NC OSH Advisory Council Meeting

Is this safe? A construction case study

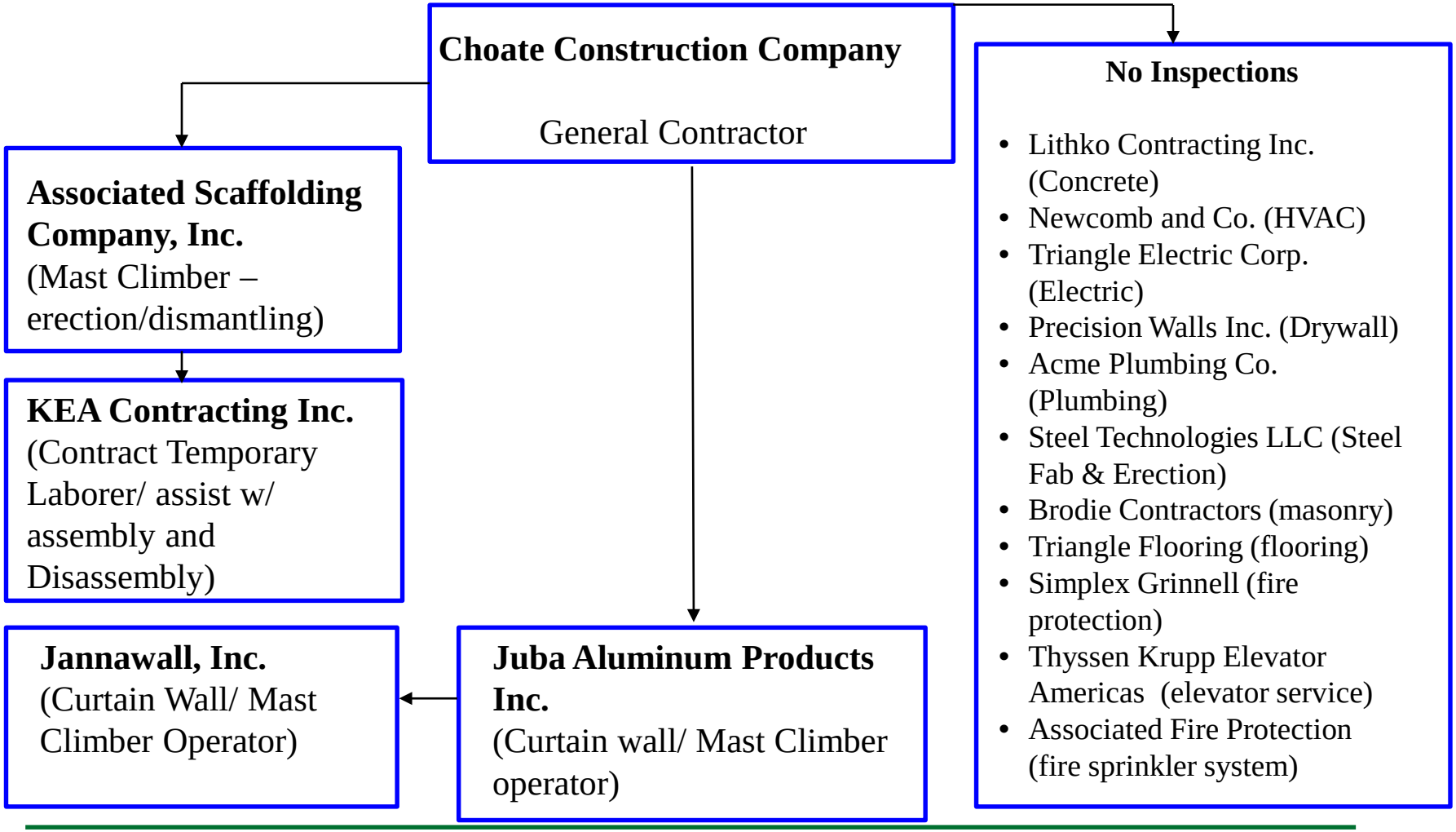
Randolph Community College
Comer Conference Center
November 20, 2019

Associated Scaffolding – Charter Square Construction Project:

Mast Climbing Scaffold Collapse during Dismantling – 3/23/2015

Presented by:
Scott Mabry – Assistant Deputy Commissioner

Contractors Onsite



Scope of Project

- Charter Square Construction project located in downtown Raleigh, North Carolina
- Construction of a multi-story steel framed building
- Exterior of the building was glass façade (glass curtain wall)
- The exterior construction was approximately 99% complete when the accident occurred

Project Description

- December 2014 – Choate awarded Associated Scaffolding the contract to install six (6) mast climbing platforms
- Mast Climber model – Klimerlite manufactured by Klimber Platforms, Inc. in Ontario, Canada
- Initial purpose of erecting the Mast Climber was:
  - stud framing, detail work, metal panel work, soffit “roof wing” of the overhang
- Later the Mast Climber was used to install glass windows at higher floors

Charter Square Tower

Allowable Load

- ***Klimerlite Allowable Load*** - single mast with a free standing height of 40 feet with a 45 feet wide platform without rear extension was 3000 lbs. (includes weight of employees)
  - The 3000 lbs. had to be evenly distributed on each side of the main platform (1500 lbs. per each side)
  - Allowable for a standard configuration for a 45 feet wide platform with up to a 5 foot extension on the wall side (lower platform) and no rear extension

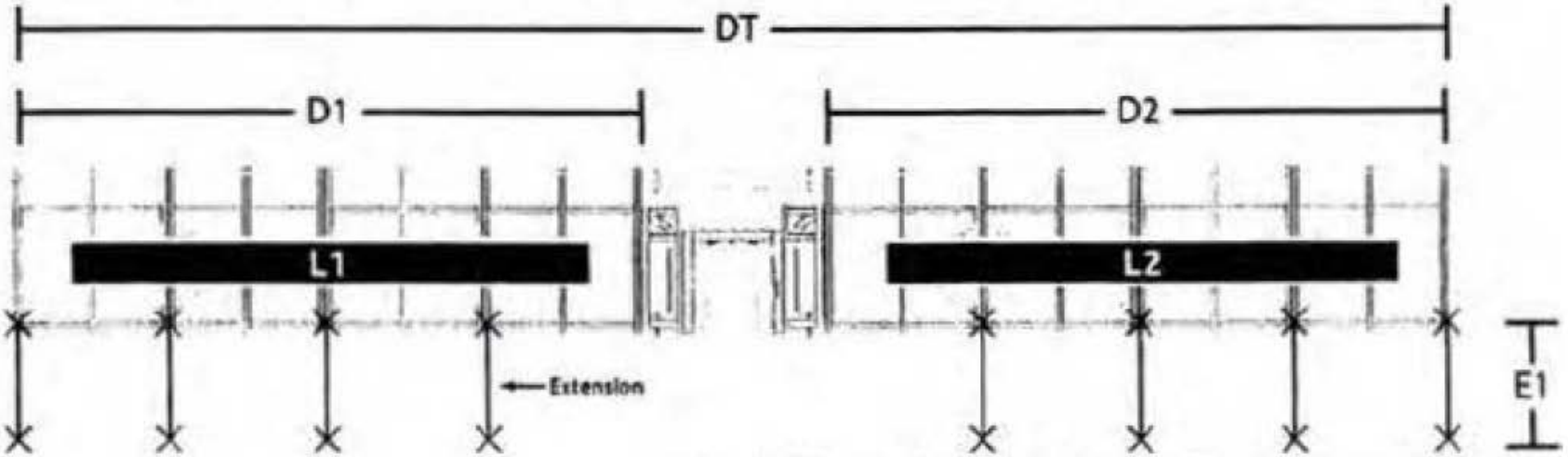
Total Superimposed Load on Platform

- 13 mast sections (12 -5’ sections and 1-2’-8” section) = 3070 lbs.
- 6 ties (3 ties weight 200 lbs.) = 400 lbs.
- 4 employees = 175 lbs. x 4 = = 700 lbs.
- Personal equipment for two persons = 90 lbs.

- Total gravity load on the platform = 4260 lbs.
- Total lateral load on platform, as per ANSI = 135 lbs.

KLIMERLITE Single-Mast Layout

PLAN VIEW



Extension Area: NO MATERIAL – PERSONNEL ONLY

SECTION LENGTHS

DT	D1		D2	
Feet	# Plat. Sect.	Feet (m)	# Plat. Sect.	Feet (m)
13 (4)	1	4 (1.2)	1	4 (1.2)
21 (6.4)	2	8 (2.4)	2	8 (2.4)
29 (8.8)	3	12 (3.9)	3	12 (3.9)
37 (11.3)	4	16 (4.1)	4	16 (4.1)
45 (13.7)	5	20 (5.3)	5	20 (5.3)

DT = Length Total *D1 – D2 = Length of Platform Section*

SECTION LOADS

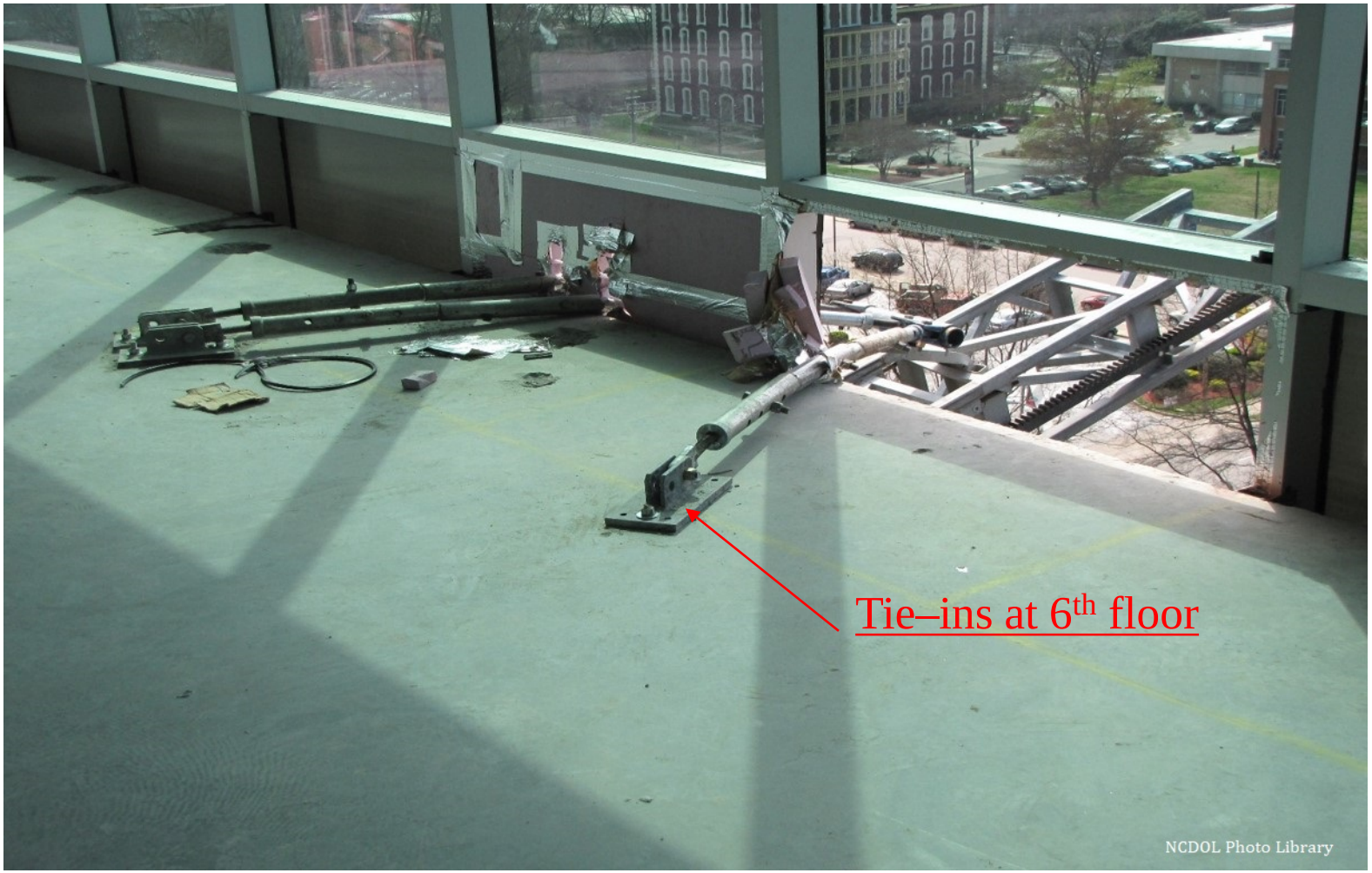
LT	L1	L2
Pounds (kg.)	Pounds (kg.)	Pounds (kg.)
6,000 (2,720)	3,000 (1,360)	3,000 (1,360)
5,500 (2,495)	2,750 (1,250)	2,750 (1,250)
4,750 (2,155)	2,375 (1,190)	2,375 (1,190)
4,000 (1,815)	2,000 (910)	2,000 (910)
3,000 (1,360)	1,500 (680)	1,500 (680)

LT = Load Total *L1 – L2 = Load per Section*

Assembly of the Mast Climbing Platform

- Two certified technicians for the assembly and disassembly of the mast climbers
- Ties were provided on the 3rd, 6th, 9th, 11th floors and on the roof level
- There were three (3) ties at each floor attached to the building using wall plates
- Connections between the vertical mast sections were made by bearings and by spring loaded bolts
- Tower was plumbed by adjusting the turnbuckle at the ties

Mast Climbing Tie -Ins

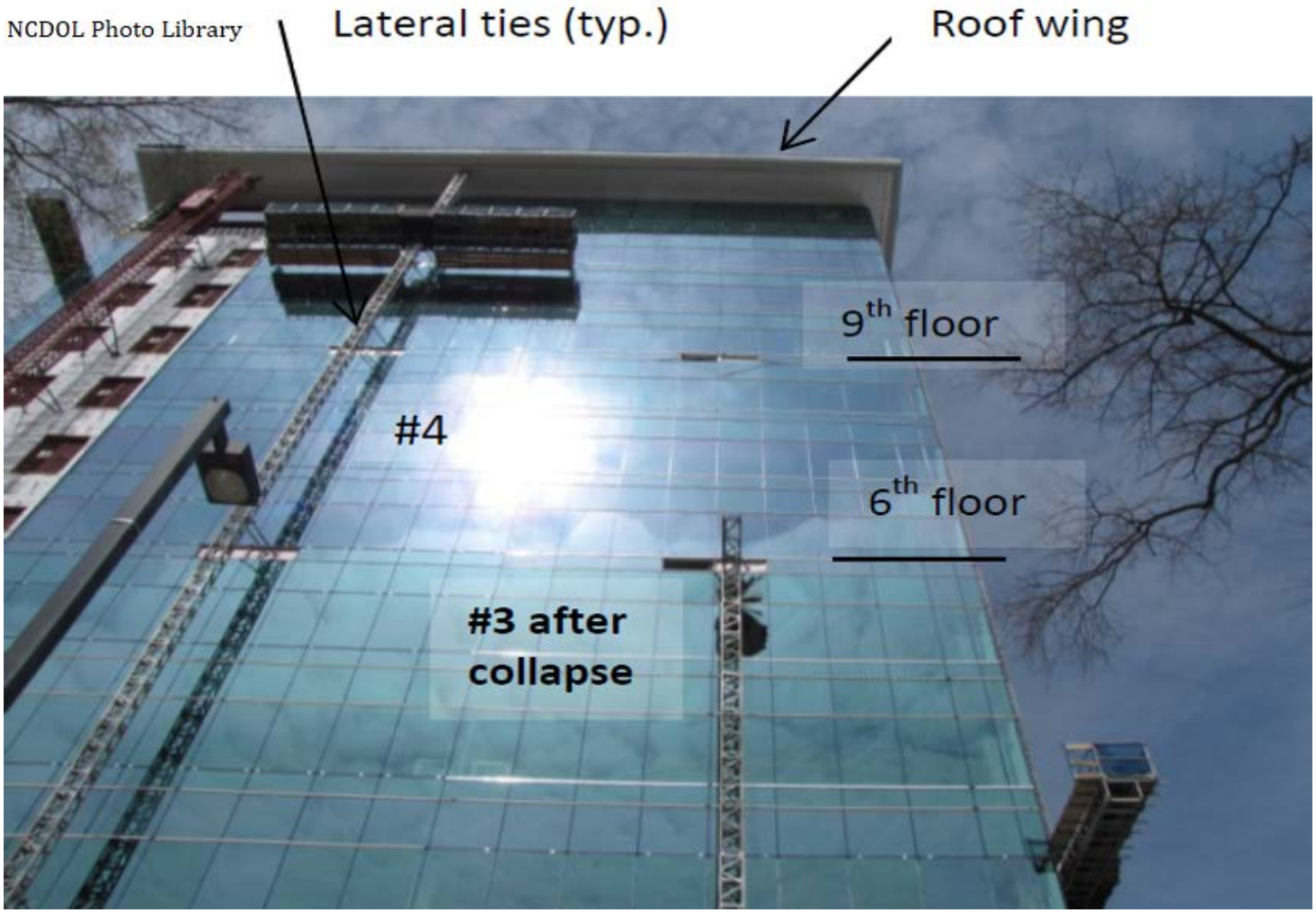


Critical Considerations for Tie-ins

- Manufacturer recommended tie-ins no greater than 40 feet

- Spacing between the:

- 3rd and 6th floor ties: 47 ft
- 6th and 9th floor ties: 47 ft.
- 9th and 11th floor ties: 31 ft.
- 11th and roof ties: 25 ft.


NCDOL Photo Library
Lateral ties (typ.)
Roof wing
9th floor
#4
6th floor
#3 after collapse

Mast Climbing Work Platform (MCWP) Collapse

- March 23, 2015 at approximately 11:00 am
- Four employees
  - Associated Scaffolding – 1 employee
  - KEA Contracting Inc. – 1 temporary laborer
  - Jannawall Inc. – 2 employees
- Three employees were killed and one employee was severely injured

Accident Findings

- Disassembling the mast climber by removing the tie-ins and work platform sections
- The Kea employee was assisting the Associated Scaffolding employee with the disassembly of MCWP #3
- Two Jannawall employees were directed to work from the platform during the disassembly to install the glass panels in the openings as the tie-ins were removed

Accident Findings (contd.)

- Prior to the accident, the Vice President of Associated had instructed the Associated Scaffolding Technician assigned to disassemble MCWP #3 that Jannawall employees were not to ride the MCWP
- On 3/23/15 Choate Project Superintendent had a discussion with the Associated Scaffolding Sales Representative, and as a result of that discussion, Jannawall employees were permitted to ride MCWP #3 during the disassembly
- There were two other Jannawall employees handing glass panels from inside the building to the Jannawall employees working from the MCWP #3 platform

Accident Findings (contd.)

- Associated and Kea Contracting employees removed three tower sections and the roof ties
- Removed five mast sections between the roof and 11th floor prior to removing the ties on the 11th floor
- Removed five mast sections proceeding to the 9th floor
- 13 disassembled sections and 6 ties were placed over the mast climbing platform deck

Accident Findings (contd.)

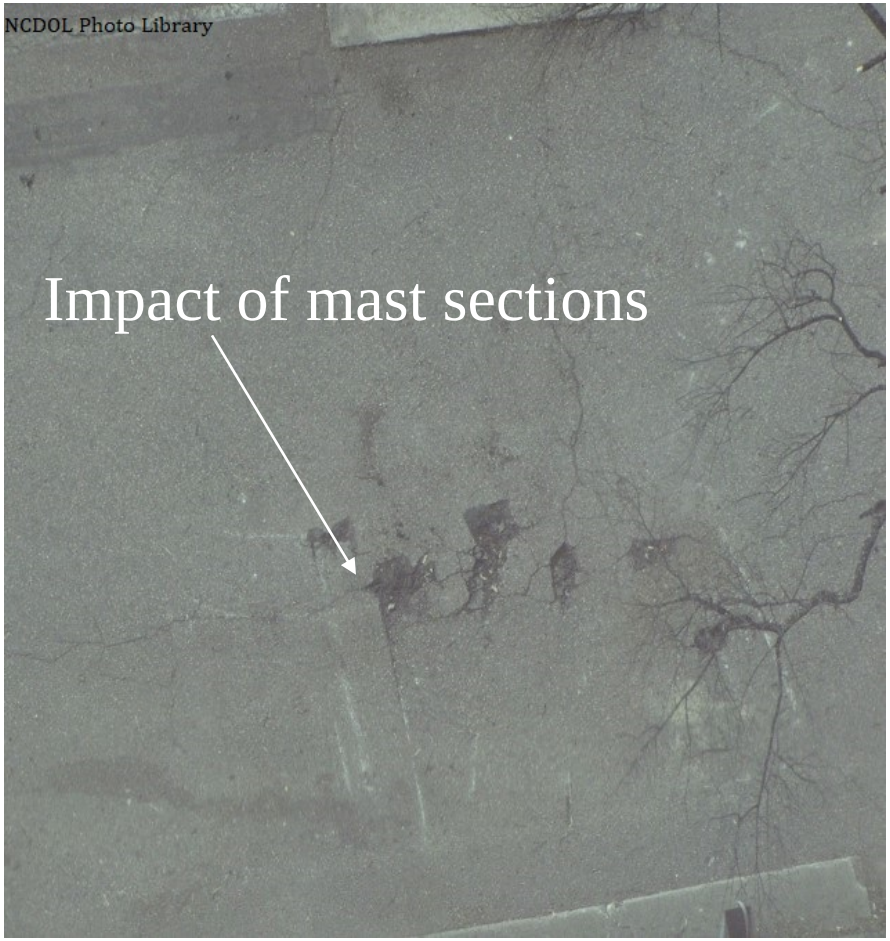
- Kea employee was overheard telling the Associated Scaffolding Supervisor/Competent Person they needed to go to the ground to unload the removed sections
- Jannawall employees working from the MCWP #3 platform were said to have asked the Supervisor/Competent Person to take the platform down
- The Supervisor/Competent Person climbed in the opening where the ties were attached on the 9th floor
- After disconnecting the ties he climbed back onto the MCWP #3 platform

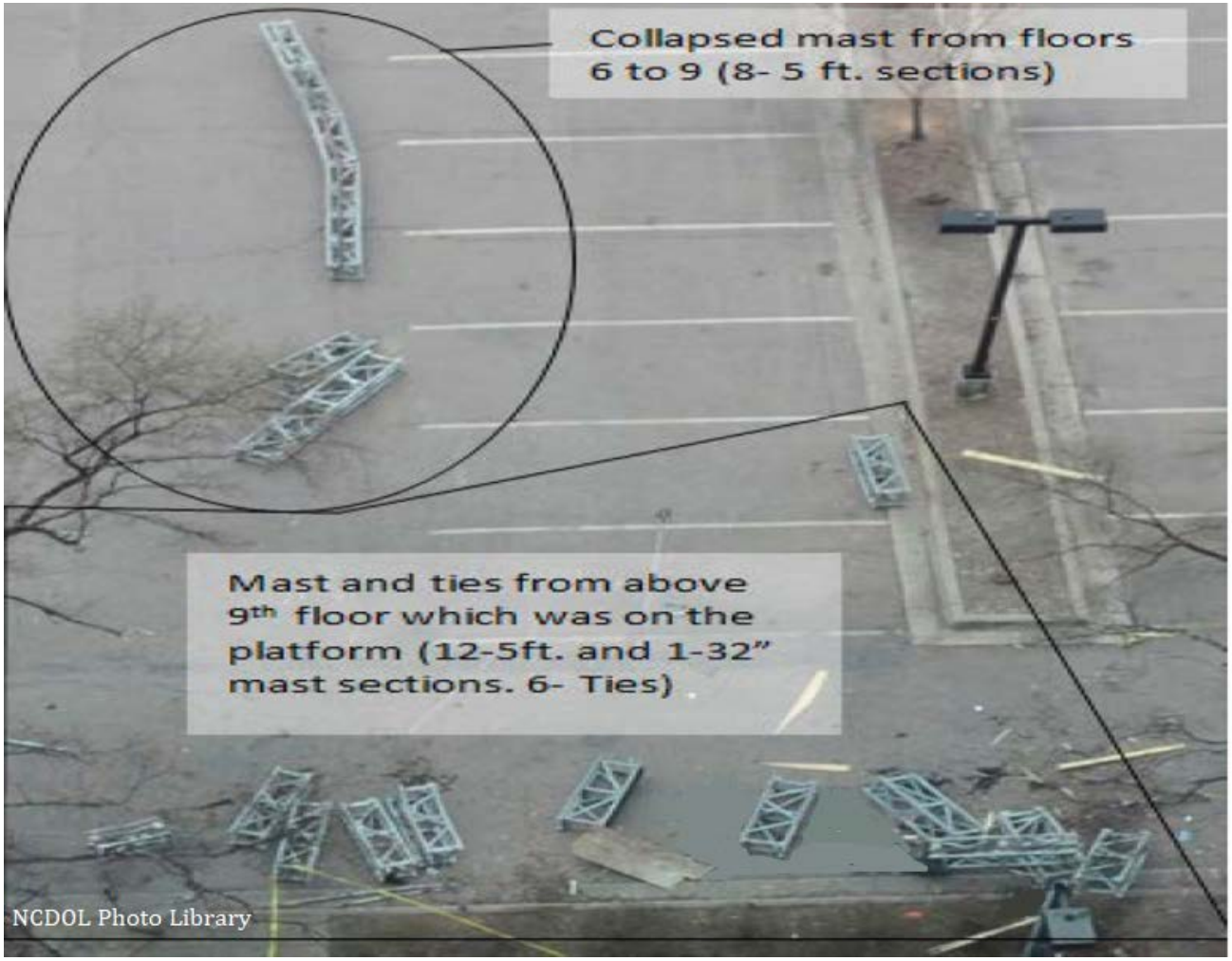
Accident Findings (contd.)

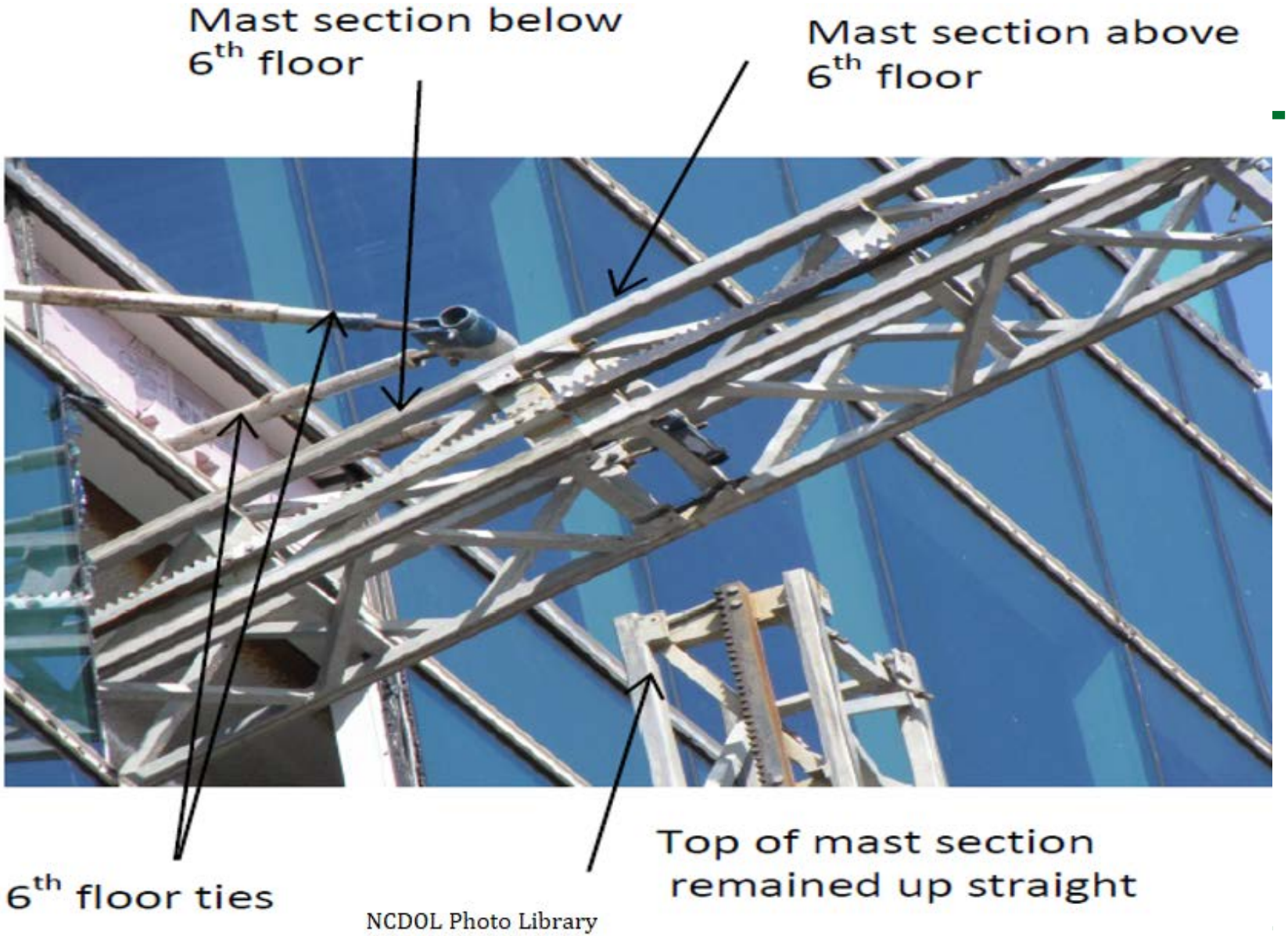
- The platform and mast began to lean from the building
- The Jannawall employee working inside the building reached for one of the Jannawall employees that was on the MCWP #3 platform and could not hold onto him because he was attached to the platform by his personal fall arrest system
- It was determined that strain was placed at the 6th floor tie-ins causing the mast sections to fall to the ground in three parts
- The 45 ft. platform fell and landed close to the building

MCWP #3
After Collapse

MWCP #3
After Collapse




Collapsed mast from floors 6 to 9 (8- 5 ft. sections)
Mast and ties from above 9th floor which was on the platform (12-5ft. and 1-32" mast sections. 6- Ties)
NCDOL Photo Library


Mast section below 6th floor
Mast section above 6th floor
6th floor ties
Top of mast section remained up straight
NCDOL Photo Library

Technical Assistance

U.S. Department of Labor
OSHA Directorate of Construction

- OSH requested technical assistance because it was believed to be a structural integrity issue
- NCDOL authorized assistance from Federal OSHA
- Mr. Mohammad Ayub, P.E, S.E. with Federal OSHA agreed to assist
- Mr. Ayub traveled to Raleigh to conduct his investigation

Mr. Ayub's Report Details

- The failed mast climbing scaffold had a front lower extension of 24" and a rear upper extension of 24"
- The dead weight of the rear extension was approximately 500 lbs.
- The deck with an upper extension is not standard configuration and is not commonly used in industry

Mr. Ayub's Report Details

- Manufacturer was not contacted to determine the safe load carrying capacity of the deck configured with an upper rear deck
- The safe load carrying capacity will be lower than 3000 lbs. if the load is placed on the rear extension
- It is unknown if the contractor used the rear extension as part of the main platform during dismantling and whether the disassembled mast sections were placed on the rear extension area


upper deck (main platform + rear extension)
This is not from # 3
lower platform
NCDOL Photo Library


NCDOL Photo Library


NCDOL Photo Library


NCDOL Photo Library


NCDOL Photo Library


NCDOL Photo Library

Mr. Ayub's Conclusion

1. Excessive free standing height of the mast and higher magnitude of the loads than permitted by the manufacturer

2. Direction of the mast climbing platform and its mast was improperly done as the vertical spacing of the lateral ties exceeded the manufacturers maximum permitted height of 40 ft.

3. The failure of the swing bolts near the 6th floor connecting the upper and lower sections triggered the failure

Mr. Ayub's Conclusion

4. The dismantling of the mast climbing platform and its mast was done improperly as the technician overloaded the platform which was further exacerbated by untying the 9th floor ties; technician should have unloaded the disassembled sections to the ground and came back up to untie the 9th floor ties

5. The mast climbing platform erected was of a non standard configuration because of the upper rear platform and the contractor did not consult the manufacturer to obtain the corresponding load chart for the modified configuration

OSH Inspection Results

- During our investigation NCOSH had two of the same investigation findings as Mr. Ayub:
  - **1926.451(c)(1)(ii)** – Guy ties and bracing was not installed in accordance with the manufacturer recommendations or at the closest horizontal member to the 4:1 height and repeated vertically at locations of horizontal members every 20 feet (6.1m) or less thereafter for scaffolds 3 feet (0.91m) wide or less, and every 26 feet (7.9m) or less thereafter for scaffolds greater than 3 feet (0.91m) wide: (Willful Serious)
  - **1926.451(f)(1)** – Scaffold and/or scaffold components were loaded in excess of their maximum intended loads or rated capacities, whichever was less: (Willful Serious)

OSH Inspection Results

- Additional Recommended Citations:
  - **1926.451(g)(2)** – The employer did not have a competent person determine the feasibility and safety of providing fall protection for employees erecting or dismantling supported scaffolds: (Willful Serious)
  - **1926.451(f)(3)** – Scaffolds and scaffold components were not inspected for visible defects by a competent person before each work shift, and after any occurrence which could affect a scaffold's structural integrity: (Serious)

The citations were contested by Associated Scaffolding Company, Inc.

OSH Inspection Results

- Juba Aluminum Products Co., Inc. and Jannawall, Inc. were both cited for:
  - **1926.454(a)** – The employer did not have each employee who performed work while on a scaffold trained by a person qualified in the subject matter to recognize the hazards associated with the type of scaffold being used: (Serious)

Both companies contested the findings and the cases were ultimately settled. These were reclassified for both employers to non-serious with stipulations regarding training and updating their manuals on mast climbers


NCDOL Photo Library


FT
X NYLON SLINGS
POLYESTER SLINGS
MADE IN USA
VERTICAL 6400 LBS
CHOKER 5120 LBS
BASKET 12800 LBS
WARNING
Read and follow all provided
information. Failure to do
this sling may result in severe
injury or DEATH due
NCDOL Photo Library

Legal Settlement

- **1926.451(c)(1)(ii) – Reclassified to Serious**
- **1926.451(f)(1) – Reclassified to Serious**
- **1926.451(g)(2) – Deleted**
- **1926.451(f)(3) – No Change; remained Serious**

Legal Settlement

- **Stipulations**
  - Associated agreed to no longer lease or use the Mast Climbing Platforms
  - Prior to use in the future they will give written notice to NCDOL – OSH Director's Office
  - If they lease in the future, Associated will prepare and provide to the lessee a detailed safety manual for such mast climbing work platform and provide specific written instructions to the user of the MCWP scaffold for the use and inspection
  - Associated will revise its existing written safety plan for the safe use of each type of scaffolding used by Associated

Legal Settlement – added to website

What can I do to protect myself?
Never get onto a scaffold unless it has been inspected by a competent person to ensure that it has been properly assembled and is acceptable for the purpose for which it is to be used. Never use a scaffold at work unless you have been trained in its proper use.

- When mast climbing work platforms are used, they must be erected in accordance with the manufacturer's instructions. In particular, the free standing height of the mast and the magnitude of the loads placed on the platform cannot exceed what is permitted by the manufacturer. In addition, the manufacturer must be consulted for the proper load chart when using a non-standard configuration. For more information, reference the following report, Investigation of the March 23, 2015 Mast Climbing Scaffold Collapse during Dismantling at Raleigh, NC

Thank You For Attending!

Questions?

1-800-NC-LABOR

(1-800-625-2267)

www. www.labor.nc.gov