
NYC Buildings
NYC Buildings
Powering Electric Cranes
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2013 BUILD SAFE | LIVE SAFE
CONFERENCE

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Course Description

Tower Cranes are a critical component of construction sites. This course will review the process for requesting temporary power at new construction sites which utilize new electric powered tower cranes.

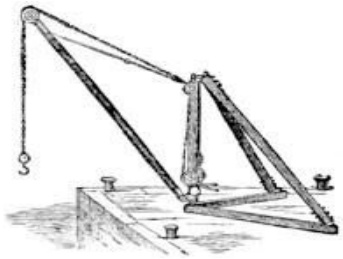
The course will use different examples to show the requirements for electric tower cranes for different types of buildings and discuss early planning strategies to request temporary electric power.

Learning Objectives

1. Participants will examine the various types of tower cranes and be able to discuss the advantages and disadvantages that pertain to each machine.
2. Participants will learn about the temporary electric service process and be able to apply these requirements.
3. Participants will study temporary power requirements for electric power cranes as prescribed by manufacturers and be able to calculate the power needed at the site through examples created by Con Edison.
4. Participants will understand the critical nature of tower crane at construction sites through the use of case studies in order to demonstrate effective early planning strategies.

Mechanical Hoists in High Rise Construction

Derrick is a lifting device with a mast held at the head with guys or braces. Derricks come with a boom for use with a hoisting mechanism and operating ropes.



First major steam-powered derrick was used in building construction in Brooklyn circa-1878.

Derricks were used as primary hoisting equipment for all major high-rise constructions because of their ease of assembly and use.

Mechanical Hoists in High Rise Construction

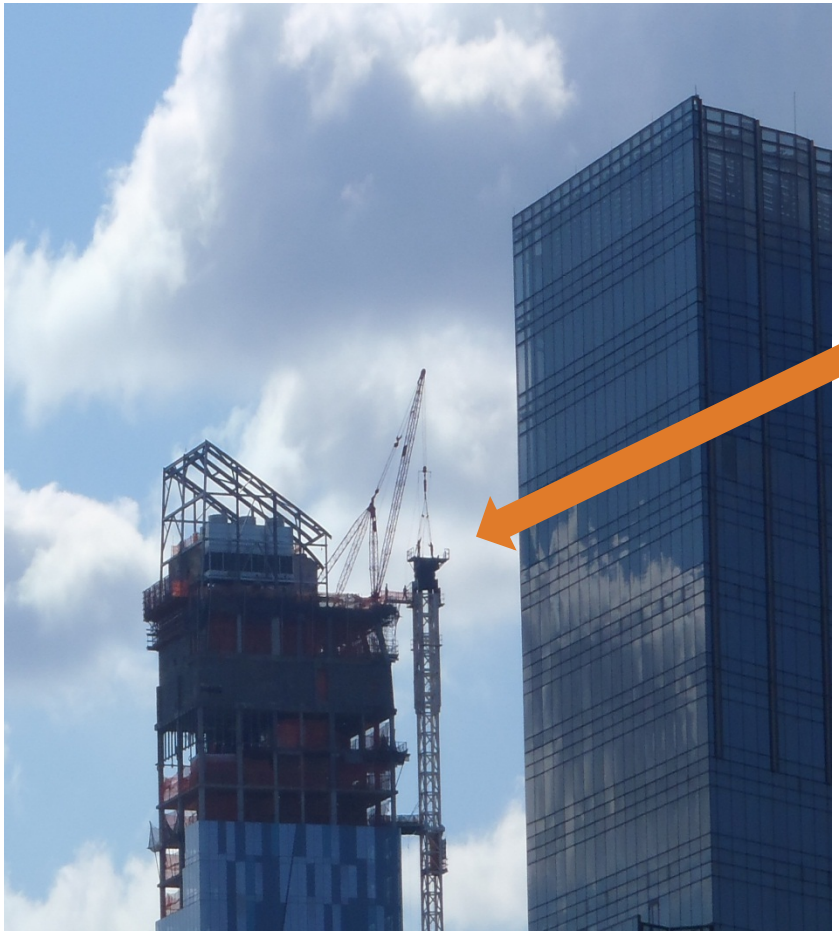
Derricks comes in ranges of 5 to 350 tons of lifting capacity.

The standard use of derricks in building construction in New York City is up to 35 tons lifting capacity.

Derricks are mostly used in New York City high-rise construction to erect or dismantle tower cranes.

The advent of the tower cranes in circa-1930 replaced derricks as the primary mode of hoisting material in high-rise building construction.

Derricks



Derricks installed on roof of high-rise building to dismantle tower crane

Derricks

Derrick is in use to hoist material

Tower Cranes in New York City Construction

Concrete and Steel Buildings:

Concrete buildings require higher line speed and lower capacity to accomplish the 2 to 3 day per-floor completion cycle

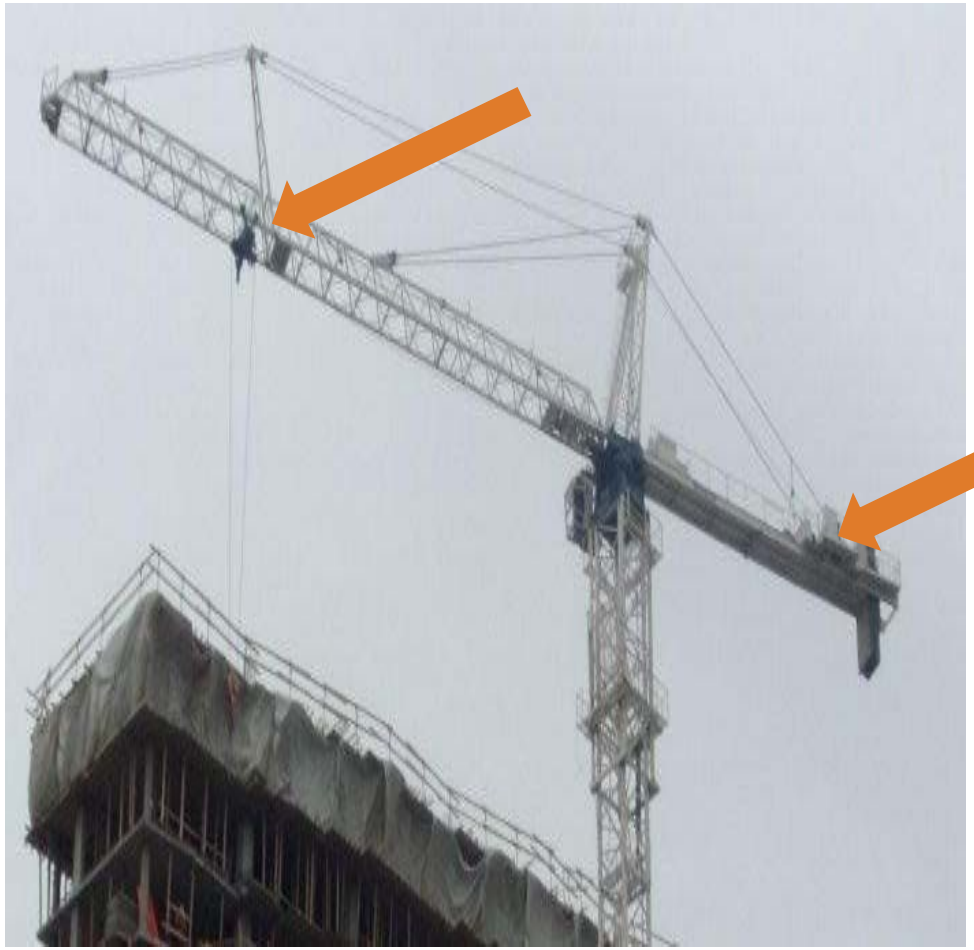
Steel buildings require higher capacity and lower line speed due to the size of the beams and columns lifted into place

Types of Tower Cranes: Luffing

This type of crane consists of “A” frame and boom section mounted on machine platform

Suitable for dense urban environments

Types of Tower Cranes: Hammerhead



This type of tower crane is very efficient due to horizontal movement of load along the boom – but it comes with site-specific restrictions due to long heel section.

Types of Tower Cranes: External Climbing

These cranes are tied to the building through special steel ties.

Types of Tower Cranes: Internal Climbing

These cranes are installed and attached inside the building through special steel ties.

Site-specific restrictions are primary reasons for this type of installation.

Types of Tower Cranes: Internal Climbing

Internal climbing tower cranes require specially designed structural members.

High-Rise Construction Is Up

New residential tower at Park Avenue requiring tower cranes

High-Rise Construction Is Up

New construction at Hudson Yards requiring tower cranes

Meetings With Tower Crane Manufacturers

1. DOB hosted meetings with Liebherr, Potain, Favco, Kroll, Wolffkran, Terex/Comedial and Cornell Co.
2. ASME/ANSI B30.3 Edition “Tower Cranes” has been released and replaces the 2009 version of ASME B30.3.

    Includes major changes and additions to scope of work for erecting, dismantling and climbing tower cranes

    New consideration of the impact of wind zone regions across the US

    Adopted Unified EN 14439 standard for tower crane safety.

3. Liebherr, Potain, Kroll, Wolffkran, Terex/Comedial are already following European Unified Standard EN 14439 for tower crane manufacturing.

Major Tower Crane Manufacturers

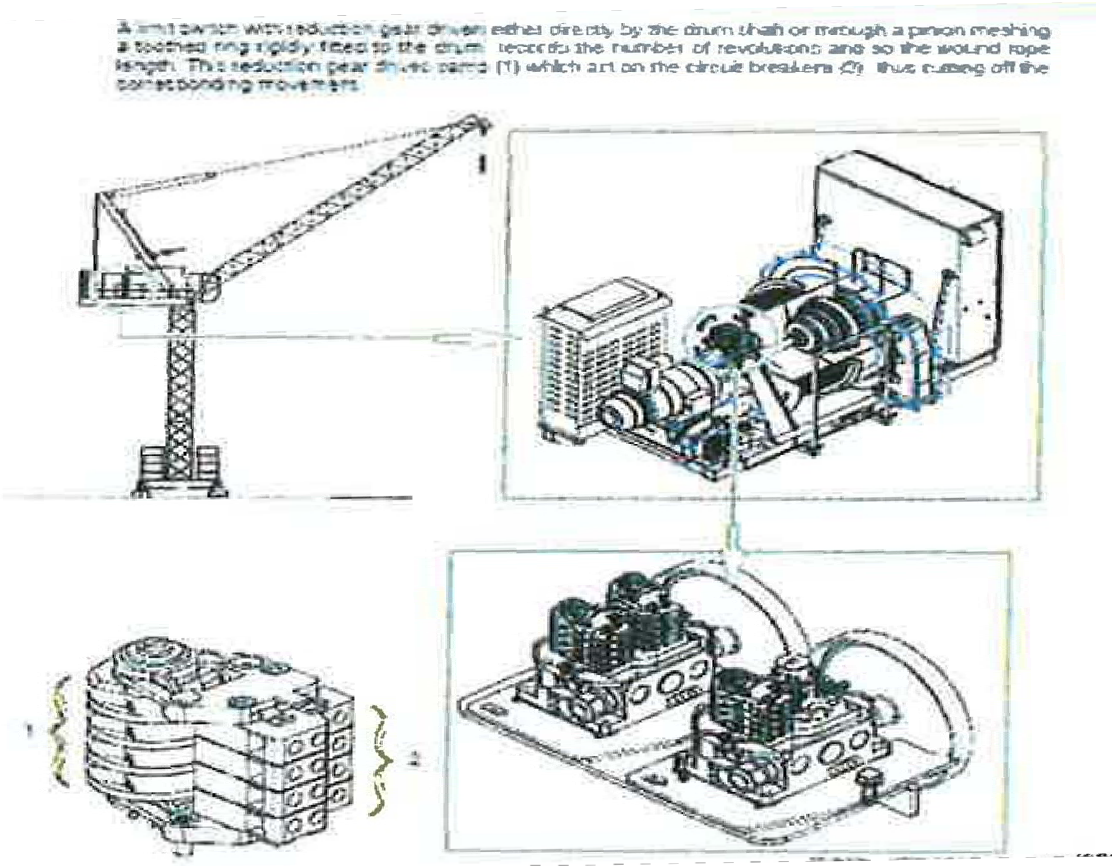
European Unified Standard EN 14439

Significant manufacturers have adopted EN 14439 on all cranes manufactured and sold from January 1, 2010 because of the benefits to users and owners:

- Increased construction site and operator safety by using anti-collision system, improved operator cabin visibility and PLC programs and numerous positive limit switches that shut off the crane when the crane is outside set parameters.
- Improved safety for erectors and users by standardized crane climbing protocol and modified working platforms.

Features Based on EN 14439: Improved Limit Switches in Luffing Cranes for Safer Operation

Luffing Limit Switches on MR 295

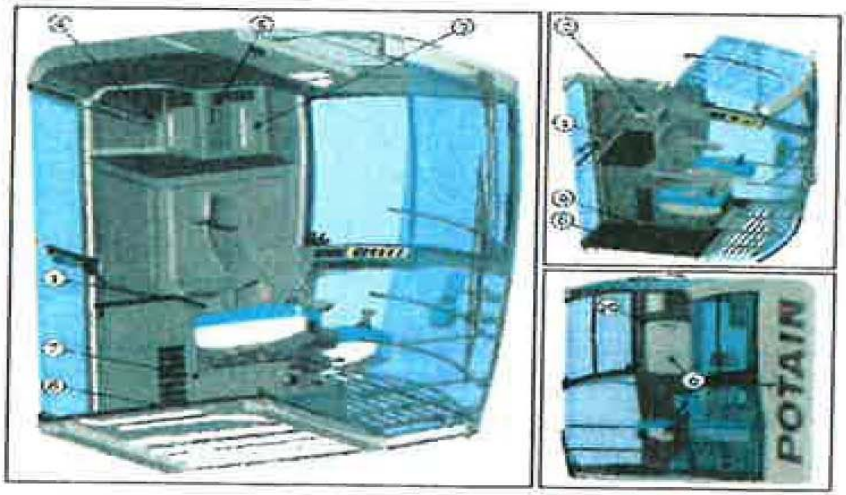


Luffing up
Luffing down
Upper decelerating
Lower decelerating
Weathervanning
Upper overrun
Lower overrun

Upper overrun

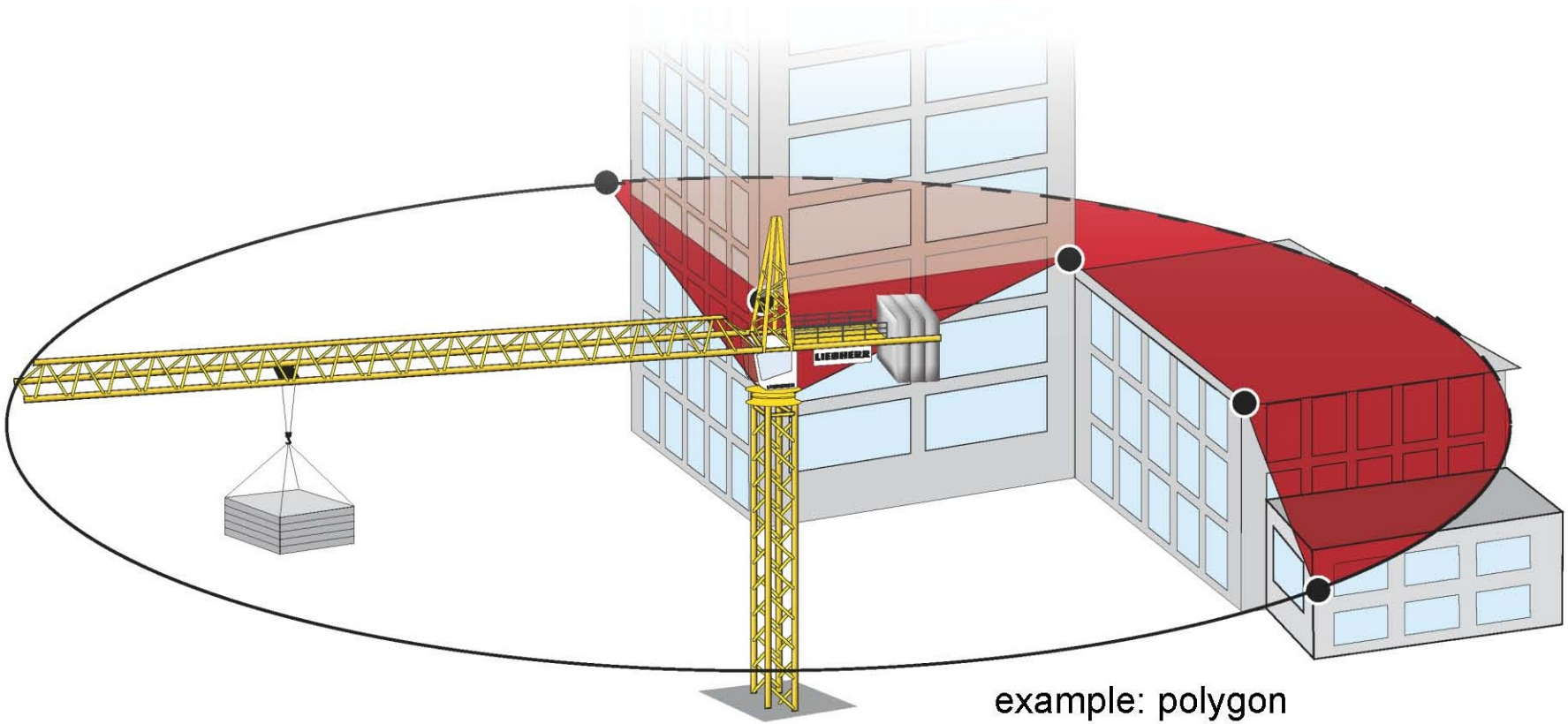
Features Based on EN 14439: Crane Operator Comfort and Safety From Better Visibility

- Ultra View cab
- Optimum front and side visibility
- Air conditionned as standard



1. Table
2. Set of 3 plugs
3/4/5. Storage compartments
6. Information zone
7. Place for fire extinguisher
8/9. Antiskid carpet
10. Cloth hanger

Features Based on EN 14439: Anti-Collision System for Protected Zones

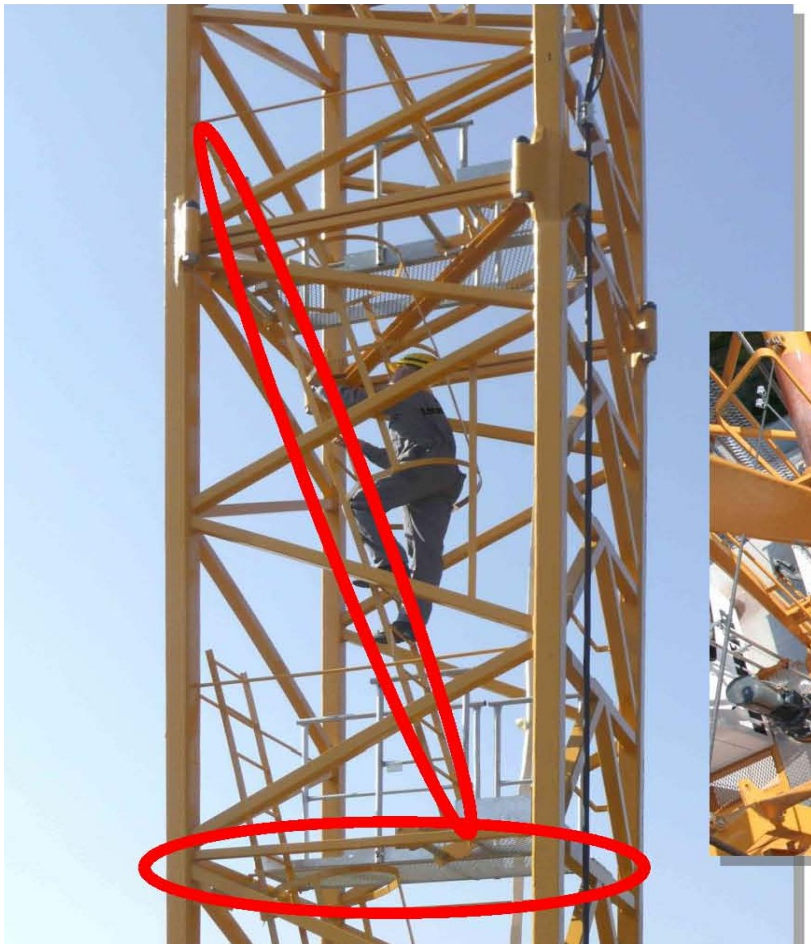


Features Based on EN 14439: Embedded Camera for Safer Load Pickup and Delivery

- **OPTIONNAL EQUIPMENT:**

CAMERA: Embedded camera on trolley gives the crane operator the ability to always have an eye on his load whatever the jobsite configuration is.

Features Based on EN 14439: Modified Safe Working Platforms



Features Based on EN 14439: Modified Safe Working Platforms

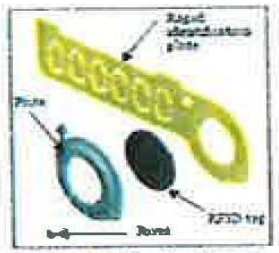
Features Based on EN 14439: Standardized Climbing Protocol

Features Based on EN 14439: Component Tracking for Safe Use of Repaired Components

Advanced Technology to Track Crane Components

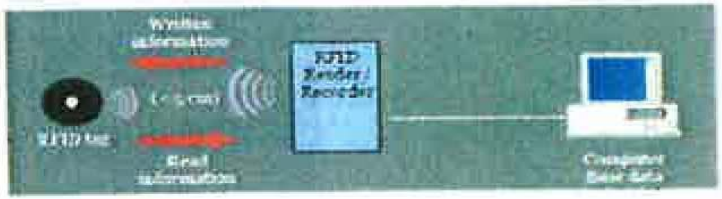
- Manitowoc offers to fit RFID tags on crane's major components (mast element, jib element, counter jib element, tie bars, cab, winches, ...)

Help customer to manage Cranes fleet and to monitor components maintenance and lifecycle.



The RFID tag direction does not match number. Reading is possible from both sides.

This chip is read by an RFID reader/recorder (example: PDA type transmitter /receiver) which picks up the information and transmits it towards an electronic data processing system.



The electronic chip contains a single identifier (serial number), information entered by Manitowoc and possible additional data recorded by the customer by means of an RFID reader/recorder.

Advantages of New Tower Cranes

Designed using current technology and latest means and methods

Computer aided interface (LMI – Load Moment Indicator)

Crane operator driving aid: Embedded camera

More advanced positive limit switches prevent overloading and over/under booming

Crane operator comfort and safety

Anti-collision system

Advanced technology to track cranes components

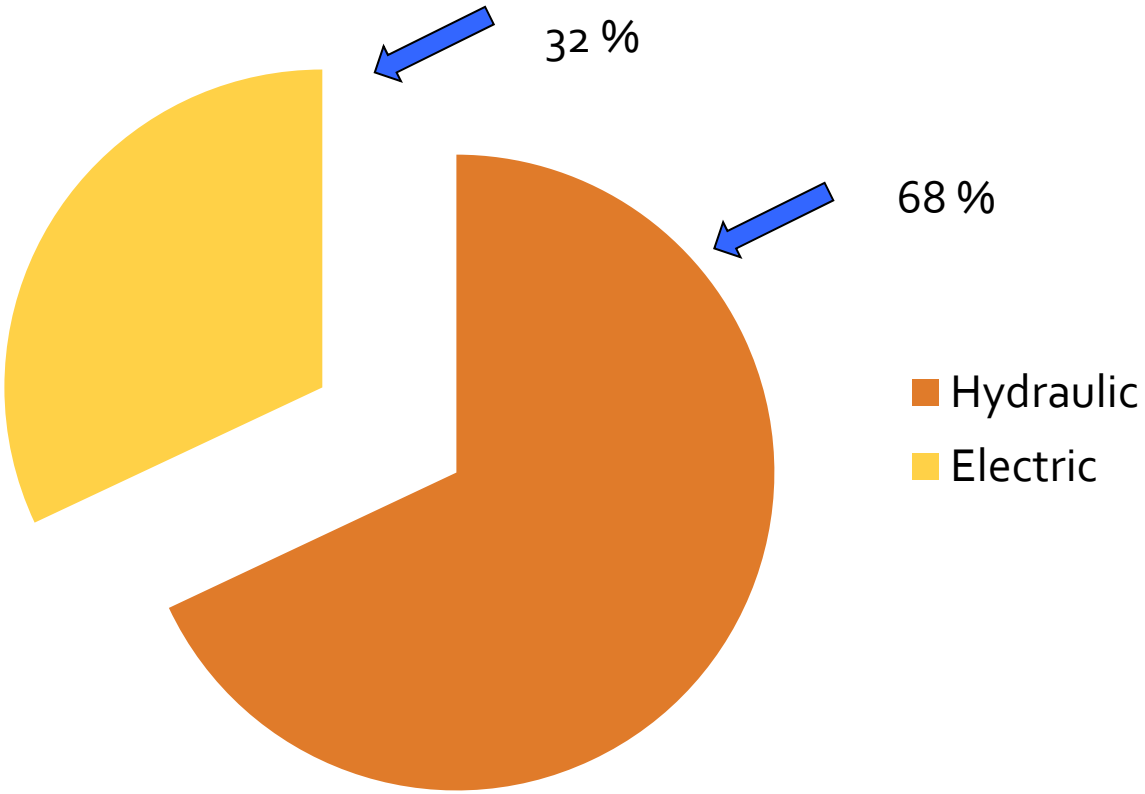
Transition to Electric Tower Cranes

Most major tower crane manufacturers switched from hydraulic to electric in the 1970s due to its technologically advanced mechanics and:

- Variable speed more advanced hoisting winch
- Energy efficiency: Decrease the power required
- Less maintenance required
- Environmental advantages (less noise / no pollution)

Hydraulic and Electric Tower Cranes

Tower Cranes Currently Registered



Facilitating New Tower Cranes

Since most tower crane manufacturers produce only electric tower cranes (Liebherr, Potain, Terex, Wolff, and Kroll), adequate electric service must be provided to all sites utilizing tower cranes.

DOB modified its tower crane prototype acceptance protocol and invited tower crane manufacturers to submit crane design and manufacturing documentations for expedited approval. One manufacturer **Terex** has submitted their new crane model through this new protocol.

The Electrical Committee is examining current industry practice of requesting and supplying adequate electric power to sites.

Electrical Committee Meetings

Electrical Committee Discussion

Topics

- Tower crane power requirements
- Construction Industry practice
- Con Edison / NYC Buildings / Industry Discussion

Electrical Committee Discussion

Temporary Power Requirements

What are the temporary power requirements of a construction site that utilizes an electrical tower crane?

Electrical Committee Discussion

Background

The typical electrical construction demand of a high-rise building (40 stories) without an electrical tower crane is approximately 1800 amps (550 kW, 208V).

A typical electrical tower crane consumes 800 amps (244 kW, 208V).

The total service requirement for a construction site utilizing an electrical tower crane is increased by 44%.

Typical Tower Crane Power Requirements

Liebherr – 884 amps (208V)

Potain/Manitowoc – 811 amps (208V)

Wolffkran – 722 amps (208V)

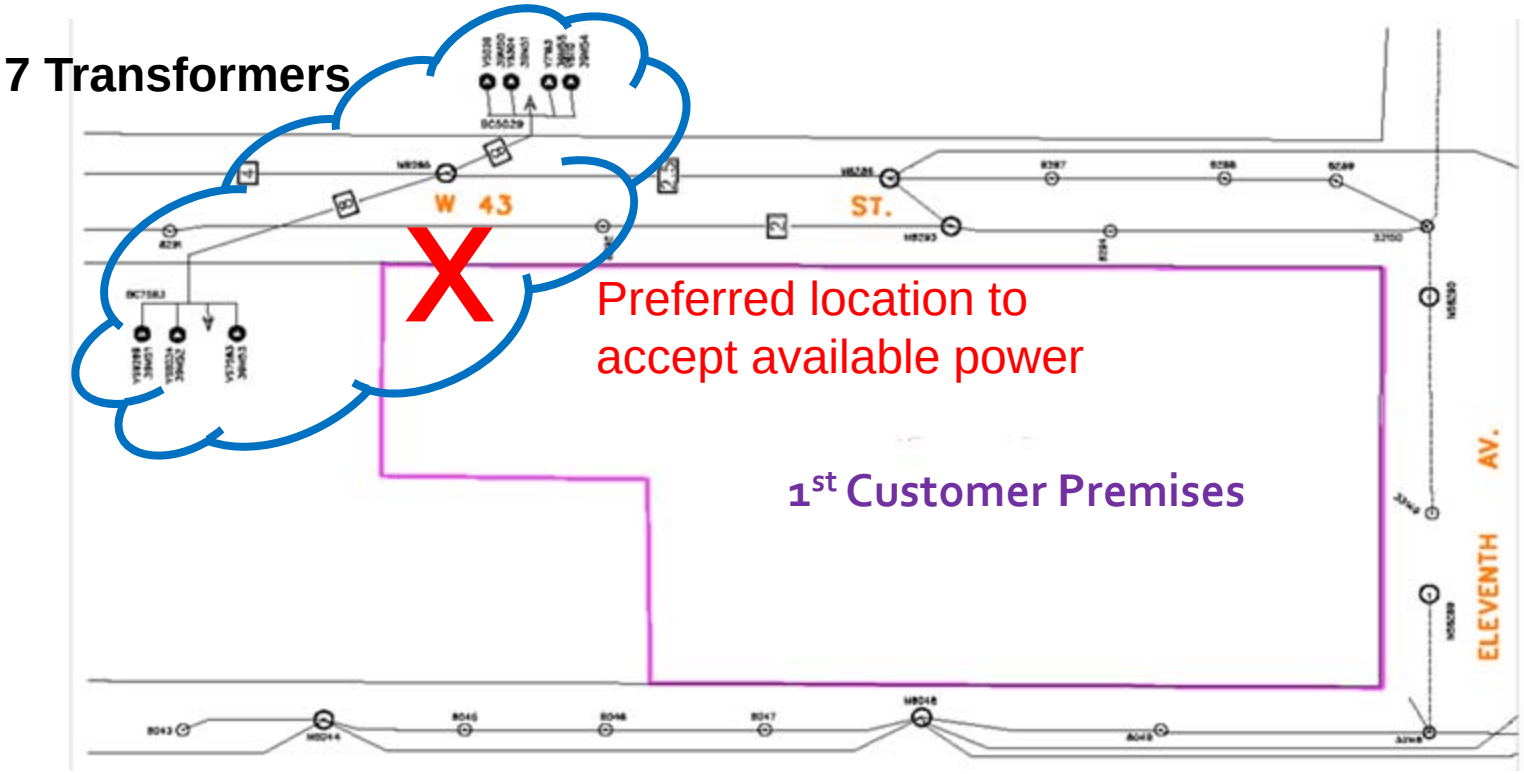
Electrical Committee Discussion

Availability of Power

What is the availability of the power in the local electrical grid to supply power to construction sites when required?

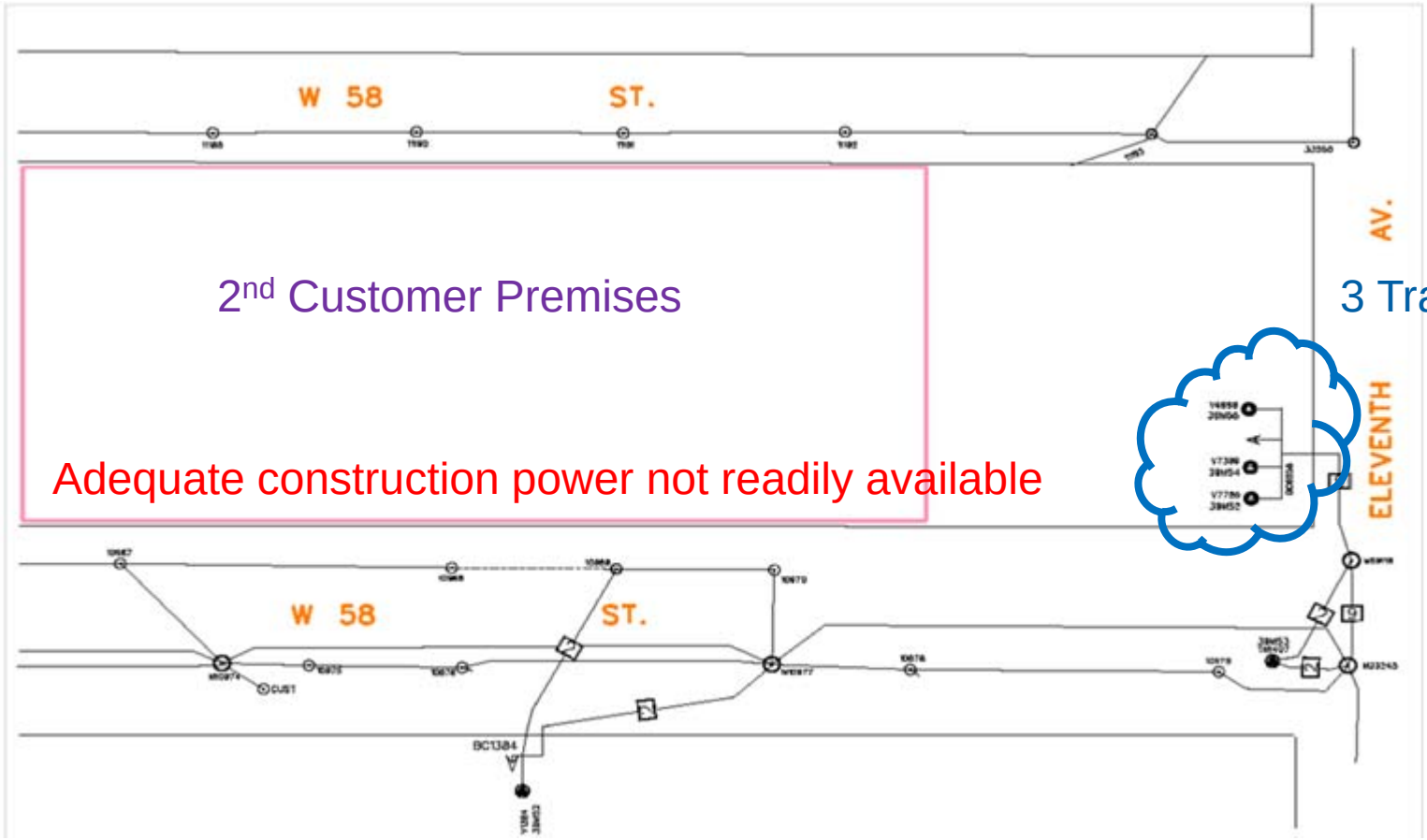
Electrical Committee Discussion

Con Edison Example: Robust Area Grid



Electrical Committee Discussion

Con Edison Example: Weak Area Grid



Electrical Committee Discussion

Requesting Temporary Service

When should electrical contractors/engineers for the developers request temporary electric service for construction sites?

Electrical Committee Discussion

Current Practice

Temporary service requests are often submitted with limited time before the construction service is needed (6 Months).

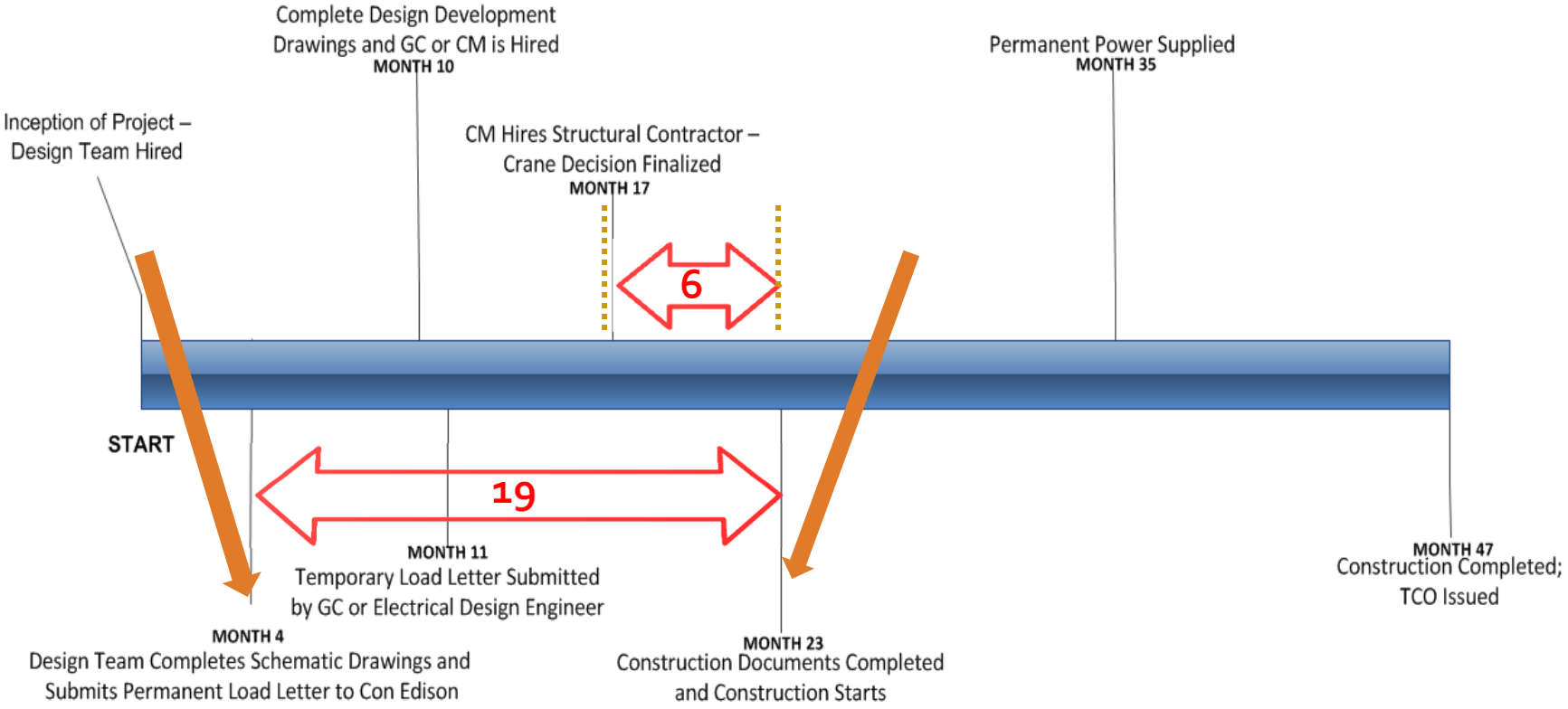
Proposal

A temporary load letter and service request should be submitted concurrently with the permanent service request.

This strategy will allow Con Edison 19 months of lead time to ensure that the adequate infrastructure is in place to supply electrical power to a construction site.

Electrical Committee Discussion

Typical Timeline: 40-story New Building Construction and Electrical Power Requirement



Electrical Committee Discussion

Protocols of Requesting Temporary Service

It is important to understand site specifics when submitting a service request to Con Edison for temporary power.

Electrical Committee Discussion

Historical Metered Electric Demand for Large Sites

Height *(Stories)*	*Footprint (Sq. Ft.)*	*Demand (W/Sq. ft.)*
Taller than 70	2 million	0.7
Taller than 70	1.5 million	0.7
Taller than 70	1 million	0.85
40 to 70	750,000	0.85
40 to 70	500,000	1.0
40	300,000	1.2

Electrical Committee Discussion

Example of Service Request Submitted to Con Edison

Temporary power requests for the project consists of:

Connected Loads (208V)

Welders - 100A	36 kW
Misc Pumps and Equipment - 200A	77 kW
Elevators (6) – 600A	216 kW
Crane – 962A	360 kW
Hoists (4) – 1333A	498 kW

Electrical Committee Discussion

Resolution

A temporary service request must include:

Load Letter specifying connected demand, building size, and the use of an electrical tower crane

Point Of Entry (POE)

Building Plot Plan (BPP)

Electrical Committee Discussion

Findings

Electrical tower cranes will substantially increase power requirements of construction sites.

Temporary service requests must be requested early in the process.

Thank You

Questions?

This concludes the American Institute of Architects Continuing Education System course.

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