

2020 DIGITAL: SAFETY, INNOVATION & SUSTAINABILITY CONFERENCE

CRANES: RISK MITAGATION

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PRESENTATION DESCRIPTION

This presentation will provide an overview of various types of Cranes, how they are designed, set up, inspected and utilized on the job site. Attendees will learn safety requirements for installing, using, operating and removing Cranes to avoid potential safety hazards. Additionally Local Laws will be discussed explaining new requirements for crane modernization(LL3/2018), the duties and responsibilities of personnel involved with cranes as well as logs and wind measurement (LL 13/2018).

JSTAINABILITY CONFERENCE



RISK MITIGATION: CODE & RULES

Where Are We Now?

 Chapter 3316-3320: Pending final City Council approval of Code Revision

 Technical Cleanup Amendments to Rules 3319-01 (went into effect 7/23/2020)

- DOB NOW: *Build* for Cranes (April 27,2020 & July 7, 2020)

1 RCNY 3319-01

Phase 1: Prototype – went into effect on January 1, 2016
 Phase 2: Onsite Inspection – went into effect 5/24/2017



RISK MITIGATION: CODE & RULES

(continued)

NEW CD8 FORMS introduced 3/1/2019

Phase 3 & 4: CD Inspection & Crane Operations (anticipated 2020/2021)

1 RCNY 3319-02: Lift Director Rule

 Went into effect on 5/24/2017 for tower cranes and derricks and 7/1/2017 for mobile cranes

Local Laws

Crane Modernization (LL 3/2018), Event Loggers (LL79/2017), and Wind Measurements (LL13/2018)



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Cranes

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OB NOW: *BUILD* **OVERVIEW**



LAUNCH APPROACH TO DOB NOW: BUILD

PROTOTYPE DOB DOB NOW NOW BUILD Existing CDs: All Transactions: Initial/New File an Amendments Supplements Fees NOT applicable New CDs: Fees applicable

STAGE TWO (started July 7) STAGE ONE (started April 27) CRANE DEVICE CRANE NOTICE PROTOTYPE CRANE DEVICE CRANE NOTICE SYSTEM OF RECORD Existing CNs: BIS DOB DOB DOB BIS New CNs: NOW | NOW NOW BUILD BUILD BUILD APPLICATIONS/TRANSACTIONS All Transactions: Continue to file All CD **Existing Records:** Initial/New Renewals or transactions: Renewals for New CN existing CNs Amendment to Amendments Register Supplements Renew update existing Applications in created in BIS BIS **CD** information Amend must be processed (Fixed Components only) in BIS **New Transactions:** New Amendment Register and Renewal Submit new CD Foundation Pour applications Fees applicable Fees Fees applicable Fees Fees applicable applicable applicable



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DOB NOW: *BUILD* – KEY STAKEHOLDERS

APPLICANT OF RECORD
 Manufacturers
 Engineers
 Device Owners
 Professional Engineers



OTHER STAKEHOLDERS

- Filing Representatives
- Hoist Machine Operators
- Master Riggers
- Tower/Climber Crane Riggers
- Lift Directors
- Equipment Users
- Licensees



INSPECTORS

- Special Inspectors
- Progress Inspectors



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DOB NOW ACCESS

Address		
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Building Identification	Number (BIN)	
Borough, Block, Lot		
Device Search		
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INDUSTRY PORTAL			
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REGISTER FOR eFILING

 All stakeholders associated with the Job Filing must register for eFiling before logging into DOB NOW.

If previously registered, use the existing eFiling username and password to access DOB NOW.

Register at <u>www.nyc.gov/dobefiling</u>

Welcome to eFiling DOB NOW will be released in phases over the coming years. During the transition, users will create and maintain their login and password through eFiling. Currently facade, plumbing, sprinkler, and standpipe filings can be submitted in DOB NOW. For online filings that have not yet transitioned to DOB NOW, please continue to access through the links below. Email Address: Forgot your password? Password: Click here to reset it! Login Register for electronic filing Major Construction Minor Construction Development Hub Hub Self-Service Major Alterations Minor Alterations Hub Full-Service New Buildings Minor Alterations Demolitions Signs Electrical and Minor Plumbing Manage Your Account All Electrical Work Add License Type Limited Alteration Application Add Sustainable Contractor Designation



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TYPE OF DEVICES

Tower Cranes

Mobile Cranes

Crawler Cranes

Pile Drivers

Derricks





TYPES OF DEVICES: TOWER CRANES

Luffing Jib



Hammerhead





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TYPES OF DEVICES: MOBILE CRANES

Crawler Crane



Crane Hydraulic





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TYPES OF DEVICES: CRAWLER CRANES

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TYPES OF DEVICES: DERRICKS & PILE DRIVERS

Derrick





Pile Driver



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UNSAFE OPERATION

 1 RCNY §3319-01(q)(6), Hoisting Personnel
 — Written notification three (3) business days prior to use

 Applicant must comply with pertinent OSHA requirements







OVERLOADING: BOOM FAILURE

1 RCNY §3319-01(g)(2)(vi)(B) 1

 Loads, surcharges, and values noted on crane or derrick notice application account for all loading conditions, including wind.











UNSAFE OPERATIONS

- 1 RCNY §3319-01(g)(2)(i)(B) Site conditions.
 - Elevations and sections detailing all pertinent site
 - conditions, dimensions indicated, include, as applicable:
 North arrow
 - Buildings and structures at and adjacent to the site, with projections, setbacks, equipment and structures on roof or setback indicated
 - Temporary construction, such as platforms, runback structures, scaffolds, mast climbers, hoists, horizontal netting, cocoon systems, climbing formwork, sidewalk sheds, fences, and barricades
 - Pedestrian and traffic control to be provided per requirements of the Department of Transportation Other cranes or derricks at the site, swing radii indicated





INSUFFICIENT CLEARANCE

1 RCNY §3319-01(g)(2)(i)(C) 6
 — Minimum clearances for the boom/jibs/attachments and counterweights

Operation restrictions
 necessary to prevent
 contact must be clearly





IMPROPER SETUP

1 RCNY §3319-01(g)(8)(i)(A) Engineer's Inspection: Prior to and following the setup, assembly, erection, jumping, or climbing of a crane or derrick, the crane or derrick notice engineer, or a qualified person employed and supervised by such engineer, must perform an inspection and verify compliance with the approved crane or derrick notice plans, including but not limited to:





LOOSE BOLT

- 1 RCNY §3319-01(k)(3) Poriodic inspection
 - Periodic inspection.
 - Mandatory at one to twelve month intervals, or as recommended by the manufacturer, based on activity, severity of service, and environment
 - Select items require frequent inspection
- 1 RCNY §3319-01(k)(3)(i)
 - Inspection items.
 - In addition to paragraph (1) above, check for the following:
 - 1 RCNY §3319-01(k)(3)(i)(B)
 LOOSE BOLTS or rivets





BENT BOOM LACING

1 RCNY §3319-01(p)(2)(iii)
 The operator shall be responsible for the operation of the crane or derrick hoist.





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UNSAFE OPERATION

3319-01

§6. Subdivision (d) of section 3316-01 of chapter 3300 of Title 1 of the Rules of the City of New York

 (7) Load suspended beneath another load ("Christmas treeing") prohibited. No load may be suspended directly beneath an existing load.





UNSAFE OPERATION

3319-01

§6. Subdivision (d) of section 3316-01 of chapter 3300 of Title 1 of the Rules of the City of New York

 Unfolding and pinning of a boom or swing-away





WIRE ROPE

Broken Wires



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Torn Rope





WIRE ROPE

- 1 RCNY §3319-01(m)(2)(ii)(A)
 - Broken Wires
 - Running ropes six randomly distributed broken wires in one lay or three broken wires in one strand in one lay.
 - In rotation-resistant ropes, two randomly distributed broken wires in six diameters or four randomly distributed broken wires in 30 rope diameters.
 - One outer wire broken at the point of contact with the core rope that has worked its way out of the rope structure and protrudes or loops out from the rope structure. Additional inspection of this section is required.
 - Kinking, crushing, birdcaging, or any other damage resulting in distortion of the rope structure.
 - Evidence of heat damage from any cause.





WIRE ROPE

1 RCNY §3319-01(m)(2)(ii)(A) Broken Wires (continued)

Reductions from nominal diameter of more than the following:

- 6.A 1/64 in. for diameters up to and including 5/16 in.
- 6.B1/32 in. for diameters up to and including ½ in.
- 6.C 3/64 in. for diameters up to and including ¾ in.
- 6.D1/16 in. for diameters up to and including 1 1/8 in.
- 6.E 3/32 in. for diameters up to and including $1\frac{1}{2}$ in.

In standing ropes, more than two broken wires in one lay in sections beyond end connections or more than one broken wire at an end connection.



UNSAFE OPERATIONS: KNUCKLE BOOM CRANE

Is this legal?





UNSAFE OPERATIONS

Is this legal?

ANNEX/ DEFECTION DEEDS

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CRANE: ARTICULATING BOOM

Permitting and Licensing Requirements

NYC Building Code 3319.3

Does not require prior approval of the Department of Buildings to use an articulating boom crane at a jobsite, provided all of the following conditions are met:

- The articulating boom crane is used exclusively to load or unload a truck or trailer;
 - The length of the boom does not exceed 135 feet; and

The material is not raised vertically more than 100 feet during the unloading process.



CRANE: ARTICULATING BOOM

Permitting and Licensing Requirements

- A prototype, CN, CD, and HMO licensee are required if an articulating boom crane is used for any other type of work at a job site including but not limited to:
 - Deliveries at a jobsite beyond the maximums specified in BC 3319.3.
 - Holding steel, HVAC equipment, hoist towers, scaffolding, or any other loads in place while they are bolted or otherwise affixed.
- Assisting in the demolition of a building.



IMPROPER TIEBACK

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Buildings

WHAT IS A MINI-CRANE?

Mobile Crane

- Wheel or tread-mounted
 - Boom length not exceeding 50 feet
 - Manufacturer's rated capacity of 3 tons or less








An ALT-2 permit must be obtained prior to the use of a mini-crane.

The EQ-Construction Equipment work type must be selected

Plans must be filed with the permit and developed by a NYS registered PE



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Plans must include:

- Machine make and model
 - Capacity
- Site conditions/location/configuration
 - Maximum and minimum swing radii
- Minimum boom clearance
- Picking/landing zones
- Securing tiebacks
- Wind thresholds



Operator Qualifications

Licensed New York City Hoisting Machine Operator (HMO)

Valid certificate acceptable to the Department

Issued by manufacturer

Specific to make/model of mini-crane to use on site



Steel Erection Work and Critical Picks

MUST have Licensed New York City Hoisting Machine Operator

Mini-crane capacity in excess of 1 ton

Rigging crew and rigging supervisor must be trained or certified in accordance with Section BC 3316.9.2 of the NYC Building Code



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(HMO

A Lift Director is not required for the use of a mini

crane

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CERTIFICATE OF ON-SITE INSPECTION

1 RCNY §3319-01 (went into effect 5/24/2017) **Application for Certificate of On-Site Inspection** Cranes and Derricks Notice Plan Assembly/Disassembly Plan **Pre-operational Test Procedures** Load Imposed Wind Action Plan Certifications Calculations



RISK MITIGATION: CODES & RULES

On-site Inspection – A/D Director – Updated CD8 Forms - Lift Director Frequent Inspections Log Requirements Local Laws - LL 79/2017: Event Recorders — LL 3/2018: Crane Age Bill - LL 13/2018: Anemometer



- The application must be accompanied by a wind action plan containing:
 - Load reductions, if any, due to wind
 - The maximum in-service wind threshold
 - Wind thresholds, configurations, and procedures, including angles and sequencing, for parking and securing the crane in each applicable out-of-service position (e.g. retracted, parked, jackknifed, laid down, and/or other special protective measures for wind)
 - The communication protocol for safeguarding the crane in the event of changes in weather forecasts over weekends or longer stoppage periods



(continued)

- Self-contained document
- Maximum in-service threshold (30 mph or per manufacturer whichever more stringent)
 - Specific to configuration
- Able to be implemented based upon site conditions







In-service/During Operation

Out-of-service

Sample Wind Action Plan for a specific configuration, make and model of crawler crane

WIND REQUIREMENTS	
WIND SPEED (mph)	LUFFING JIB
	REDUCTION BY %
15	0
20	10
25	20
30	40
35	70
Above 35	OPERATION PROHIBITED

UP TO 49 MPH: PARK CRANE (UPPER IN LINE WITH CRAWLERS) WITH LOAD BLOCKS AND WEIGHT BALLS ON GROUND OR SECURED. POSITION BOOM AT 80° AND LUFFING JIB AT 66°-70°.

UP TO 80 MPH: JACK KNIFE BOOM AND LUFFING JIB.

ABOVE 80 MPH: LAY BOOM AND JIB DOWN.

NOTE: The table above is from the Manufacturer's manual. The New York City Department of Buildings does not allow the operation of cranes above 30 mph





Out-of-service Parked Position

Winds < 45 Mph (Park)

- Park Boom at 80°
- Park Luffing Jib at 63° To 70°
- Do Not Place Weight Balls on Ground
- At higher wind speeds, the boom and jib must be placed on the ground or jack-knifed.

NOTE: Developed for specific crane make, model and configuration



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Out-of-service Jack-knifing



(Sample) Jack-knife Procedure

- Park boom at 80°,
- Set luffing jib at ±56°
- Max wind speed 53 mph
- Place all blocks on ground (at higher wind speeds, the Boom & jib must be placed on the ground)

NOTE: Developed for specific crane make, model and configuration



Sequence of Laying Down



The HMO must:

- Perform a parking/securing inspection at any time the crane is taken out of service and parked or secured
- Record in the crane log the laid down configuration
- Reference to the wind action plan or manufacturer's manual page
- Maximum wind speed allowed for such configuration



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Out of Service Laydown

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Boom

Jib





Site Specific Wind Analysis

NYC Building Code 1618 (Loads on Temporary Installations)

 Installations governed by this code shall be defined as temporary when such installations are intended to be taken apart or removed after a limited period following their installation including but not limited to CRANES.

Loads on Temporary Structures

Shall be designed and constructed to resist loads as per NYC BC Chapter 16.
 All temporary installations reducing the design environmental loads shall include action plan. (Basic wind speed can be reduced by applying a factor of 0.8)

Action plan shall be reliably implemented with one day's notice or less.



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Site Specific Wind Analysis: 1 RCNY §3319-01

- Cover each configuration for which approval is sought.
 - Crane EOR to provide the manufacturer the following:
 - Project address
 - Crane make and model
 - Maximum lifting capacity
 - Distance of crane from building

Buildings

- Site Specific Wind Analysis: 1 RCNY §3319-01 (continued)
- Required information from manufacturer:
 - Wind load base shear
 - Wind load overturning moment at base
 - Vertical loads at base
 - Overturning moment at base center due to vertical loads
 - The slewing moment
- Certification from the manufacturer that analysis is based on information provided by the crane EOR
- Certification from the manufacturer that all components can sustain wind load as specified above



- Site Specific Wind Analysis: RCNY §3319–01 (continued)
 - Note any special condition in which the crane may not be used or installed
- Proposed tie-in spacing
- Elevations and sections
- Action plan in case reduction factor is applied
- Wind load conditions, exposure category, wind distribution:
 - In-service of at least 45 mph
 - Out-of-service in accordance with NYCBC Chapter 16



TOWER CRANE WIND ACTION PLAN

Action Plan Elevation TIE #2 (REINFORCED **TOWER SECTION** TIE #1 (RELEASED) SUSTAINABILITY CONFERENCE 56 SAFETY, INNOVATION

Specify

- Boom configuration
- Boom angle and radius for weathervaning
- Phase including mast height





NEW ON-SITE INSPECTION FORMS (CD8)



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NEW CRANES & DERRICKS FORMS

Why do we need new forms?

Need a consistent method of reporting on-site inspections to the Department

Improved reporting of special inspections





NEW CRANES & DERRICKS FORMS

New CN Filings Started March 2019

CD8

Filed by Design Applicant of Record (Crane Engineer)

CD8-TR

Performed by Crane Engineer and SIA, documented on CD8 and Building TR1 form

CD8-AD

Documents all inspection items on current CD6, signed by A/D Director and Crane Engineer



NEW CRANES & DERRICKS FORMS

When do I use each new CD8?

CD8

Any job requiring an on-site inspection – ALWAYS FILED

CD8-TR

Any job requiring on-site special inspections

CD8-AD

Any job requiring an assembled or disassembled inspection or assembly/disassembly director





CD8: ON-SITE CRANE INSPECTIONS

Inspections performed exclusively by Design Applicant

On-site Inspection Checklist added

Rule references added



CD8-TR: ID OF SPECIAL INSPECTIONS

Replaces TR forms for crane filings

Requires multiple filings for each applicable phase

Identification of requirement

Identification of inspection agency

- Certification of Completion



CD8-TR: ID OF SPECIAL INSPECTIONS

CD8-TR Special Inspections Subgrade Deep Foundations Reinforcement Concrete

Design Applicant also inspects setup for conformance to design requirements, such as location, embedded components, stools, pile type/count, SIA reports





CD8-AD: ON-SITE CRANE PRE-OPERATION INSPECTIONS

Unassembled Inspection Checklist Assembled Inspection Checklist Surveyor's statement

Rigger or A/D Director's statement

Pre-operational Test Witness Section



WHO INSPECTS THESE?



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LOCAL LAW 79 OF 2017

Event Recorders

LL79/2017 requires that all cranes be equipped with event recorders that collect the following data:

Crane configuration

Any overload condition

Status of limit switches

Operator overrides



LOCAL LAW 79 OF 2017

A crane's Certificate of Operation cannot be renewed unless certification is provided to the Department that the event recorder has been installed.

EXCEPTIONS:

Cranes where the manufacturer certifies to the Department that the recorder cannot be installed due to technological limitation



LOCAL LAW 3 OF 2018

Crane Age Bill

To encourage crane modernization, recent amendments to NYCBC 3302.1 and 3319.13 set rules for how long a crane in NYC can be used.



LOCAL LAW 3 OF 2018

- NYCBC 3302.1 redefines the manufacturer date of a crane to the earliest of either:
 - The date the crane was originally manufactured for its intended purpose.
 - The date that the oldest major component of the crane was originally manufactured.
- NYCBC 3319.13 sets a standard for the maximum duration a crane can operate in NYC.
 - BC 3319.13 Only cranes having an age of less than 25 years from the manufacture date may be used in New York City. Notwithstanding the provisions of Section 3319.5, the certificate of operation for a crane with an age greater than 25 years from the manufacture date shall be deemed to have expired.



LOCAL LAW 13 OF 2018

Anemometers Required

Anemometers are now required to be installed and used during crane and derrick operations.

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ANEMOMETER REQUIREMENTS

The anemometer:

MUST be provided by crane manufacturer or its approved
 entity

- MUST be installed at the top of the boom or other location specified by the crane manufacturer.
 - MUST measure a 3-second gust wind.

MUST be available to the HMO at the operator's station with a real-time display.


ANEMOMETER REQUIREMENTS

- Recent amendments to 1 RCNY §3319-01 require anemometers to be used during derrick operations.
- One of two installation options may be selected:
 - The anemometer may be installed on the derrick, or
 - An anemometer may be installed at a high point of the site



ANEMOMETER REQUIREMENTS

An anemometer installed at a high point of the site:

- MUST be located at the site's high point approximate to derrick boom's height and location.
- MUST be freely exposed to the wind.
- MUST be calibrated in accordance with ASTM D5096-02.
- MUST measure a 3-second gust wind.
- MUST be available to the HMO at the operator's station with a real time display, or provide a HMO designated person to monitor display and alert the HMO when measurements near, meet, or exceed the thresholds specified in the approved wind action plan.



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