



# 2024 SPRING CONVENTION



APRIL 21-24, 2024  
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# CHICAGO RIVER WALL CAP REPAIRS

DUNJA VLA



APRIL 21-24, 2024

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# ➤ LEARNING POINTS

- Access and planning for the investigation in a hard-to-reach, underwater and sensitive construction site.
- Underwater survey and repair work by divers, using boat and barge as working platform.
- Phasing of work/staging, collecting debris, coordination with a restaurant/wedding venue within the work access area.
- Special challenges in underwater concrete repairs.







# LOCATION

CME Building - Two Towers



Ogilvie Train Station







## WHY IS THE RIVER SO IMPORTANT?

### ➤ RECORD-BREAKING

- Chicago has 37 movable bridges
- More than any city on earth!

### ➤ EARLY & INNOVATIVE

- Engineers REVERSED the flow of the river in 1900

### ➤ COMMERCIAL IMPACT

- Commercial transport on the I&M canal
- Tourism - architectural cruises make it a valuable resource





# RIVER FLOW REVERSAL



ORIGINAL RIVER PATTERN



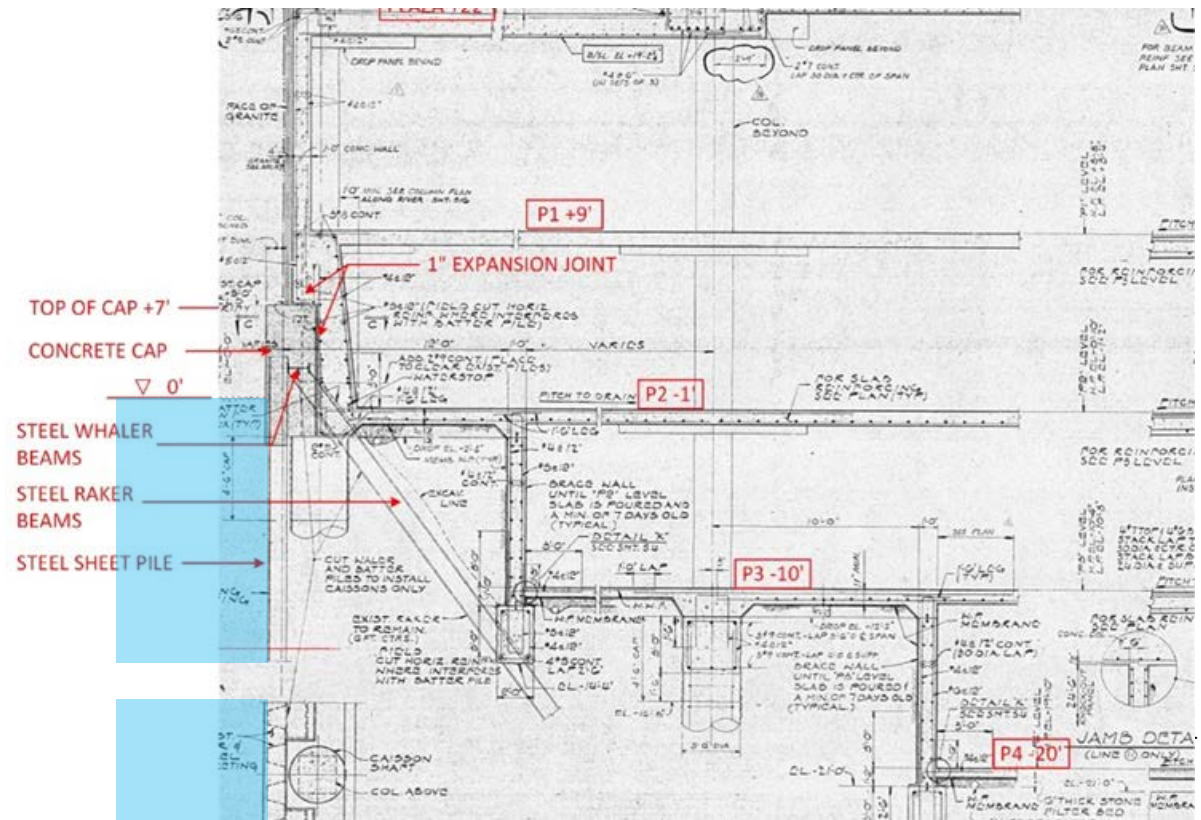
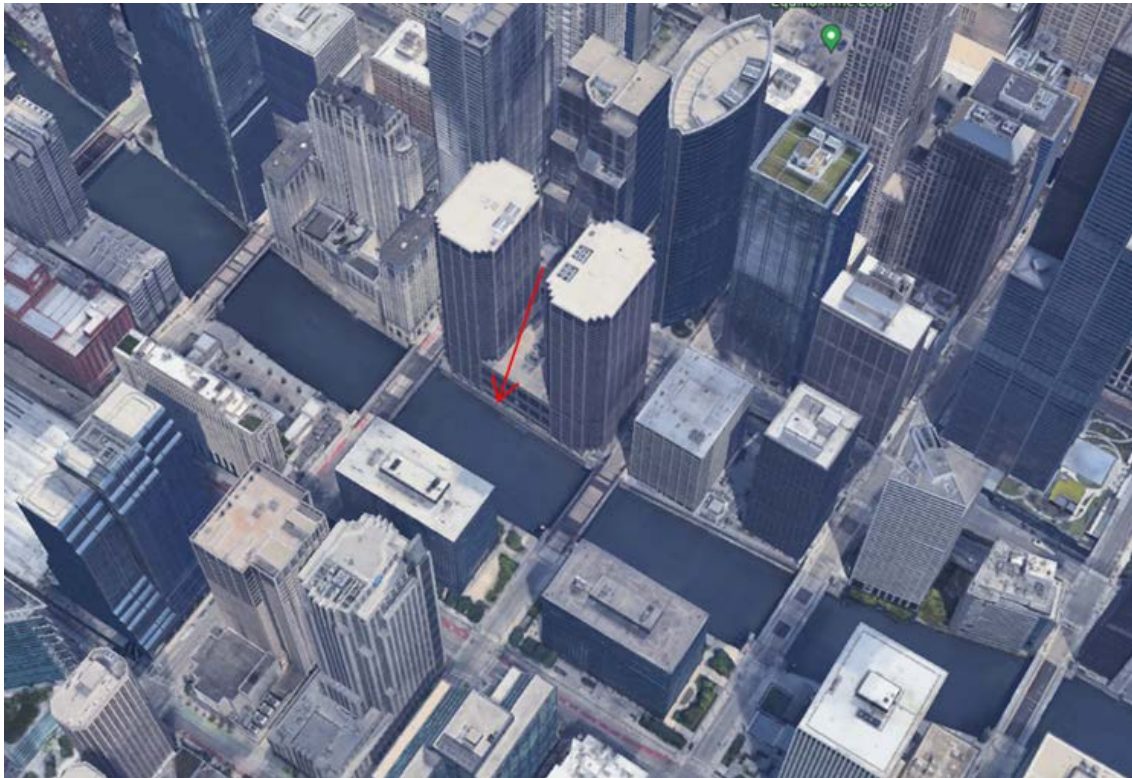
Project Location

RIVERSED RIVER FLOW

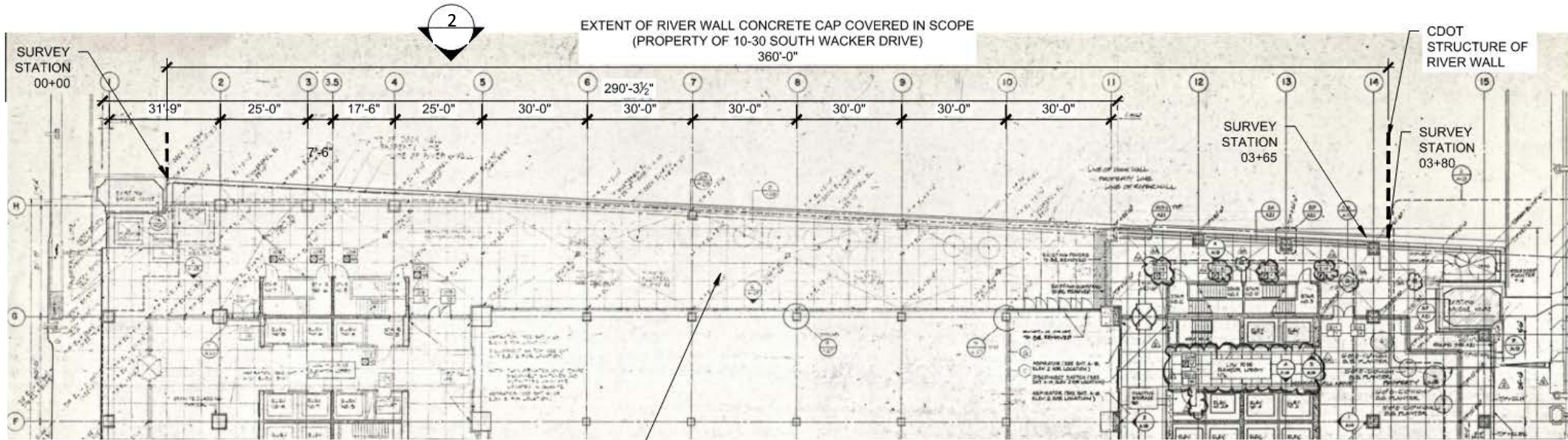


# ➤ INVESTIGATION

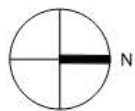
➤ In 2017 WJE was engaged to assess the condition of the retaining wall located on the west side of the building (river side). The retaining wall, also referred to as a “river wall” or “dock wall,” separates the subgrade areas of the building structure from the adjacent Chicago River. The goal of the assessment was to understand the structural integrity and functionality of the wall and develop recommendations for remedial actions, if necessary.



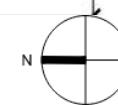




**1** Plan View\*  
Not to Scale



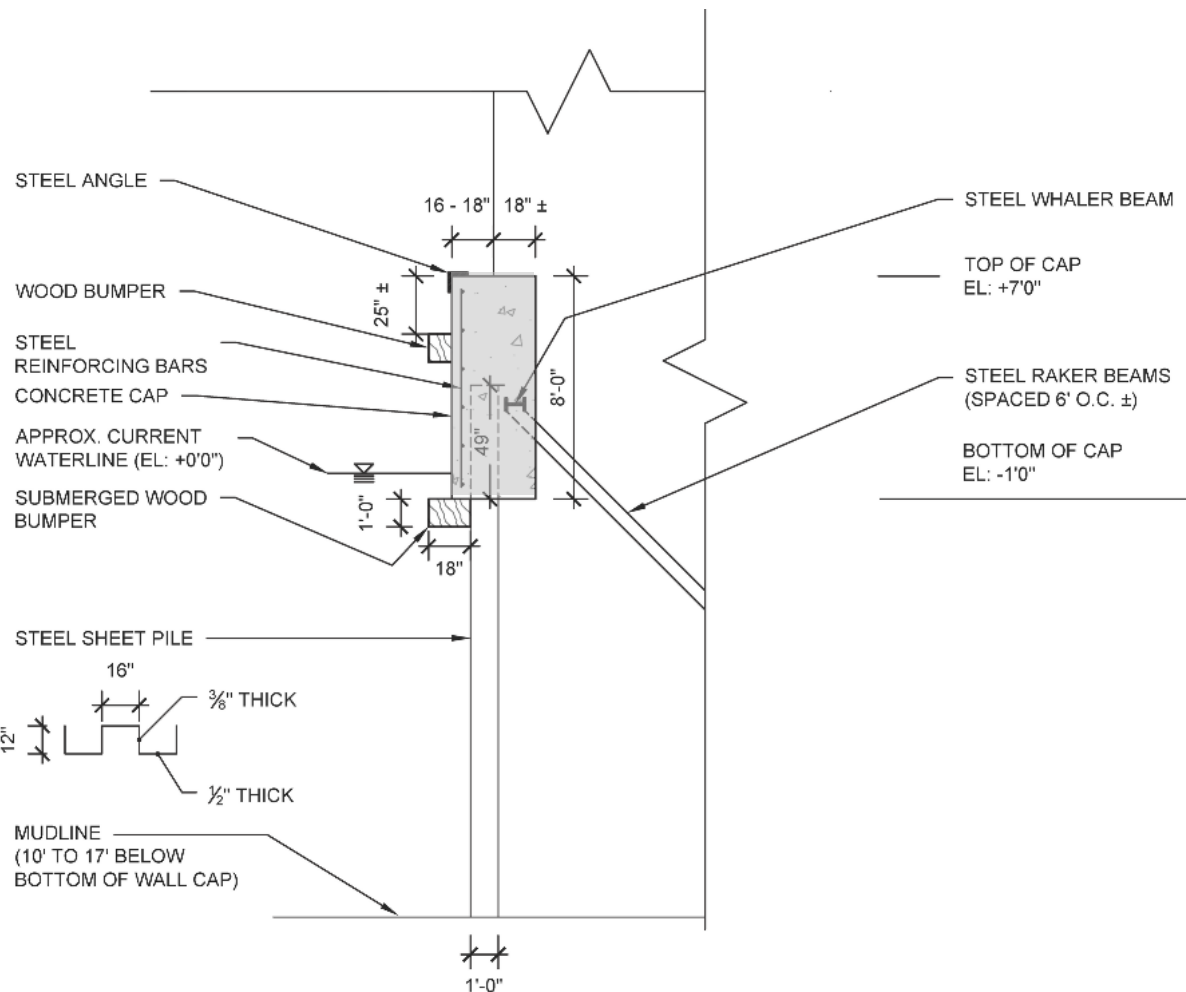
**2** River Wall - Elevation View  
Not to Scale







Overall view of river wall from Monroe Street bridge



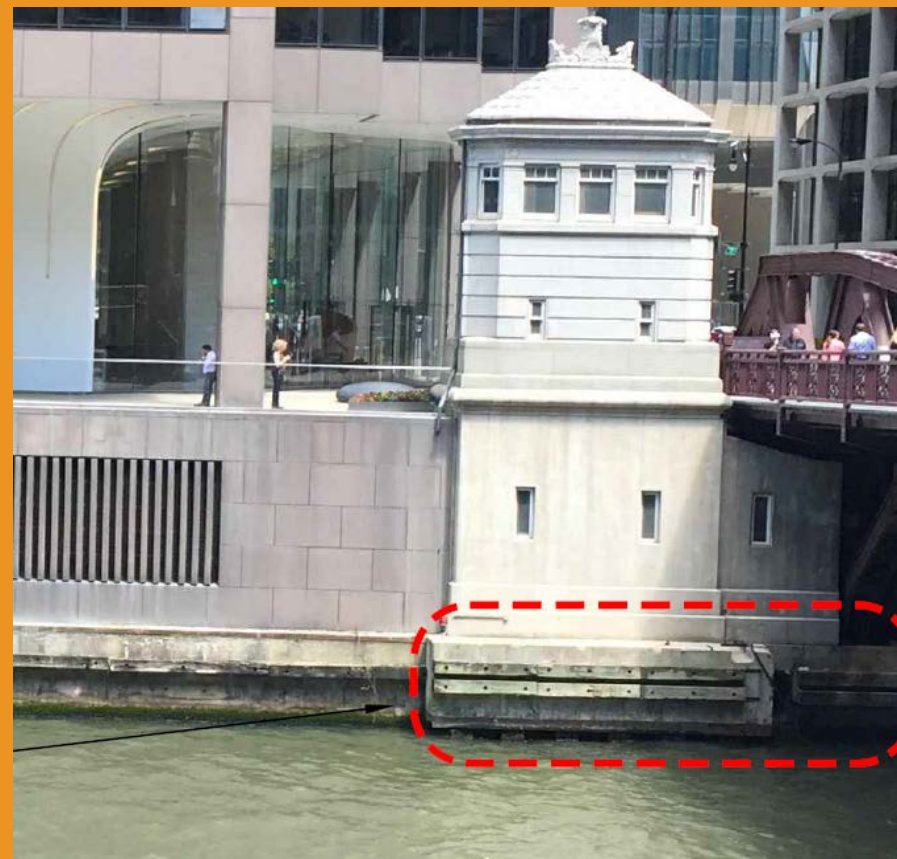
Cross section drawing of typical retaining wall section. CME structure not shown for clarity



Overall view of sheet pile retaining wall structure above the water level



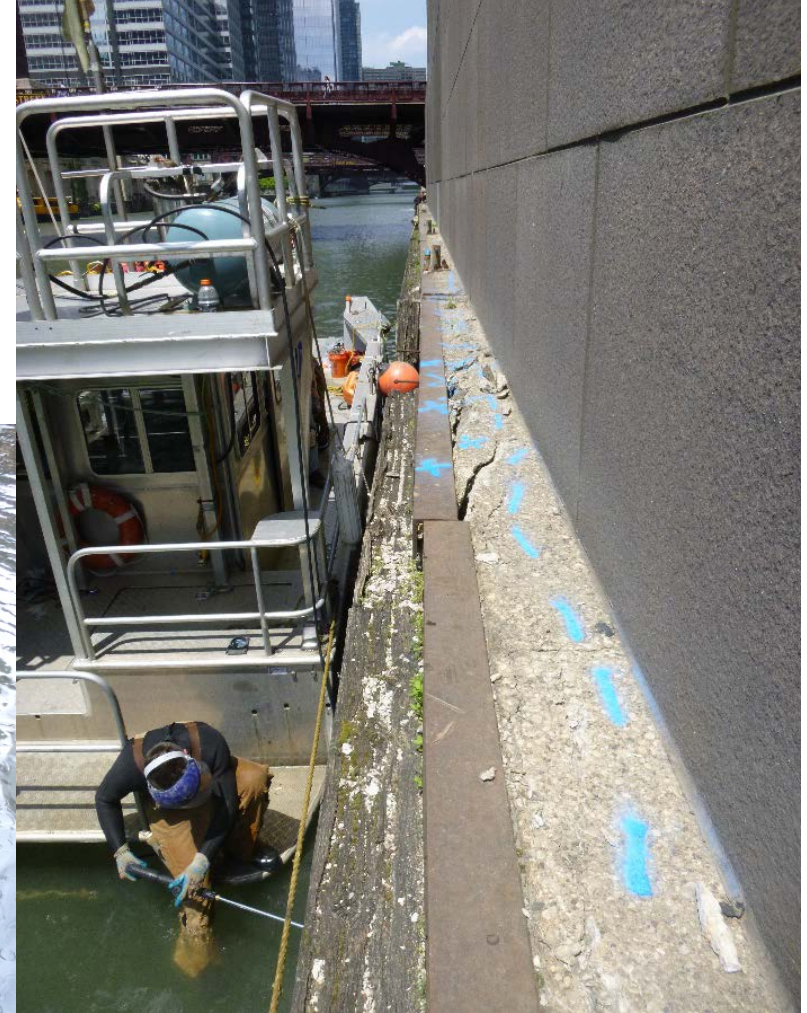
# ➤ OUR WORK WAS ADJACENT TO THE CITY RIVER WALL







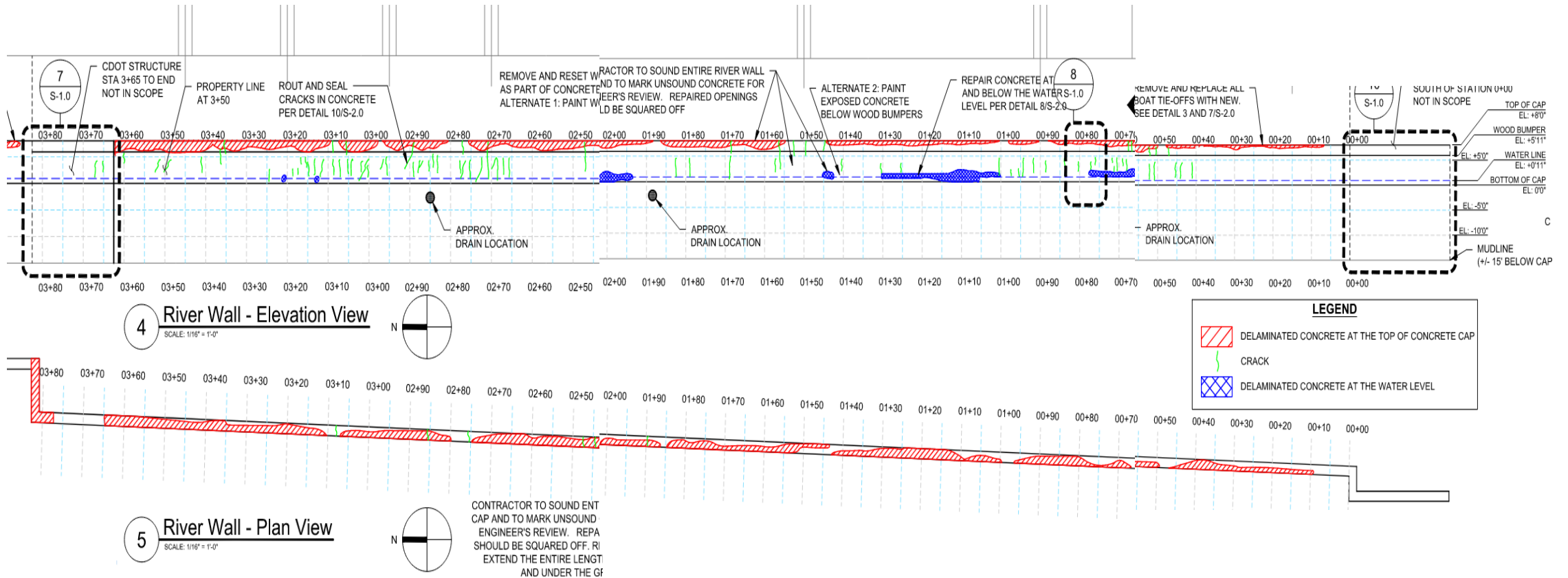
# HOW WAS IT DONE?







# SURVEY STATIONS AND MAPPING NOTES



# ➤ TYPICAL CONDITIONS - ABOVE WATER LINE



Concrete distress across the full width of the top surface of the cap



Spall behind angle at Station 2+30





Concrete spall between  
Station 3+50 and  
Station 3+60



Typical concrete distress (outlined in blue paint)  
at top of concrete cap



Spalling on top of timber pile river wall  
(City's property)



# ➤ TYPICAL CONDITIONS - AT WATER LINE



Severely eroded concrete at waterline

Surface erosion and marine growth at bottom of concrete cap



Spall at waterline exposing inside face of sheet piling

(1) Condition of rebar exposed at water line

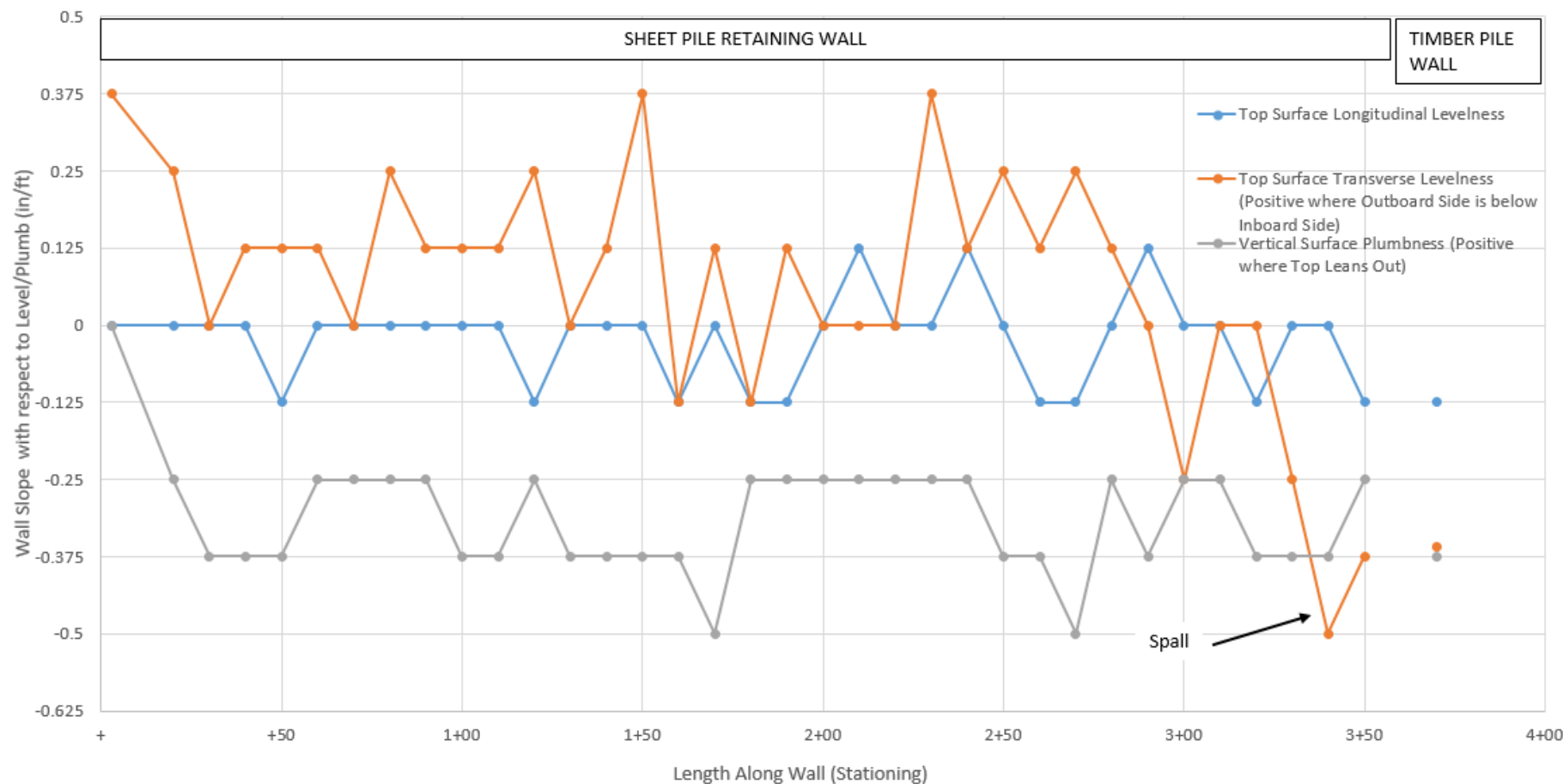
(2) Minor corrosion

(3) Advanced corrosion





# CONCRETE CAP ORIENTATION MEASUREMENTS

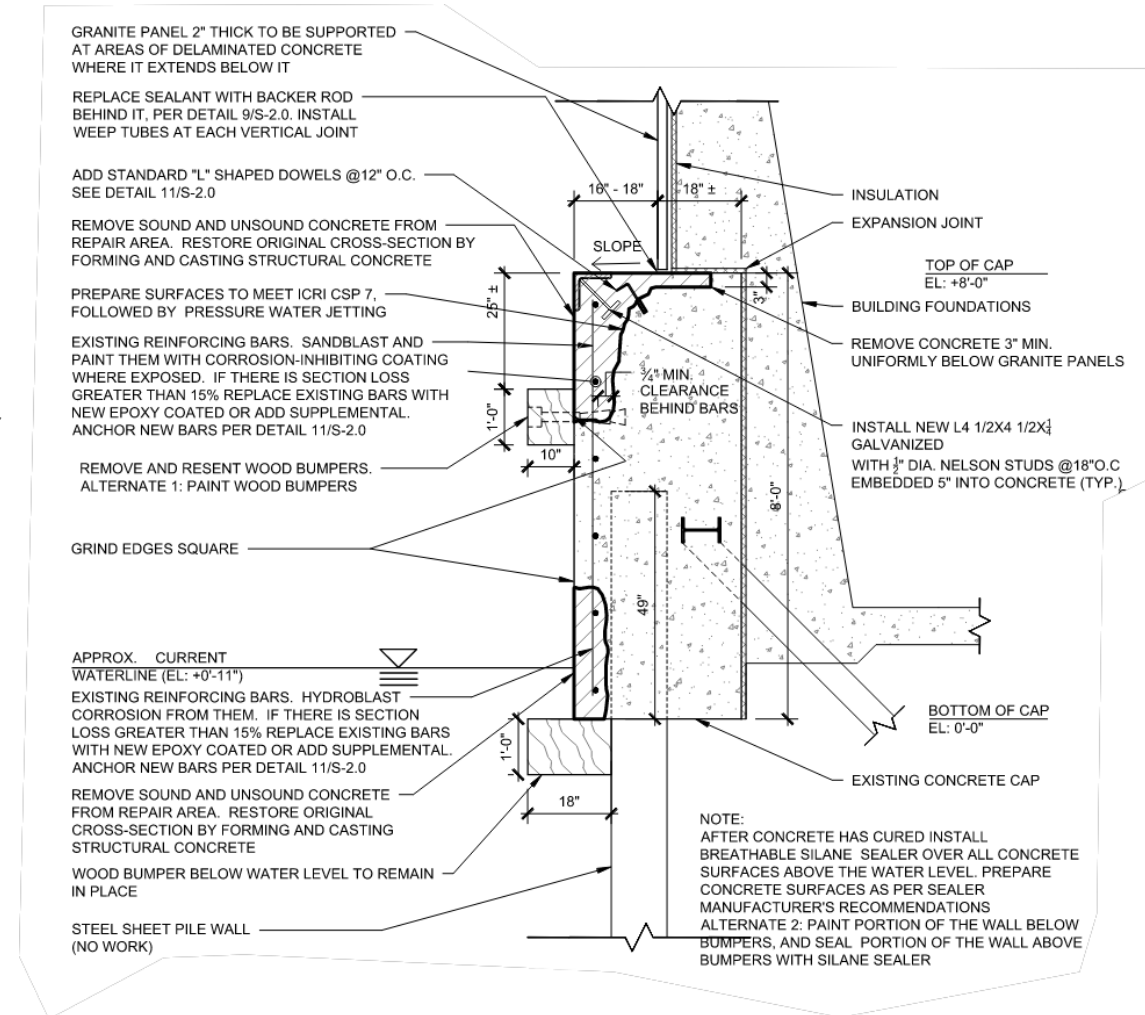


# ➤ REPAIR DESIGN

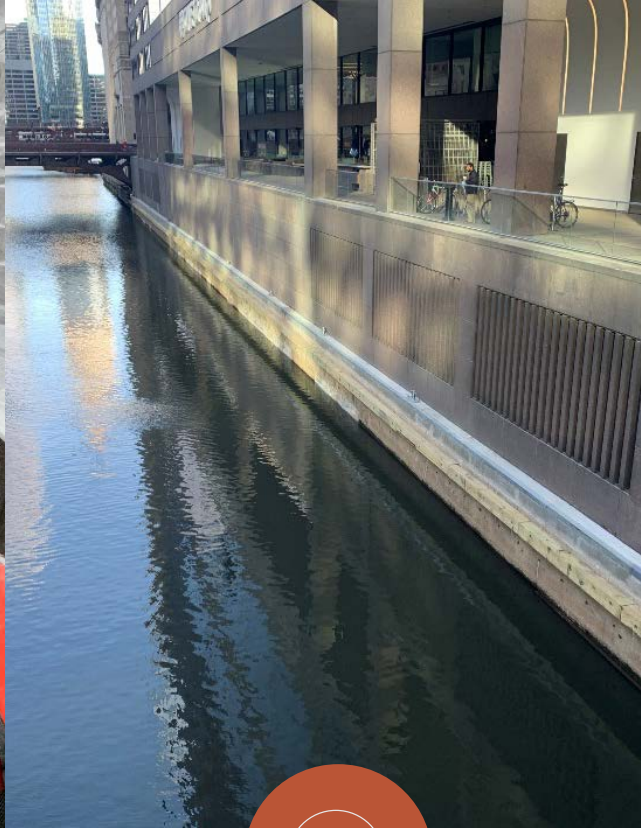
## Summary of the Work:

➤ This work was intended to address deterioration of concrete cap part of the river wall. This repair project consisted of but was not limited to, the following items:

1. Repair of delaminated concrete at the top 2.5 feet of the river wall concrete cap, including replacement of steel angle at the top outside corner at areas of delaminated concrete, and removal and resetting of wood bumpers.
2. Repair of delaminated concrete at the base of the river wall concrete cap, at the water level, approx. 1.5 ft high (approximately one foot of the wall is below water level).
3. Application of breathable water repellent sealer over the concrete wall cap surfaces.
4. Routing and sealing of cracks.
5. Removal and replacement of boat tie-offs
6. Replacement of the wood bumpers





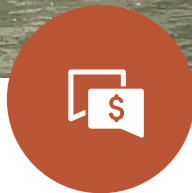


## Bid Docs Released

June 2019 – Design Completed

August 19, 2019 – First Revision

September 2019 – Documents Sent for Bid

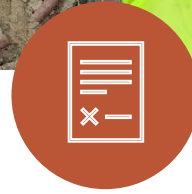


## Bid Form Submitted

October 21, 2019 – Bid Submitted

April 20, 2021 – Bid Form Revision

May 5, 2021 – Contract Signed



## Permit Process

Submitted September 2019 to:  
City of Chicago, Chicago D.O.T.,  
Harbor Permit

Chicago District Army Corps of  
Engineers reviewed  
Permit obtained in October 2020



## Completion of Work

June 3, 2021 – Work Begins

December 12, 2021 – Work Completed

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## SITE PROTECTION

City streets and infrastructure, private business' facades, and the water below our work area need to be protected

## WORKSITE ENCLOSURE

Full enclosure of the work area was the only way to ensure that:  
1. Dust controlled & Full Respirators  
2. Rubble did not fall into the water



## CAREFUL DEMOLITION

There were many factors which made the demolition difficult: noise, dust, access, rubble collection, waterline





# WORK ITEMS

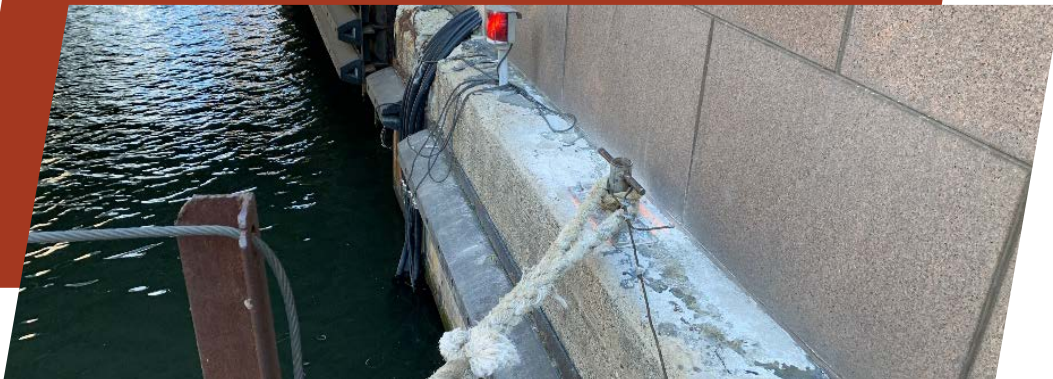
Partial-Depth Concrete Repairs



Partial Depth Below Water Concrete



Replacement of Steel Angle & Wood Bumpers



Crack Sealing & Installation of Sealer







# CONSTRUCTION BEGINS



## BARGE DELIVERED

AFTER LOADING ALL INITIAL EQUIPMENT AND MATERIALS ON A BARGE ON THE SOUTH SIDE OF THE CITY, A TUGBOAT DELIVERED THE LOADED BARGE



## ASSEMBLING ACCESS

AFTER INSTALLING PROTECTION, PIPE SCAFFOLDING WAS SET UP FOR BARGE ACCESS. RAILINGS WERE CONSTRUCTED FOR A SAFE WORK SITE (C.A.Z.)



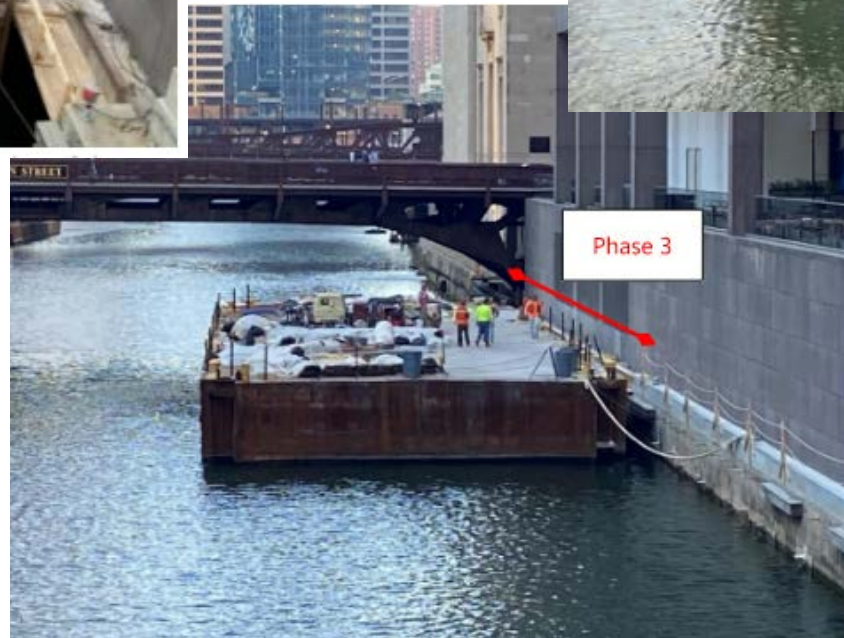
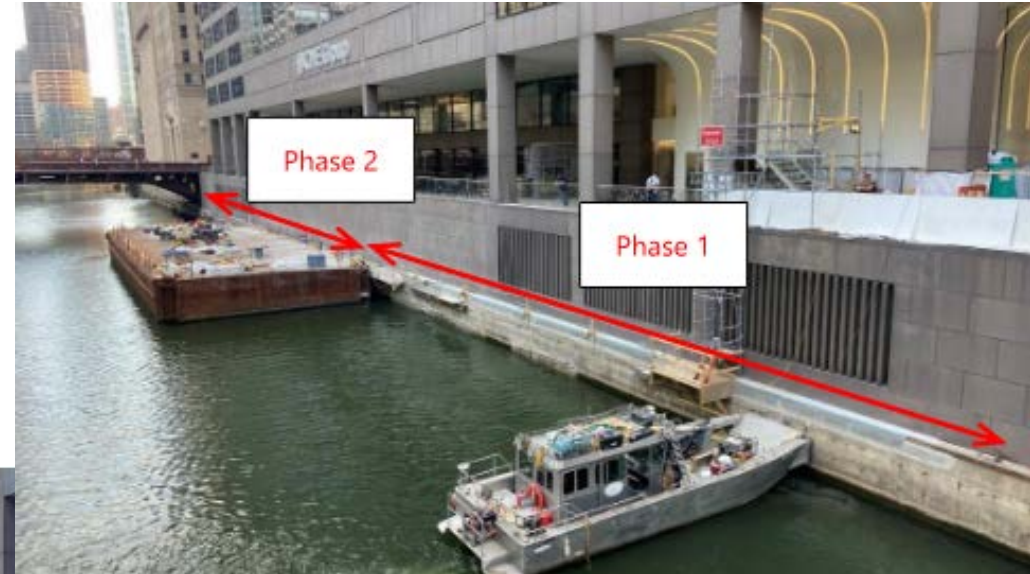
## INITIAL SOUNDING

WJE AND AWI MET TO ESTABLISH THE EXTENT OF THE DELAMINATION & CRACK REPAIR NEEDED FOR THE SOUND RESTORATION OF WALL CAP





# PHASING OF WORK







# DEMO & SURFACE PREP



Overall and close-up views of delaminated concrete at the river wall concrete cap marked for removal



Section of delaminated concrete at the wall cap where boat tie-off is used for the barge



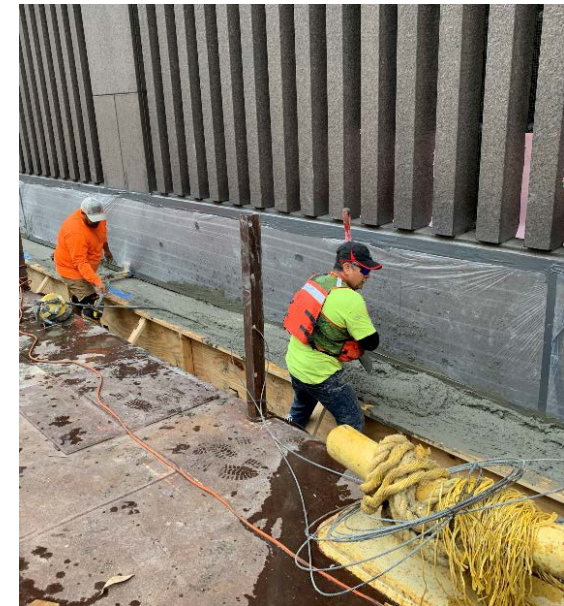
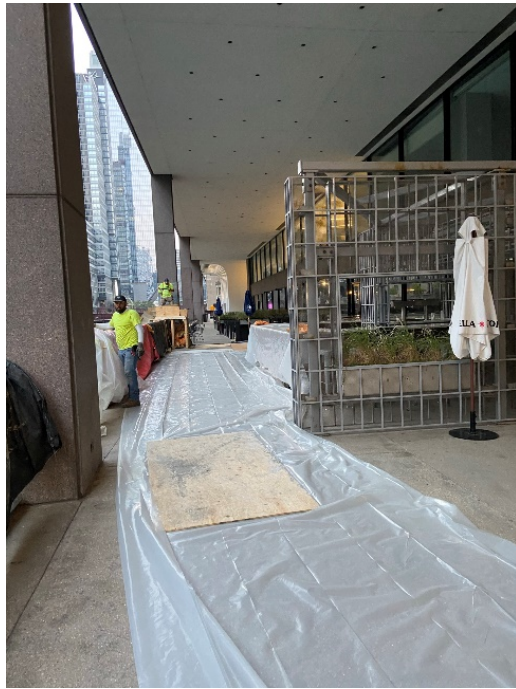
Painting of reinforcing bars with corrosion inhibiting paint







# PROTECTION OF SURFACES & CONCRETE POUR



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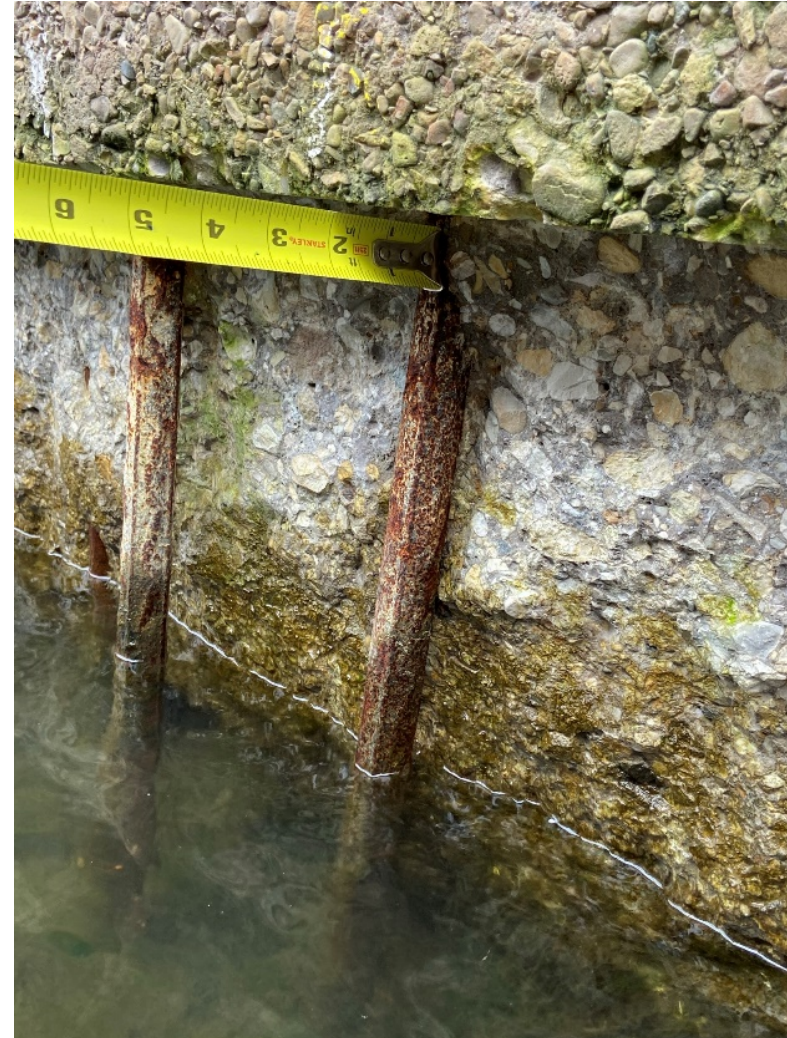
# POURED CONCRETE







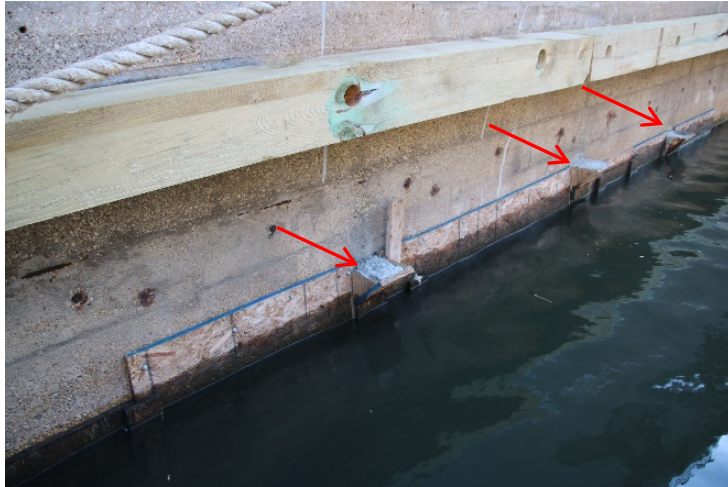
# CONCRETE REMOVAL AT WATER LEVEL







# FAILED REPAIRS AT THE WATER LEVEL



Birds mouth were spaced too far apart

Concrete placement created voids in shape of cones. The sections with voids needed to be reformed and repoured



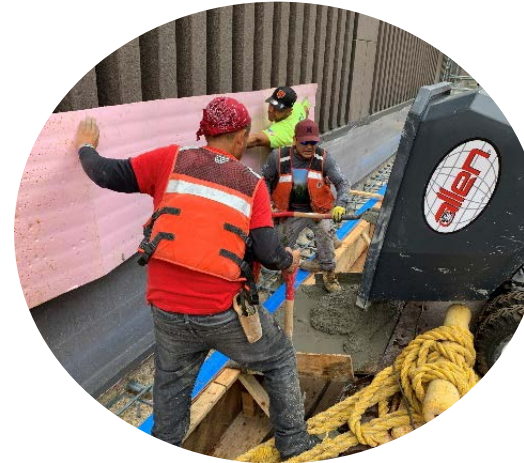


# ➤ CHALLENGES



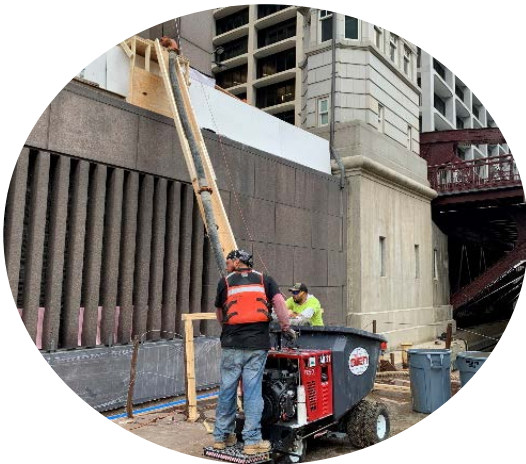
## *THE BARGE*

Everything that was not initially loaded on the barge had to be lowered over the wall and tied off. Barge was moved BY HAND to save \$6k charge from tugboat



## *VOIDS*

Allied had to learn the nuances of placing underwater concrete. There ended up being voids which we had to later return to fill



## *ACCESS FOR POUR*

We needed special CDOT permits to stop our trucks at this crucial intersection. Buggies allowed us to cart the concrete to our chute, dump it down, and place before consolidation



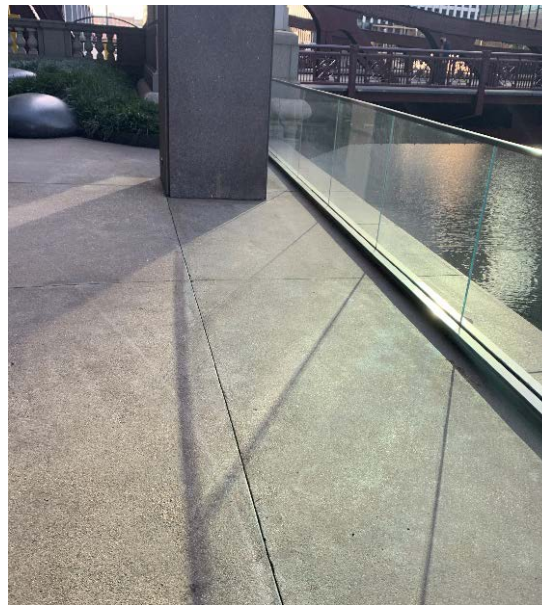
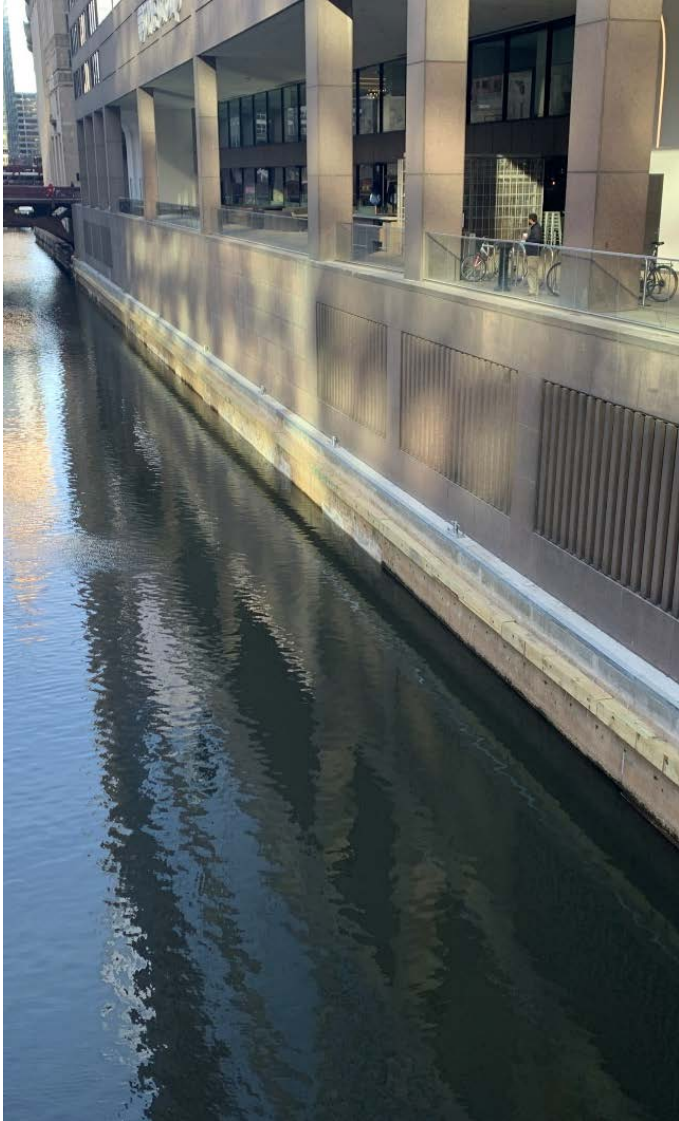
## *WOOD BUMPERS*

Although the work item seems simple, the incredible weight of the wood made the transport and installation of the wood bumpers difficult





# COMPLETION OF WORK



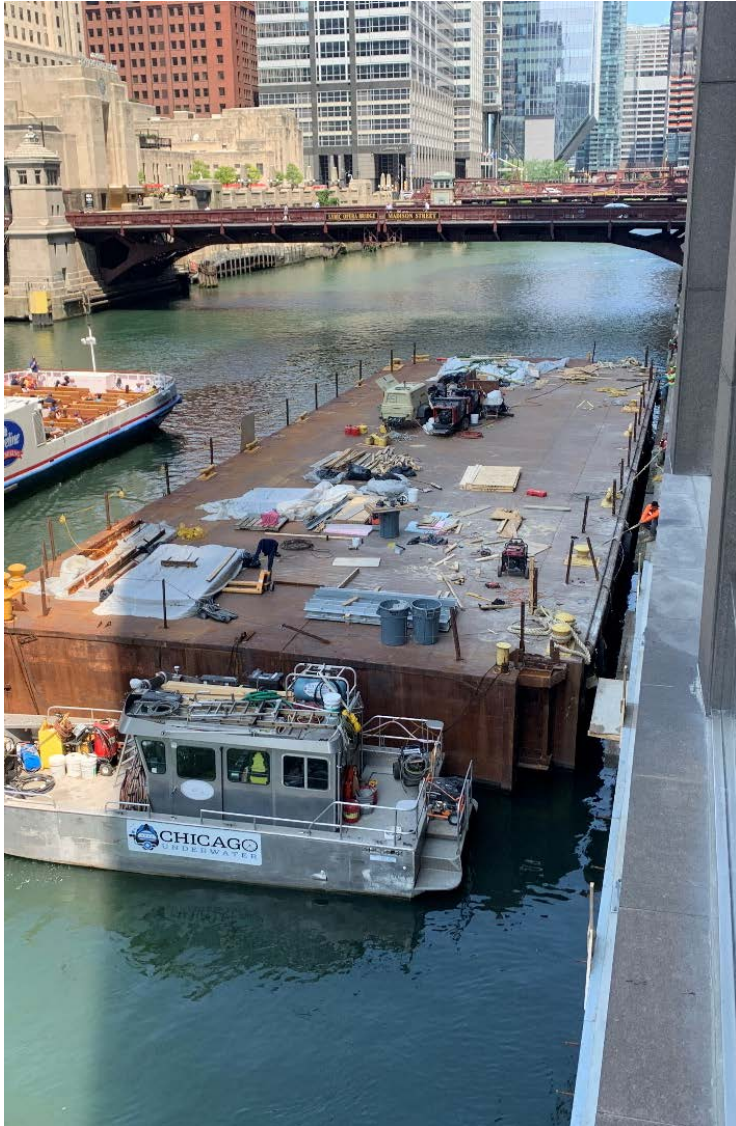
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# LESSONS LEARNED



- Obtaining a permit for this type of projects can take over a year. Reflect that in your bid price.
- Develop a logistics plan to the smallest detail when access to area of work is challenging.
- Space concrete pour pockets “bird mouths” at no more than 24 inches apart.
- Have different expectations for “cleaned” bars at the water level than above it.
- Sounding and inspecting repair openings at the water level from the boat platform is challenging and time consuming.
- Number of divers that do concrete repairs is very limited.



# ➤ Questions?

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