervision of a registered design professional who shall cause his or her seal and signature to be affixed to such documents that may be required for the work.

Exception: Where this chapter specifically indicates that the design may be executed by another individual.

3301.6.3 Capacity. No structure, temporary construction, or equipment shall be loaded in excess of its capacity as specified by the code, manufacturer, and/or designer. Where there is a discrepancy, the stricter standard shall apply.

- §3314.4.4.3 – components to have a factor of safety of 4.

CUT FRAMES

The modification of these frames would require the following:

- Site specific details of all modifications made. A manufacturer letter indicating that they have reviewed and accepted the field modifications.
- A manufacturer protocol for acceptable means of cutting frames.
- Testing data for the cut frames (including any eccentricity/moment induced on members by the field condition) provided by the manufacturer and signed and sealed by a NYS Registered Design Professional (RDP). Must be accepted by the RDP.
- Safety factor of 4 for all components must be demonstrated and clearly indicated.

SUPPORTED SCAFFOLD

DISLODGEMENT/ANCHORAGE: CASE STUDY 1

SUPPORTED SCAFFOLD

DISLODGEMENT/ANCHORAGE: CASE STUDY 1

Findings

- Deficient design for the wind loading

Immediate Actions

- Street closures
- Emergency work to secure the scaffold and components

Follow-up Actions

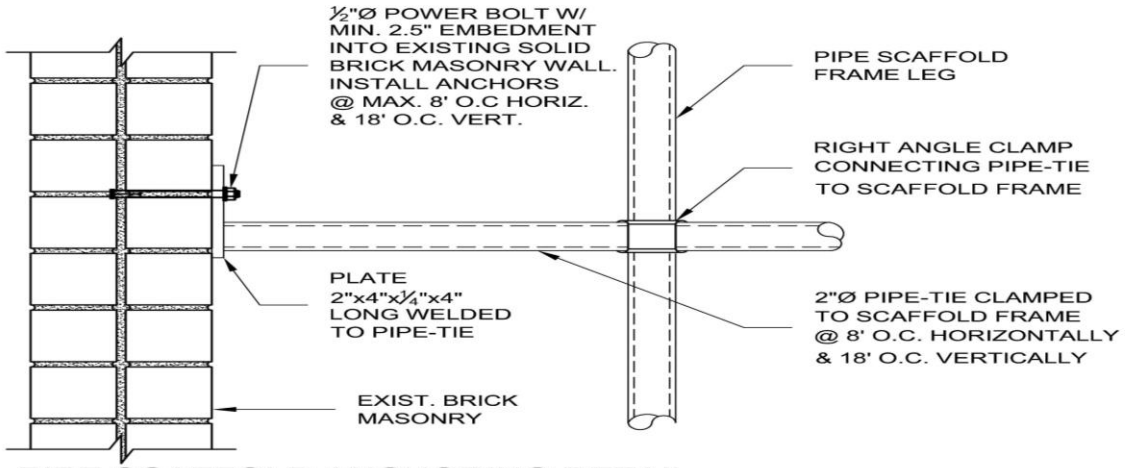
- Applicant replacement
- Redesign of the scaffold to account for the wind forces
  - Additional tie-backs were included to account for corner forces.
- Wind action plan was specified including netting removal, planking removal and dismantling where required

SUPPORTED SCAFFOLD

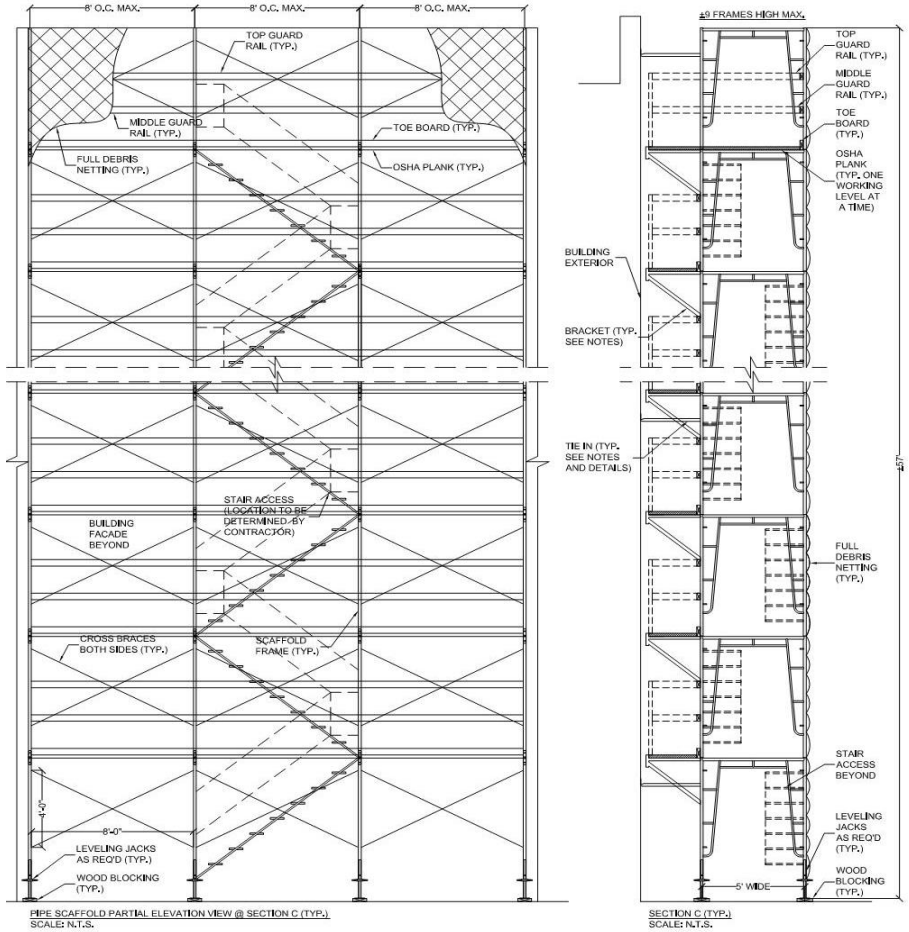
BRACING & ANCHORAGE: CASE STUDY 2

§3314.9.1 Height-to-base ratio

First brace installed at four (4) times the least plan dimension repeated every 26ft. vertically, minimum 30ft. Horizontally (Scaffold is 5ft. wide with a height of 57ft.)



PIPE SCAFFOLD ANCHORING DETAIL
OPTION 1: SOLID BRICK WALL
N.T.S.

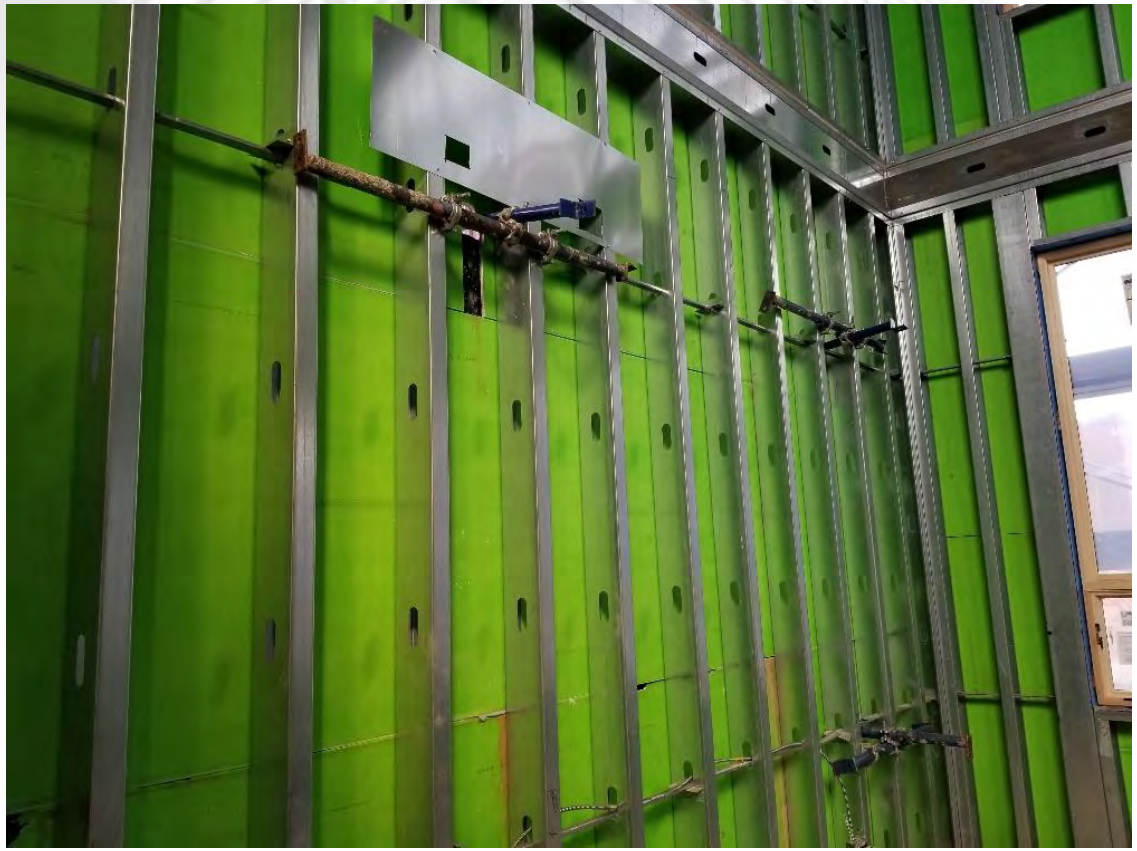


PIPE SCAFFOLD PARTIAL ELEVATION VIEW @ SECTION C (TYP.)
SCALE: N.T.S.

SECTION C (TYP.)
SCALE: N.T.S.

SUPPORTED SCAFFOLD

BRACING & ANCHORAGE: CASE STUDY 2



- The PE/Applicant specified anchorage into brick masonry, not cold-formed metal studs
- The Contractor attached to the metal studs
- Work performed contrary to the drawings
- Installation and pre-shift inspection reports were erroneous

OUTRIGGER SCAFFOLD (THRUST OUT) PLATFORMS

OUTRIGGER/THRUST OUT PLATFORM

COMMON ERRORS & OMMISSIONS

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DESIGN/DRAWING ERRORS & OMISSIONS

- Coordination with the intended base building operation whether it be a new construction, an alteration, or a demolition is critical. We have found this to be a commonly overlooked component.
  - We have seen a lack of critical information for support restraint as it relates to these operations.
  - For example, when performing demolition at the floor above, is the support condition of the outrigger beams still sufficient?
  - When altering an existing building, will the support conditions be impacted by changes to the existing building?

DESIGN/DRAWING ERRORS & OMISSIONS

- Architectural and EQ drawing are not coordinated
  - Think openings, structural elements, street layout, adjoining building(s) **AC28-104.7.1**
- Type of base building structure not shown on drawings **AC28-104.7.1**
- Wrong Code cited **AC28-101.4**
- Type of scaffolding not shown on drawings **AC28-104.7.8**
- Inspections requirements not identified for post installed anchors **AC28-104.7.7**

DESIGN/DRAWING ERRORS & OMISSIONS

- Beam design fails under required load **§1604.2**
- No restraint at fulcrum **§3314.14.1**
- Inadequate in-board restraint **§3314.14.2**
- Failure to specify connections **§107.7.3**; **AC28-104.7.1**
- Missing dimensions **§107.7.3**; **AC28-104.7.1**
- Load exceeds medium duty, 50 psf **§3314.14**

COMMON PERMIT HOLDER ERRORS & OMISSIONS

- Work without a permit **AC28-105.1**
- Work contrary to permit **AC28-105.12.2**
- No installation inspection report **§3314.4.3.3**
- Use or removal of the scaffold with winds 30 mph and greater **§3314.4.4.5**
- Stockpile of materials exceeding 50 psf (medium duty) **§3314.14**

COMMON INSPECTION ERRORS & OMISSIONS

- Material false statements on the inspection report(s). **AC28-211.1**
- Failure to notify the registered design professional/permit holder of a non-conformance. **§3314.4.3.3**
- No inspections conducted. **§3314.4.3.3**

OUTRIGGER/THRUST OUT PLATFORM

POTENTIAL REMEDIAL ACTIONS (DEPARTMENT)

POTENTIAL REMEDIAL ACTIONS (DEPARTMENT)

- Follow-up Inspections
- Engineering Technical Review
- Cease use of equipment /exterior work
- Emergency work – stabilization/removal
- Inspection program mandated through Commissioner's Order/violation to monitor and bring scaffold into compliance
- Vacate orders to create a safety zone

OUTRIGGER/THRUST OUT PLATFORM

SECONDARY HAZARDS

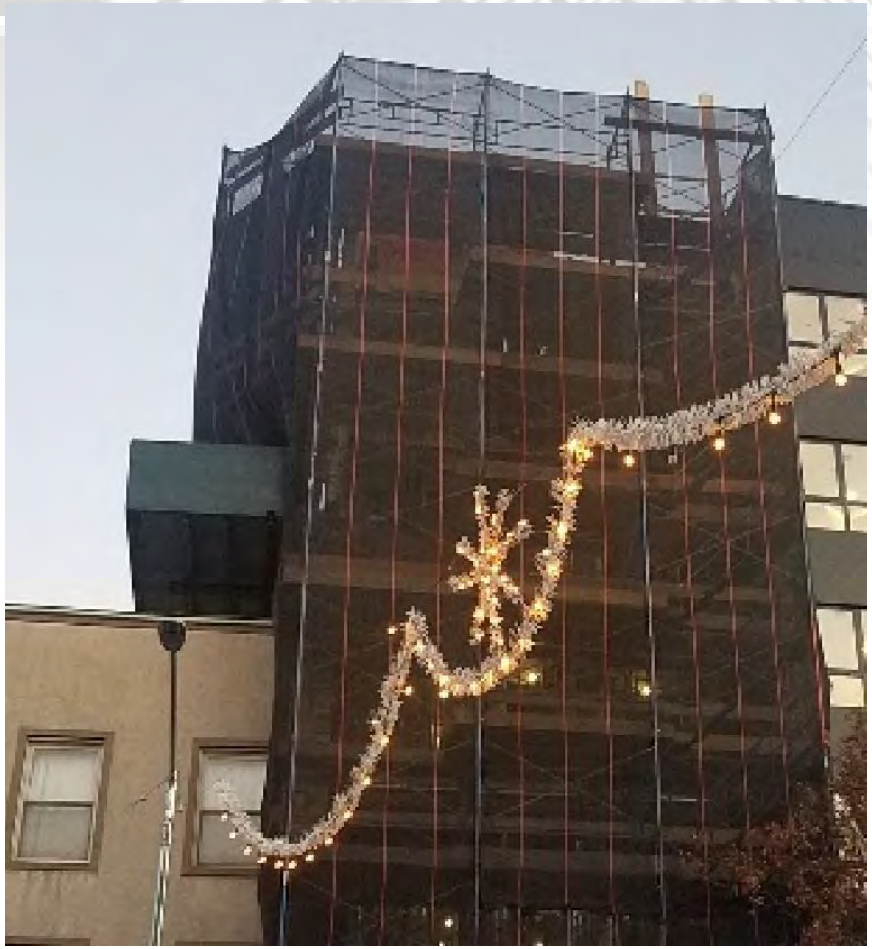
COMMON SECONDARY HAZARDS

- Wind load during removal/use (gust or sustained).
- Existing work that is non-conforming.
- Will the removal of supported scaffold tiebacks be problematic?
- Are all components of the platform securely fastened?

OUTRIGGER/THRUST OUT PLATFORM

CASE STUDIES

CASE STUDY 1: OUTRIGGER PLATFORM



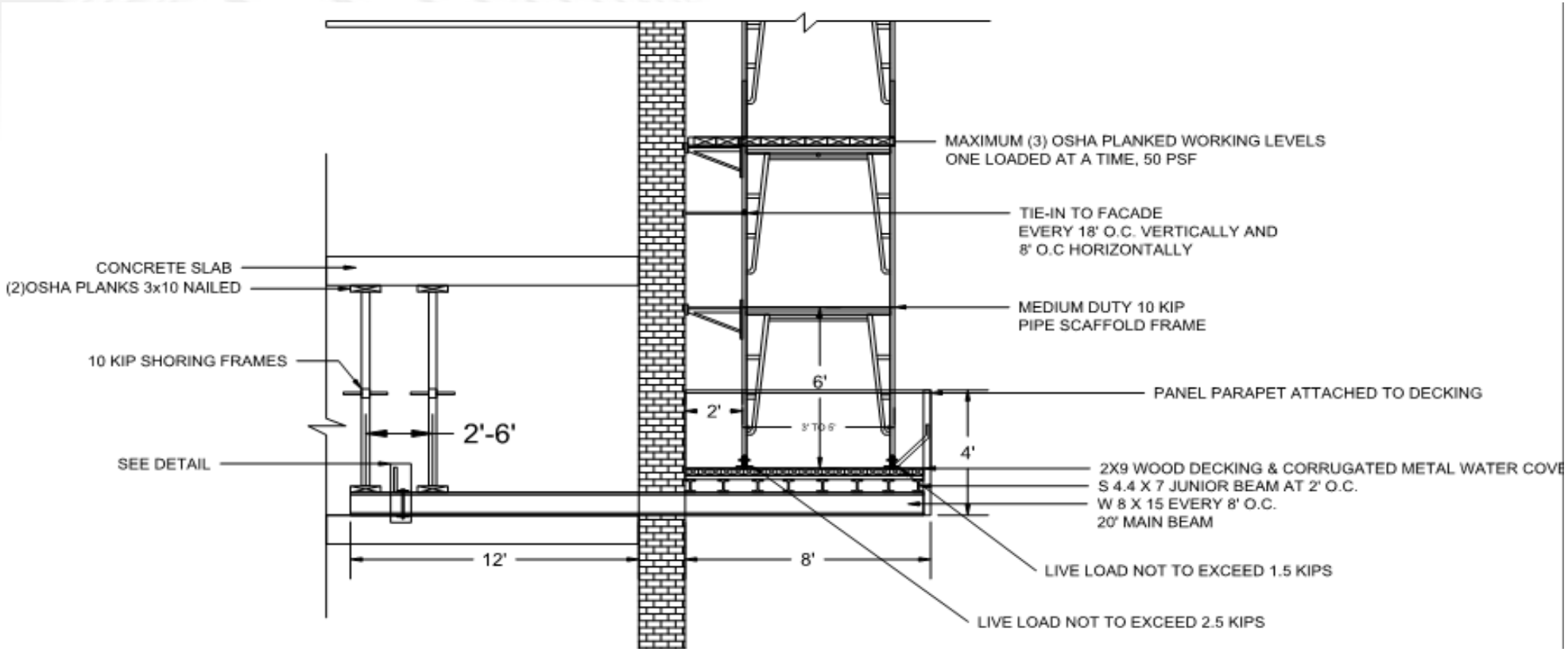
Prior to Incident

- Outrigger beam not full length
- Deck cantilever not in conformance
- Scaffold tie-backs in-place

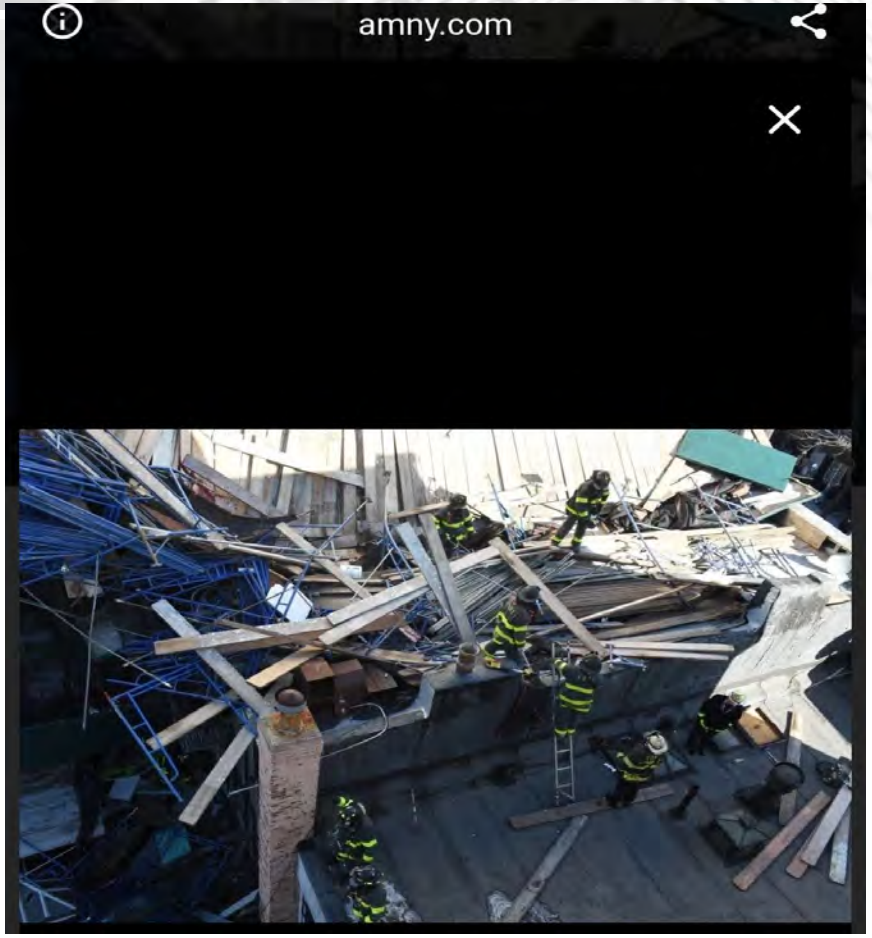
CASE STUDY 1: OUTRIGGER PLATFORM

Prior to Incident

DRAWING SPECIFICATIONS – OUTRIGGER/THRUST OUT PLATFORM



CASE STUDY 1: OUTRIGGER PLATFORM

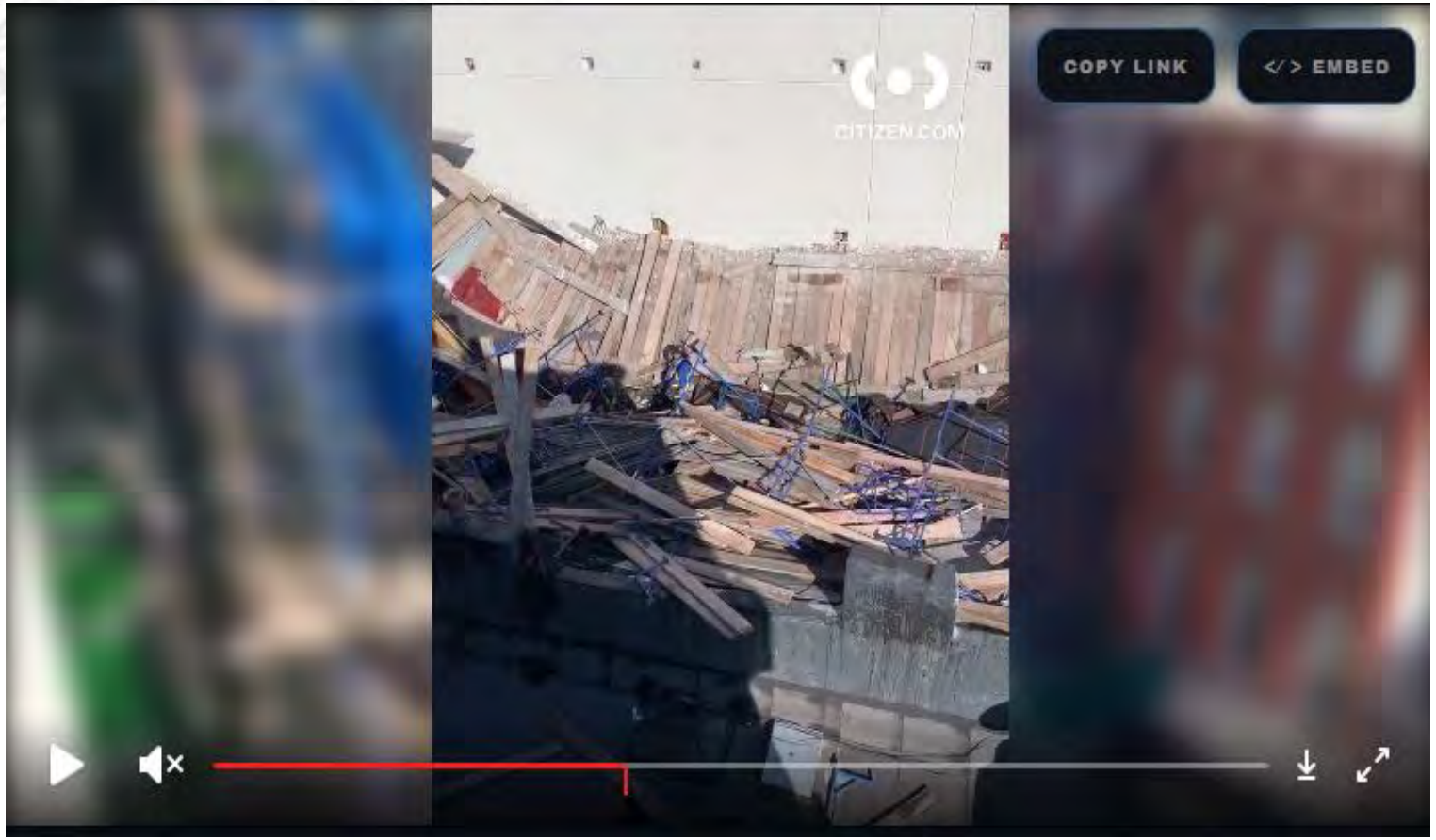


Incident

- Overloading of materials
- Removal of all scaffold supports
- Collapse on adjoining roof
- Worker injuries

CASE STUDY 1: OUTRIGGER PLATFORM

Incident



CASE STUDY 1: OUTRIGGER PLATFORM

Incident

CASE STUDY 1: OUTRIGGER PLATFORM

Incident

- Adjoining building roof damage
- Full vacate order

CASE STUDY 1: OUTRIGGER PLATFORM

Incident

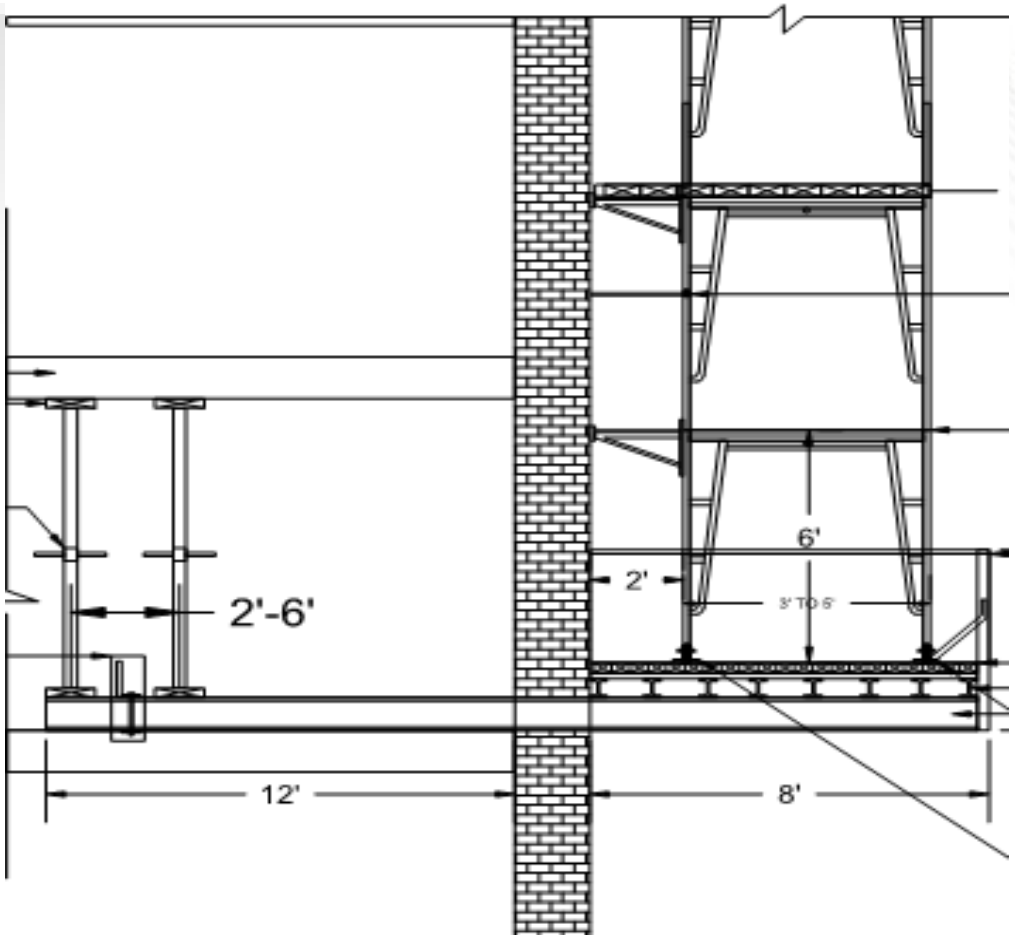
- Rear of collapse, continued hazards
- Full vacate of adjoining building
- Partial vacate required two (2) doors down

CASE STUDY 1: OUTRIGGER PLATFORM

Incident

- No restraint at fulcrum and different wall type
- Did not account for building structure
- Lateral torsional buckling failure of steel thrust out beams

CASE STUDY 1: OUTRIGGER PLATFORM



Incident Design/Drawing Issues

- No restraint at fulcrum
- Incorrect identification of building floor framing
- Incorrect identification of exterior wall material

CASE STUDY 1: OUTRIGGER PLATFORM

Incident Construction Issues

- Outrigger beams deficiently installed
  - Incorrect length
  - Did not extend full length of cantilever
  - In-board length support points varied
  - Spacing varied
- Removal of scaffold tie-backs on windy day (potentially exceeding 30 mph)
- Cantilever (and metal deck) exceeded plans

Incident Inspection Issues

- Material false statements were submitted to DOB
- Inadequate installation inspection took place
- Inadequate repair and adjustment inspection took place

CASE STUDY 1: OUTRIGGER PLATFORM

Lessons Learned: DESIGN

- Fulcrum support is critical
- Inboard end support is critical
- Adequately designed structural members are critical
- Understand and accurately account for base building construction

Lessons Learned: INSTALLATION INSPECTIONS

- Check verify exterior conditions from the street
- Check interior conditions for conformance
- Utilize checklists to assist with Code compliance inspections
- Notify all parties when there are non-conformances

CASE STUDY 1: OUTRIGGER PLATFORM

Lessons Learned: PERMIT HOLDER

- Fulcrum support is critical
- Inboard end support is critical
- Proper installation lengths are critical
- Correction of non-conformances is not optional
- Overhead hazards endanger the public
- Cease use/installation/dismantling of scaffolds in wind events (gust or sustained) exceeding 30 mph
- Do not remove the supported scaffold tie-backs unless you have a sequence of removal approved by the Applicant of Record.

BRACKET SUPPORTED SCAFFOLD

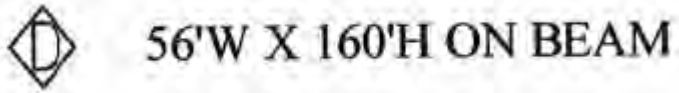
CASE STUDY 2

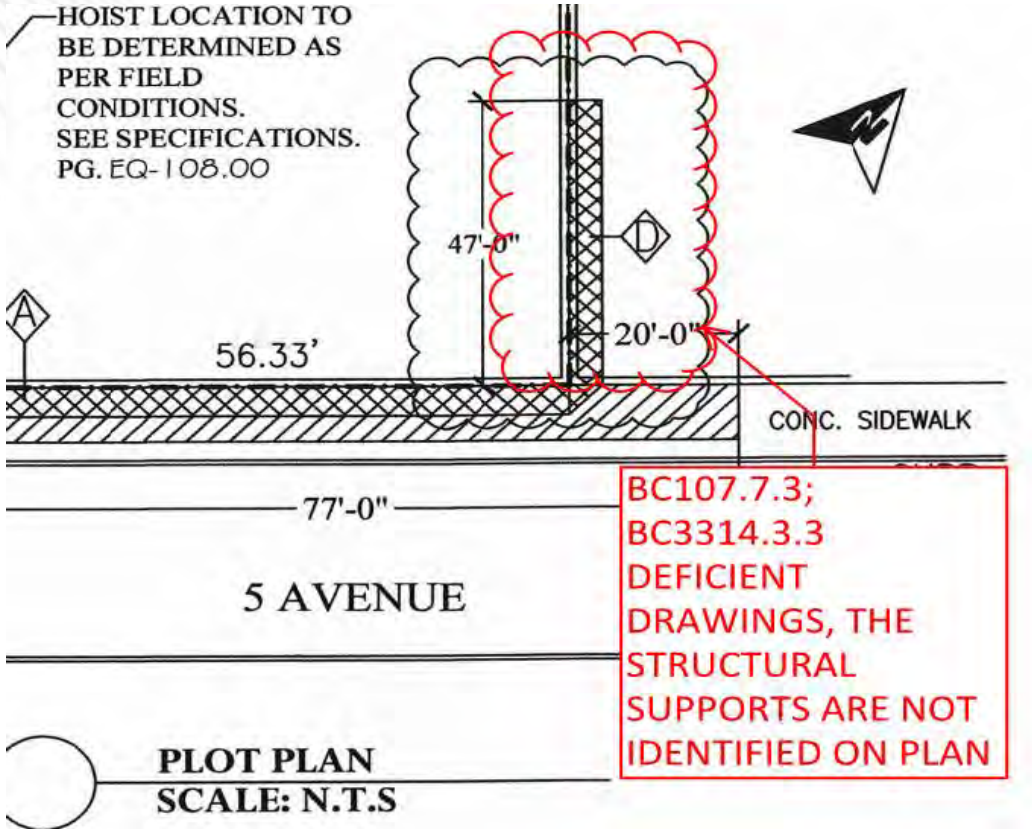
CASE STUDY 2: BRACKET SUPPORTED SCAFFOLD

CASE STUDY 2: BRACKET SUPPORTED SCAFFOLD

CASE STUDY 2: BRACKET SUPPORTED SCAFFOLD

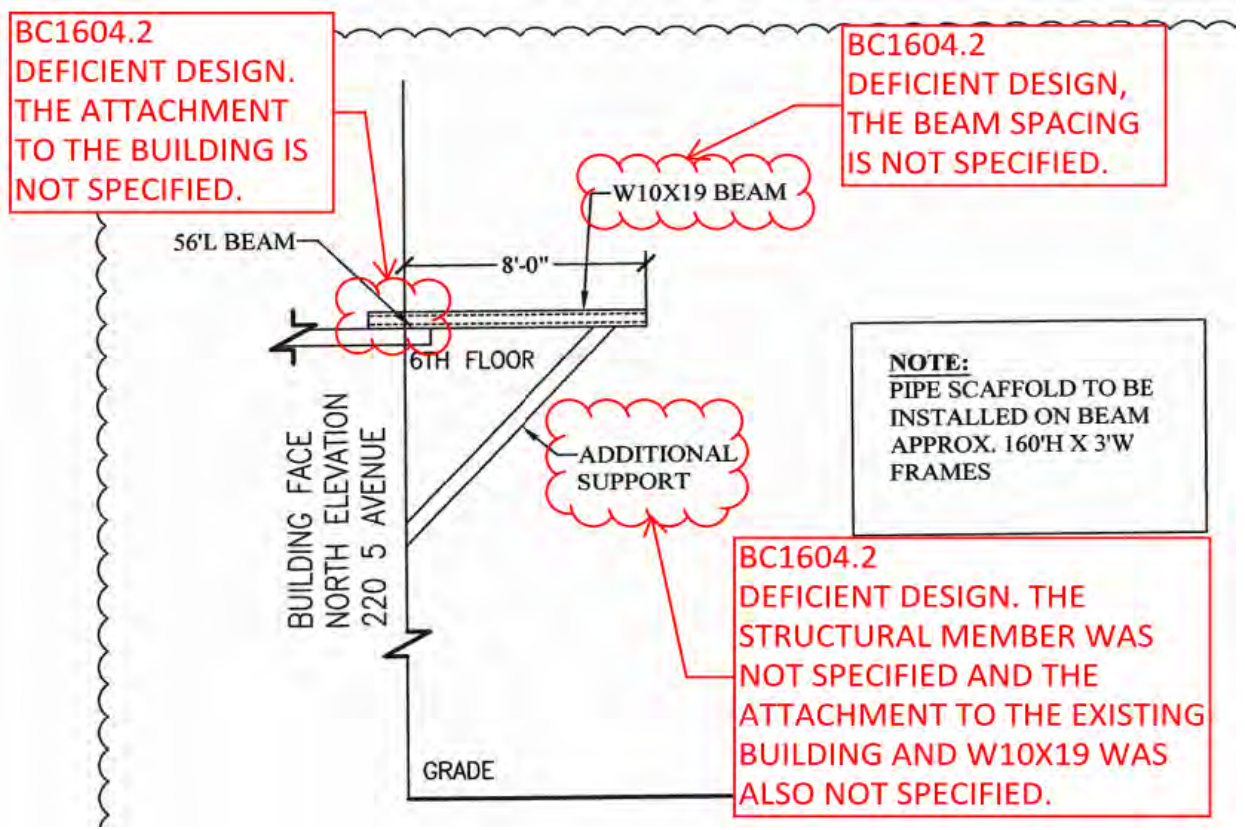
- **Drawing and Design Deficiencies**





CASE STUDY 2: BRACKET SUPPORTED SCAFFOLD

- **Drawing and Design Deficiencies**



CASE STUDY 2: BRACKET SUPPORTED SCAFFOLD

CASE STUDY 2: BRACKET SUPPORTED SCAFFOLD

Results

- Removal of the non-compliant scaffold
- Stop Work Order
- OATH Summonses to all parties (Permit Holder, Applicant of Record)

THANK YOU

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