815 Pine

Seattle's Tallest Residential Tower

ckc STRUCTURAL ENGINEERS

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MAY 6th, 2014

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Stressing the Stronger Concrete Solution

815 PINE

SEATTLE, WASHINGTON

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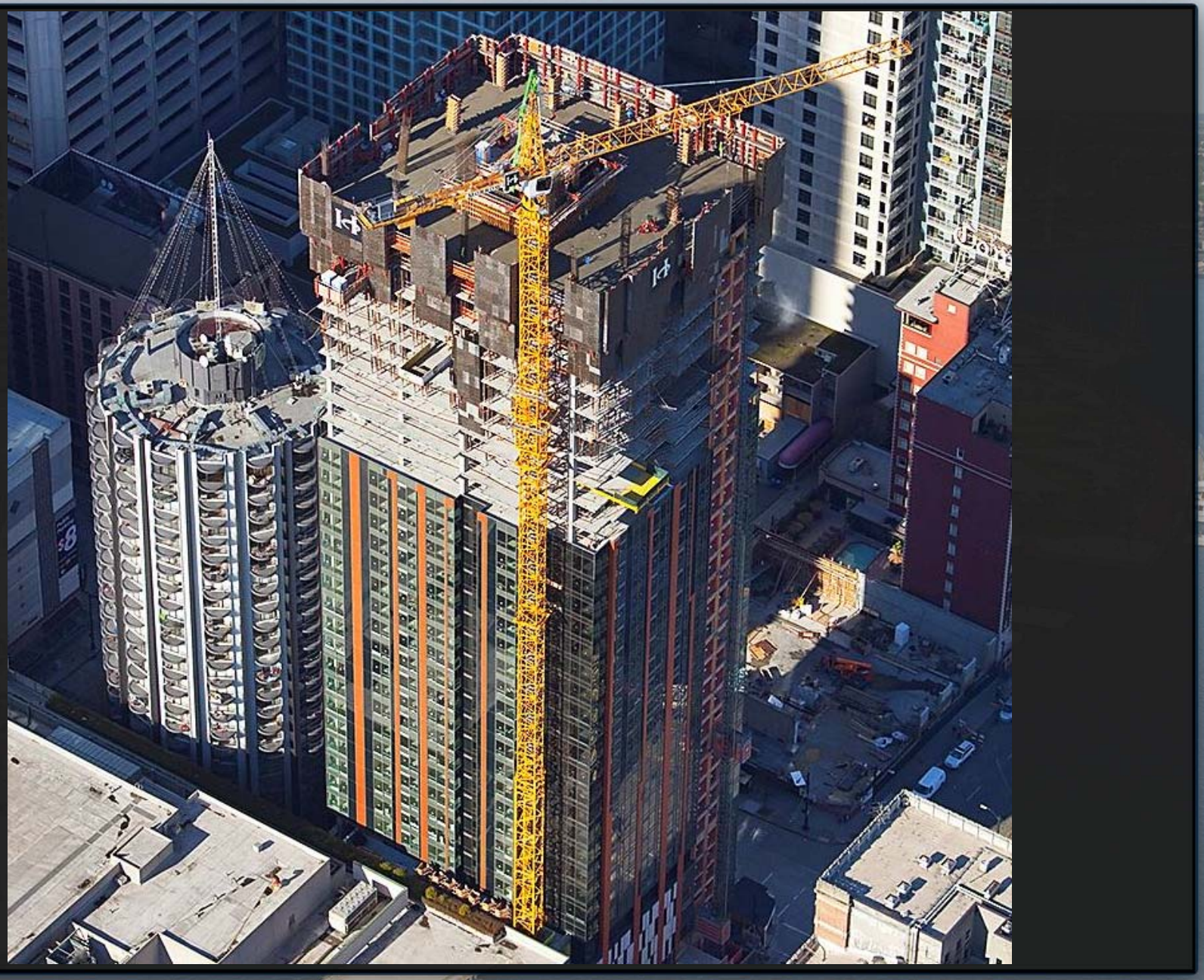
815 Pine

- 42-story residential tower with 386 units
- Four levels of parking above grade, five levels below
- 440 foot structure
- 490,000 square feet
- Expected to open in November 2014
- Targeting LEED Silver certification



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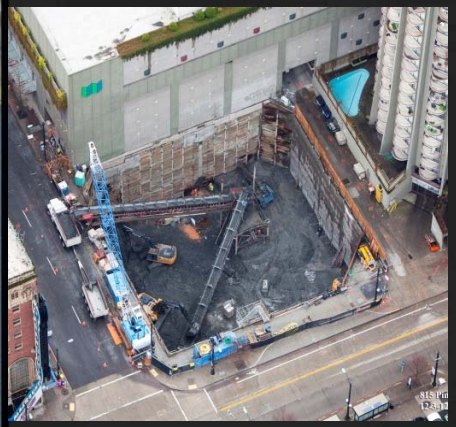

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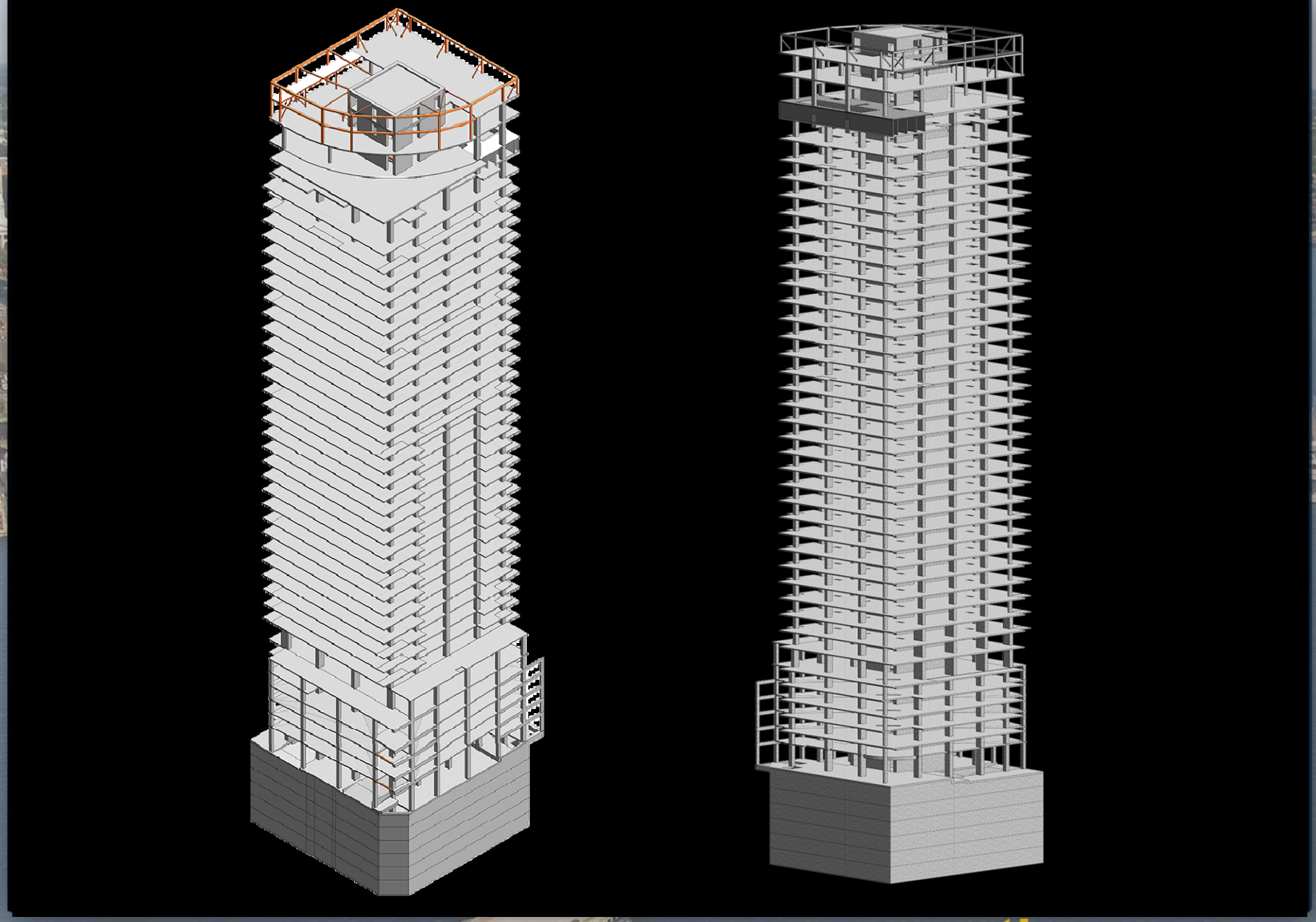
- 7 ½" post-tensioned flat plates
- Highly efficient core-wall seismic system
- Column sizes are constant from ground to top
- Formwork productivity was maximized
- Poured 51 floors in 53 weeks



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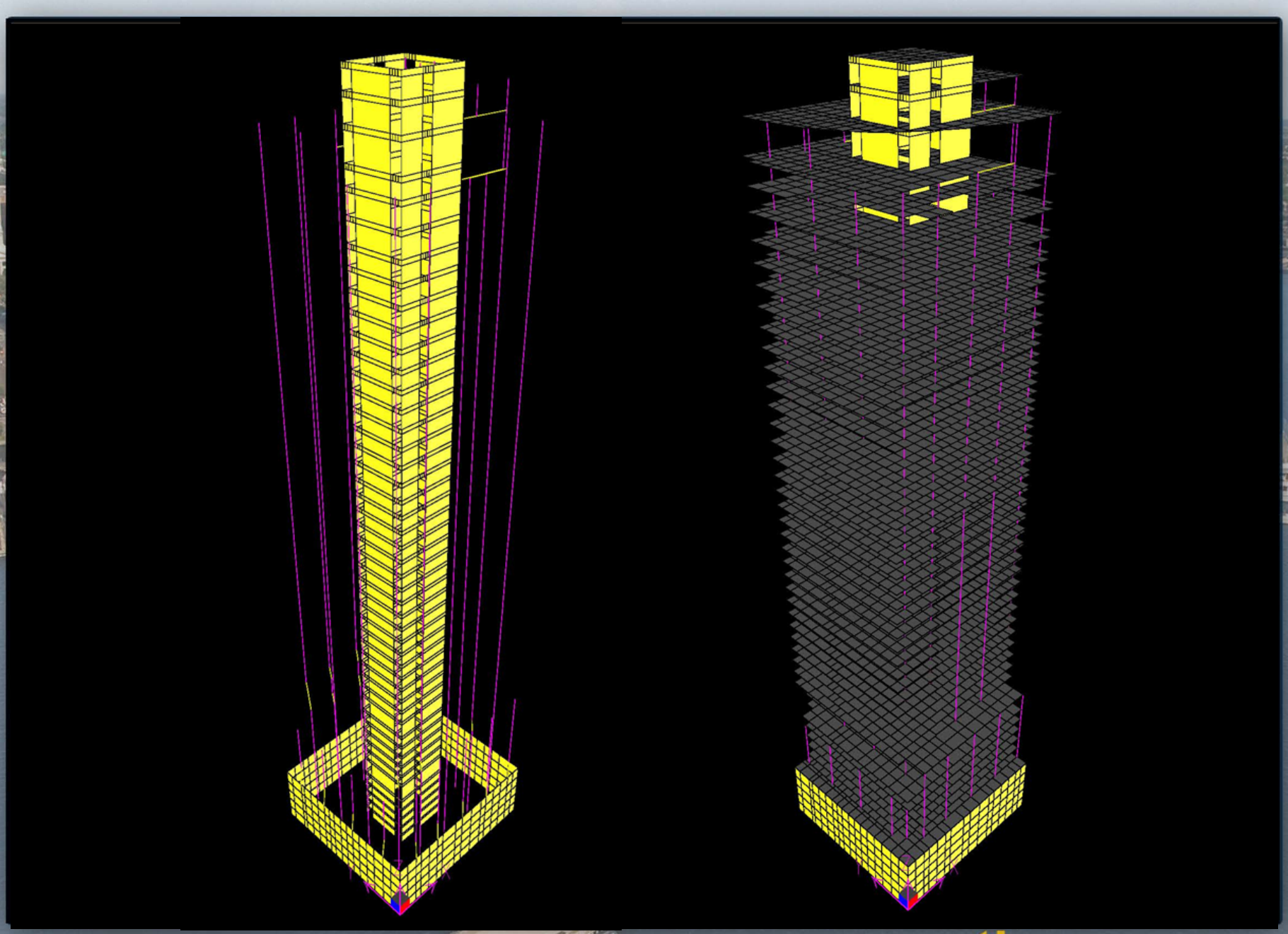
Buildings Above 240' in High Seismic Regions

- Seismic restrictions triggered at 240'
- Ductile frames or dual systems (ductile frames/shear walls) are mandated by code above 240'
- Alternatively, shear walls can be used if ductile behavior is proven through performance based analysis – peer review required



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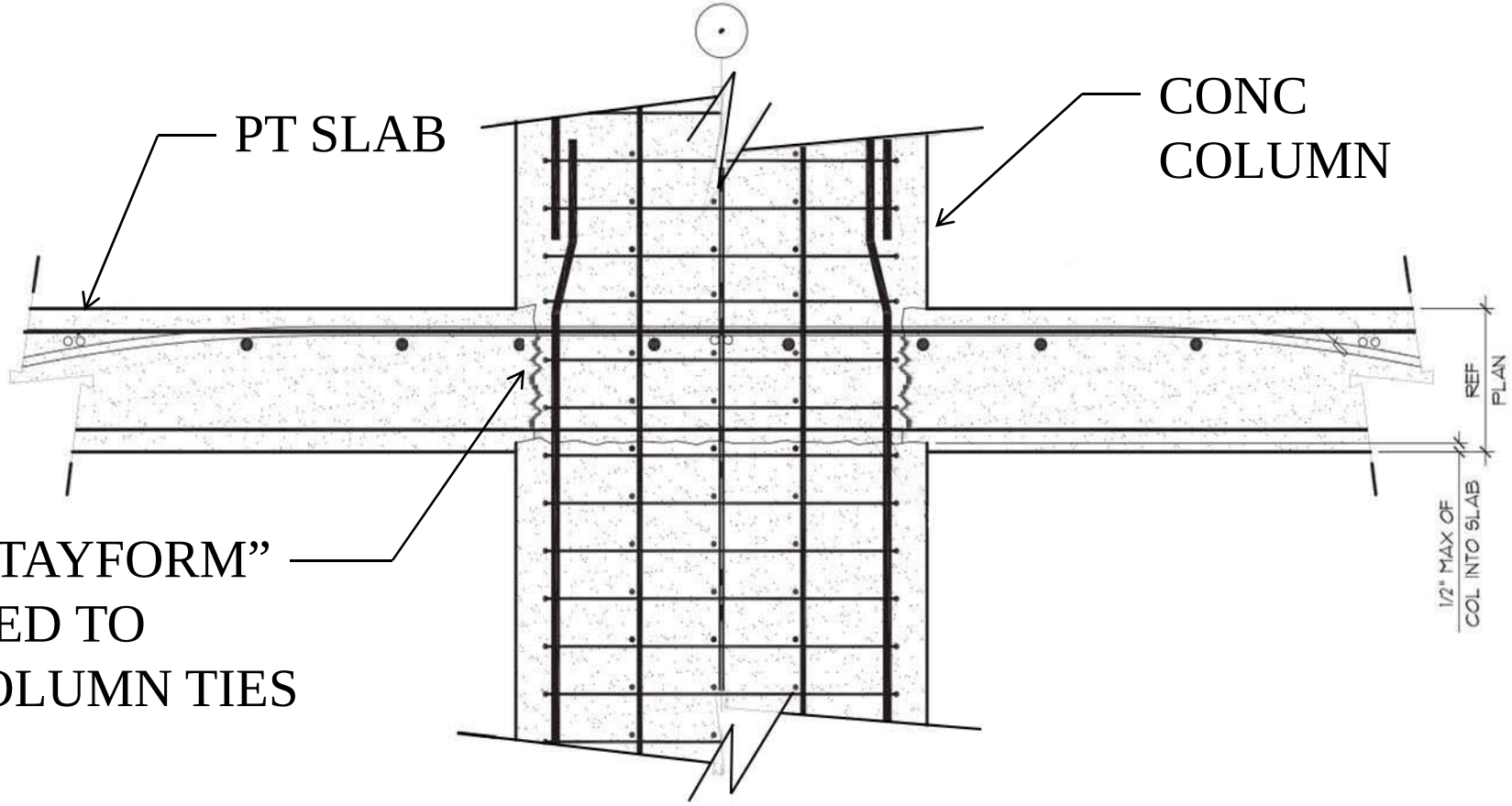
15,000 PSI Column Concrete

- Believed to be the strongest concrete ever specified in Seattle.
- Allows building's shear walls and columns to be smaller than typical towers this size
- Smaller shear walls and columns mean larger floor plates and more real estate inside the building

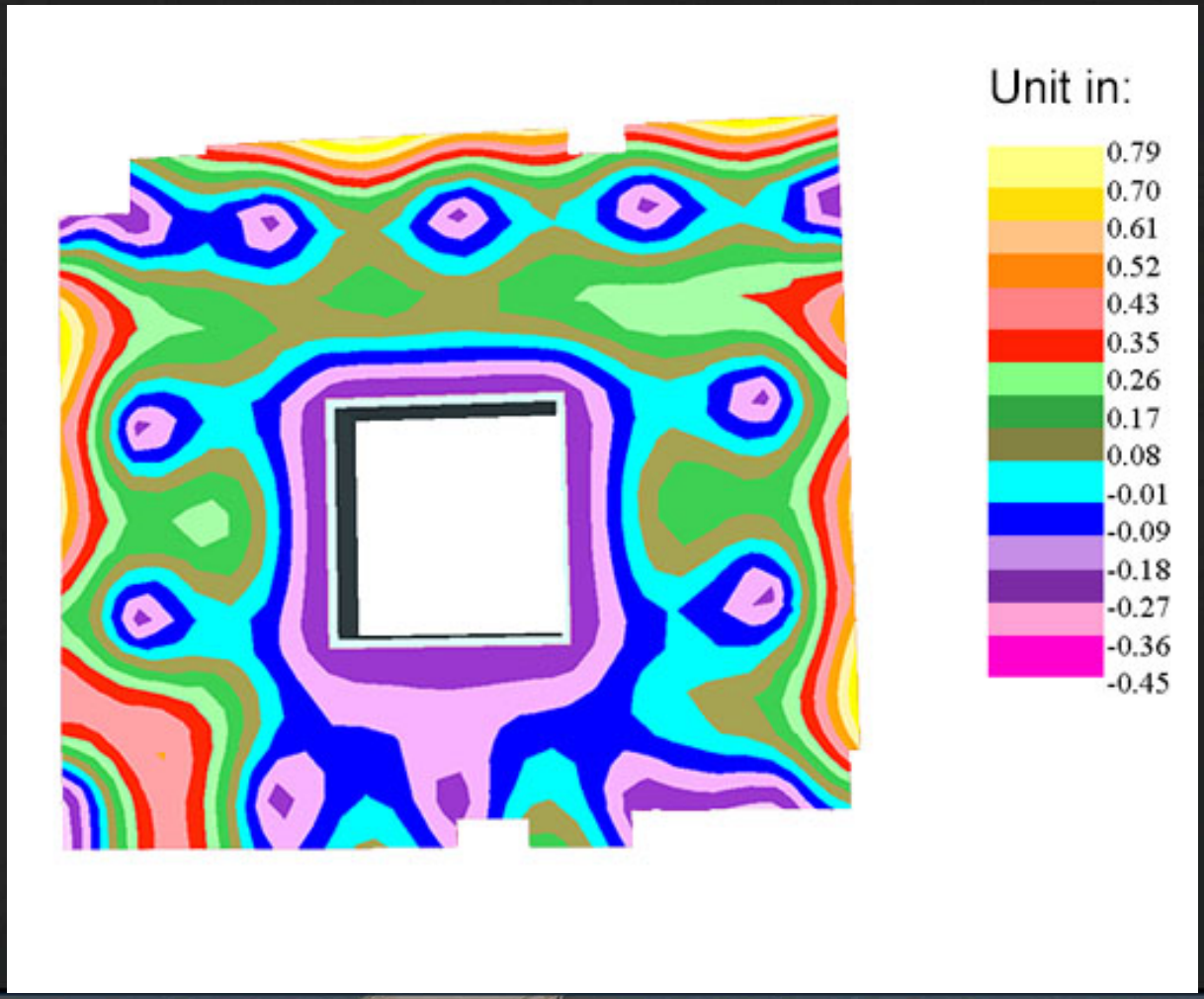
Column Concrete Placement at Slab

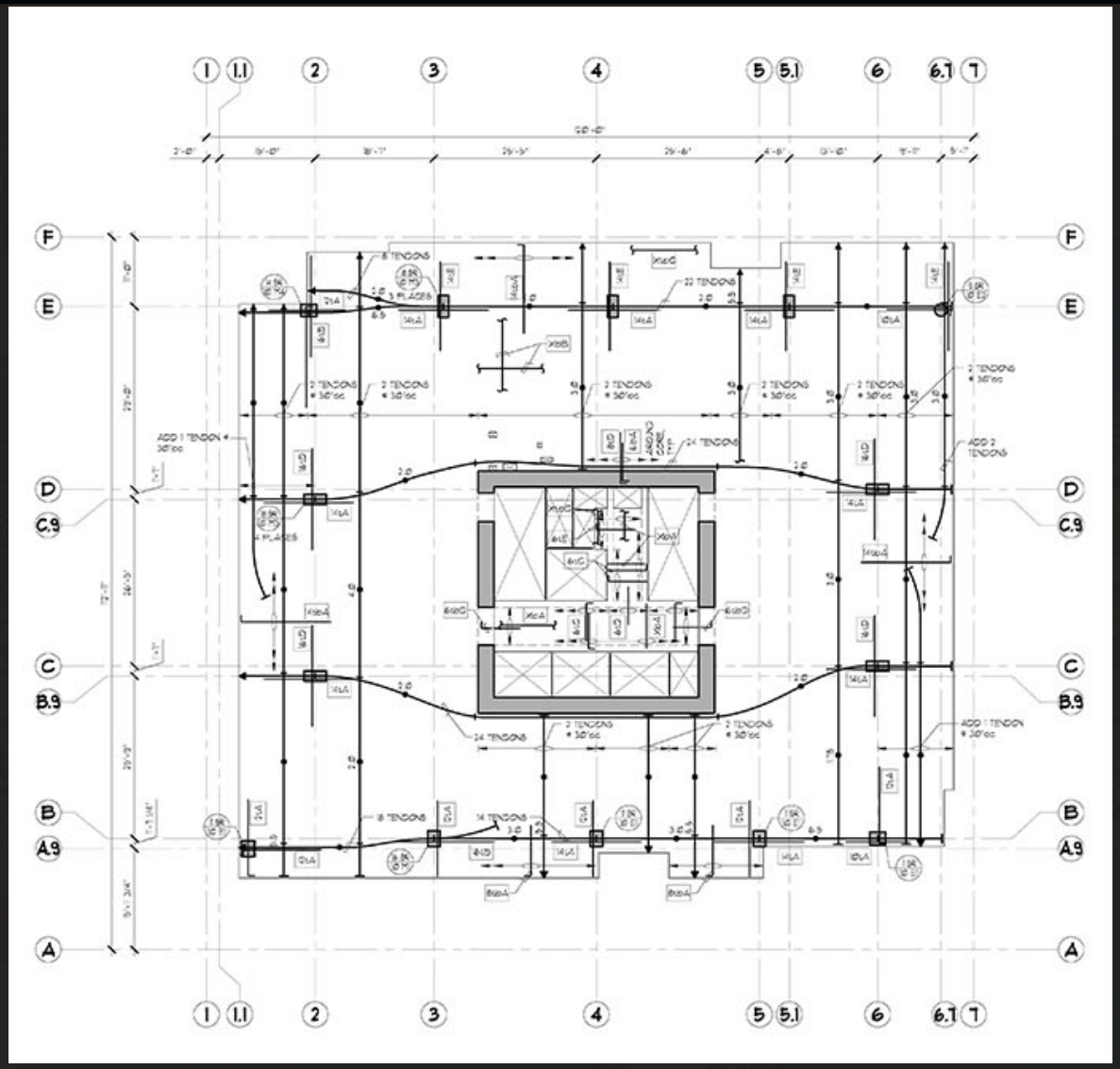


Post-Tensioning Advantages

- Thinner slabs & Shallower beams
- Longer spans & Fewer columns
- Reduced floor to floor height
- Better control of deflection & cracking
- Smaller columns & foundations
- Reduced seismic loads

Tower Slabs - Service Deflection





Tower Plan

PT Shrinkage

PT SHRINKAGE

ASSUME 100' LONG SLAB AS FOLLOWS:

POST-TENSIONING	175 PSI
CONCRETE STRENGTH	4000 PSI
TEMPERATURE CHANGE	30° F
DRYING SHRINKAGE @ 28 DAYS . . .	.042%

ELASTIC SHORTENING

$$\frac{PL}{AE} = \frac{175\,(100)\,(12)}{3{,}605{,}000} = .06"$$

CREEP

2 (.06) = .12"

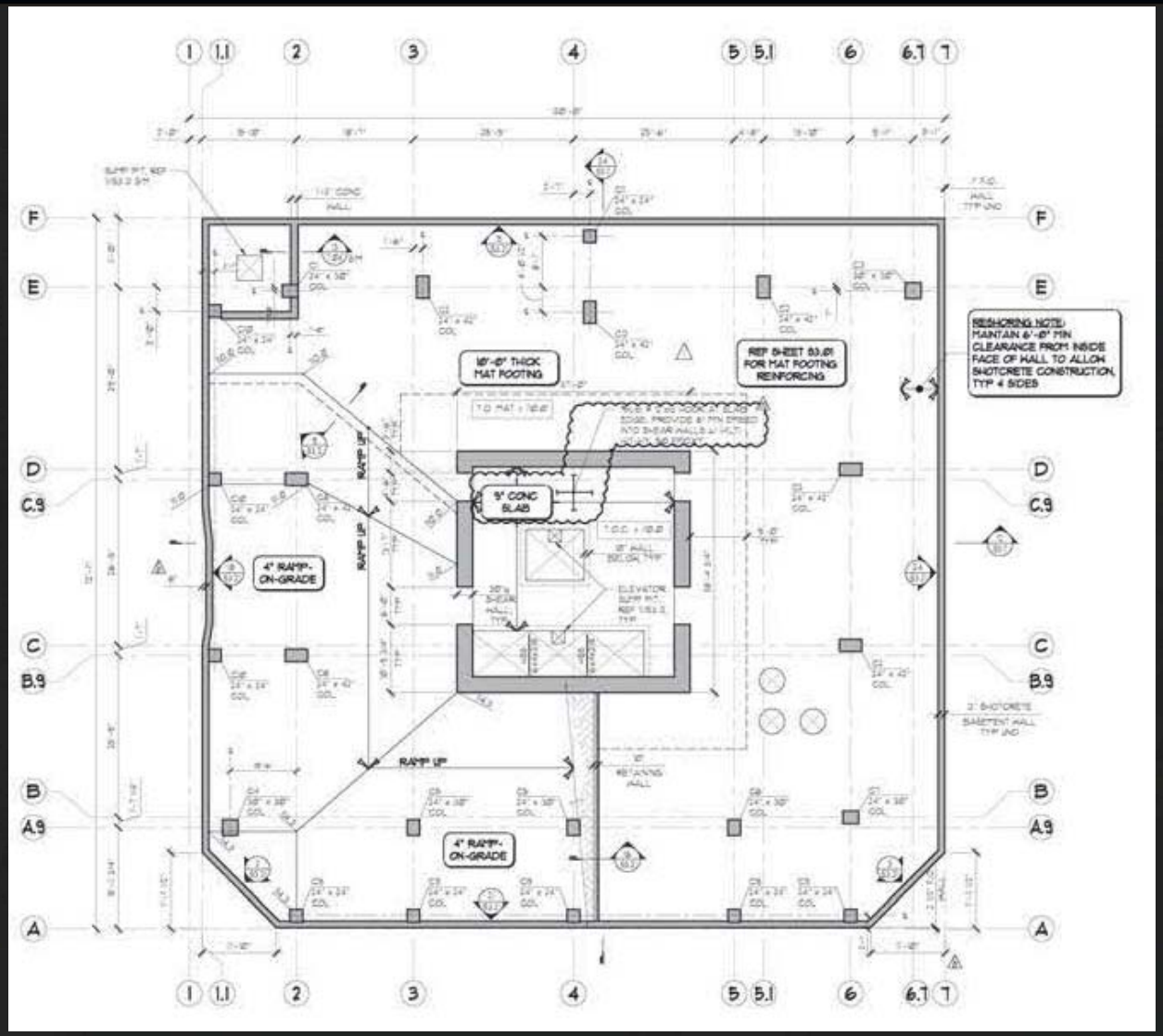
THERMAL

(.0000055) (30) (100) (12) = .20"

DRYING SHRINKAGE LONG TERM

(.00084) (100) (12) = 1.01"

TOTAL 1.39"



FOUNDATION PLAN

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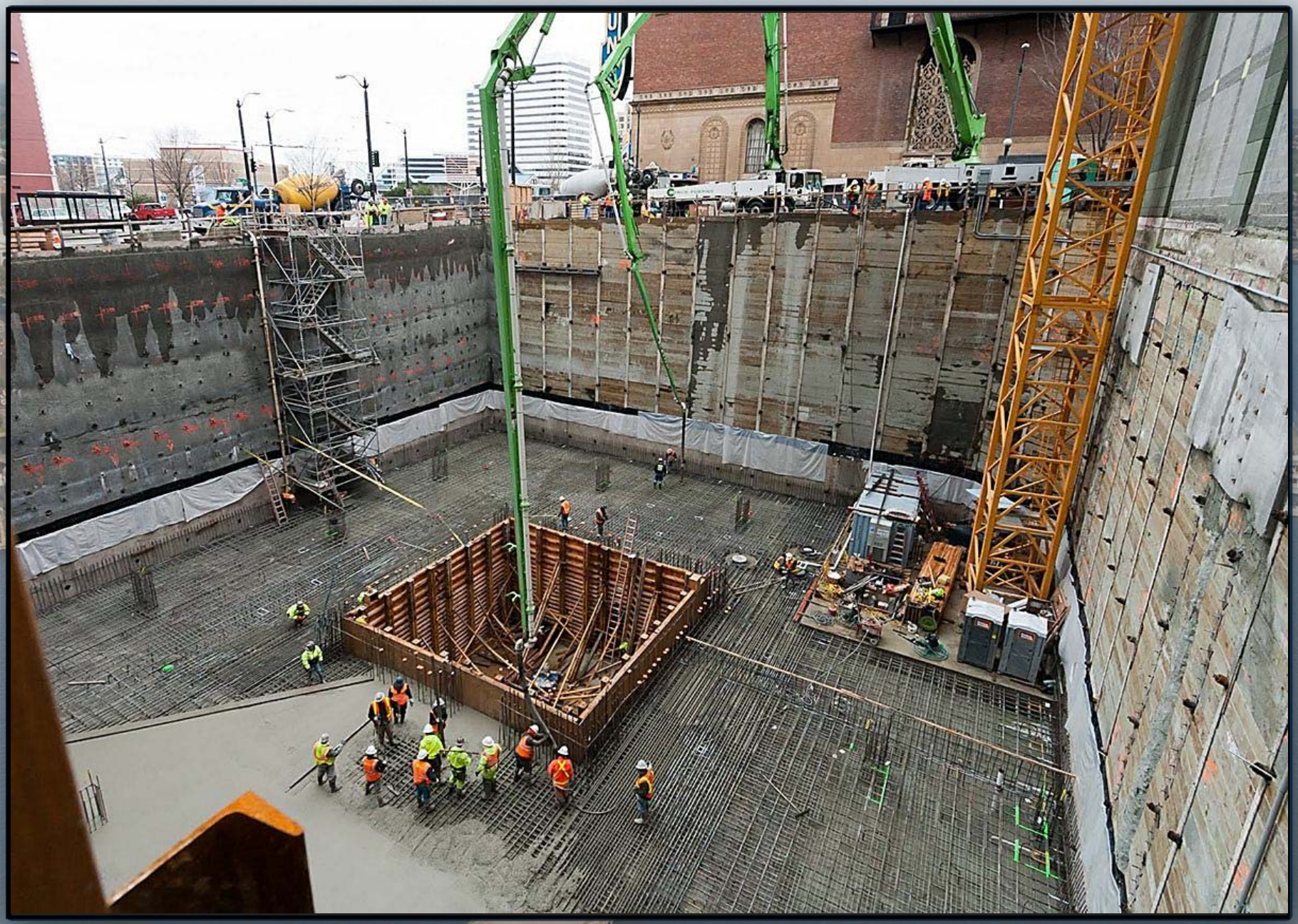

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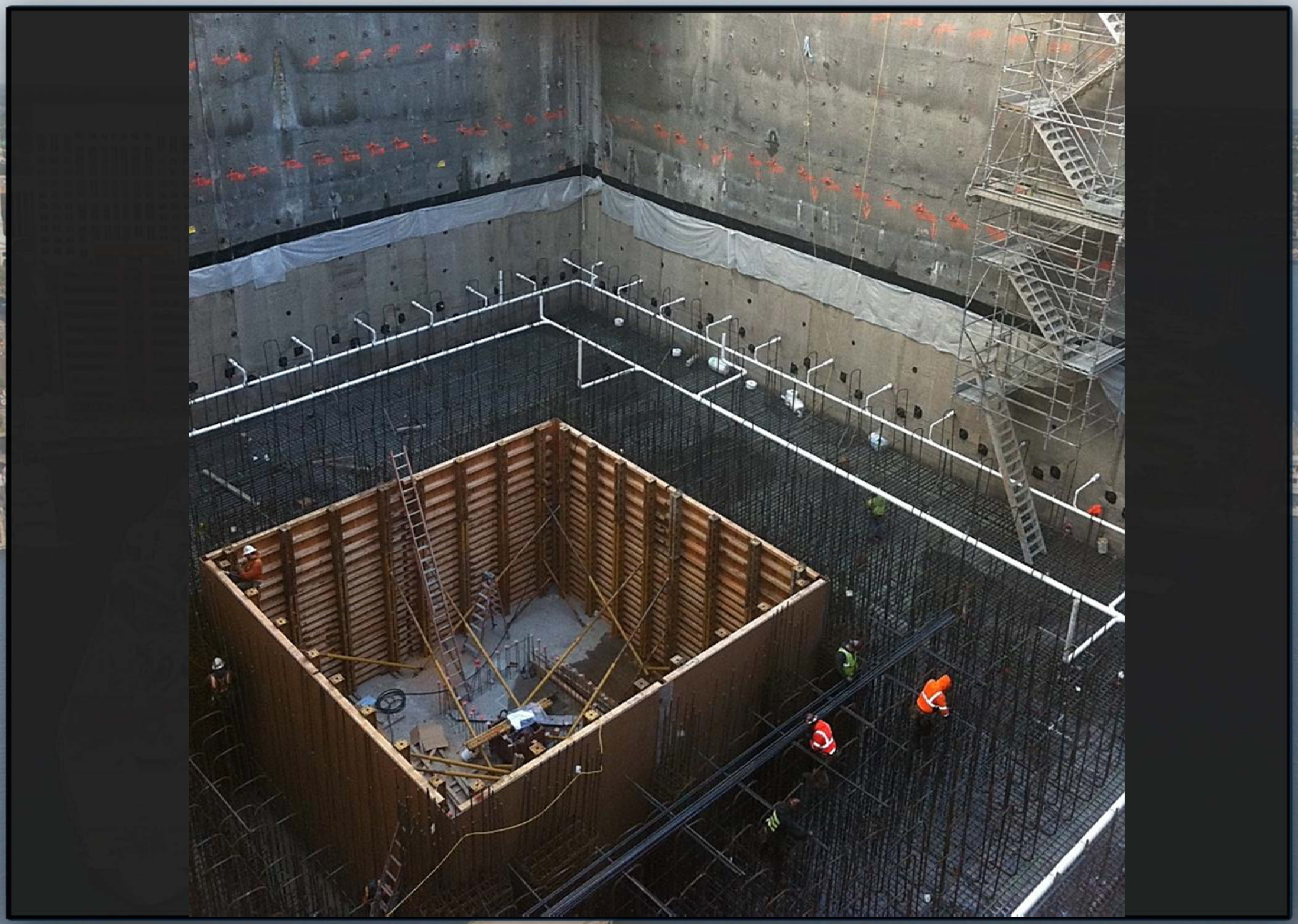

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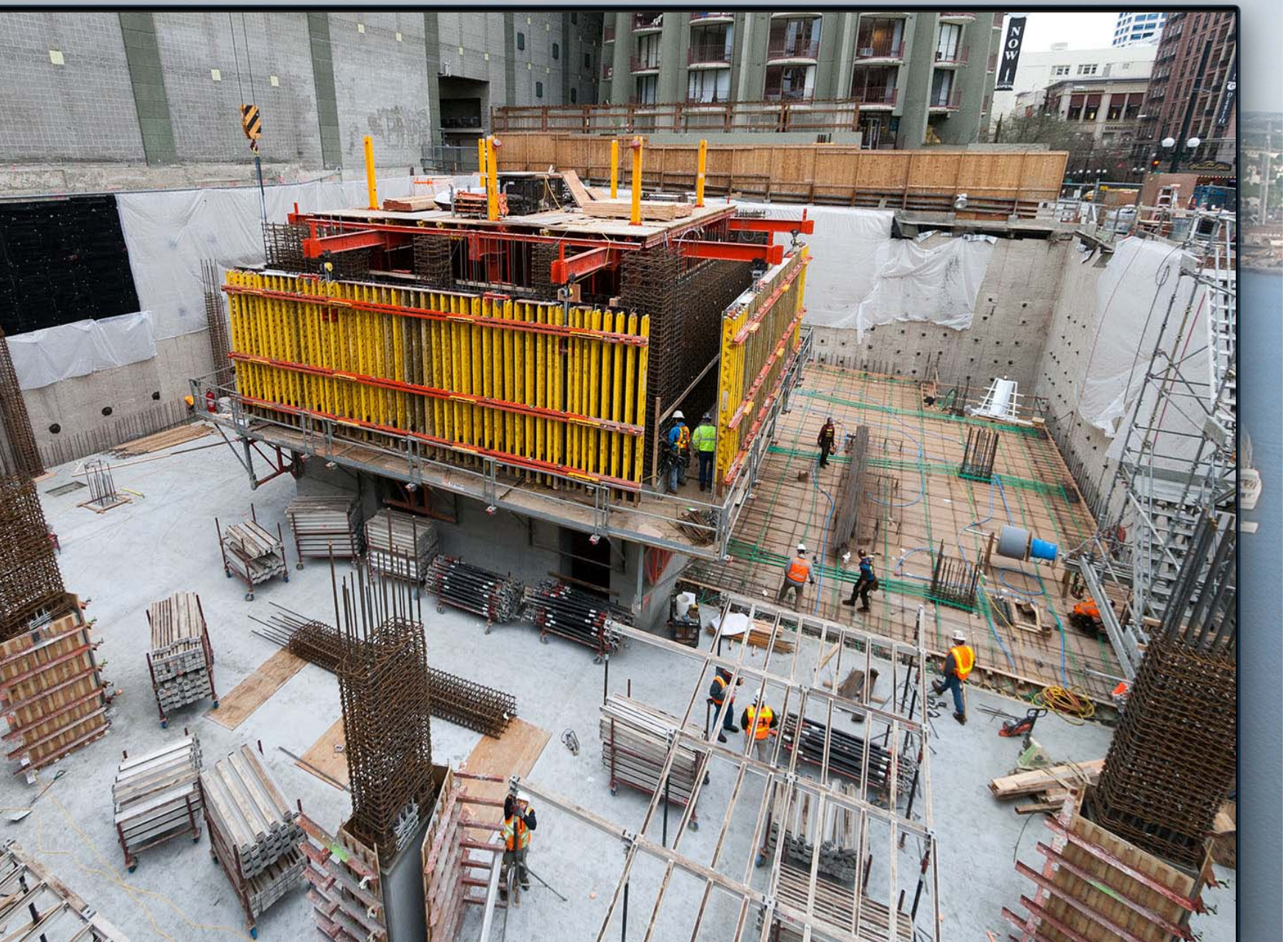
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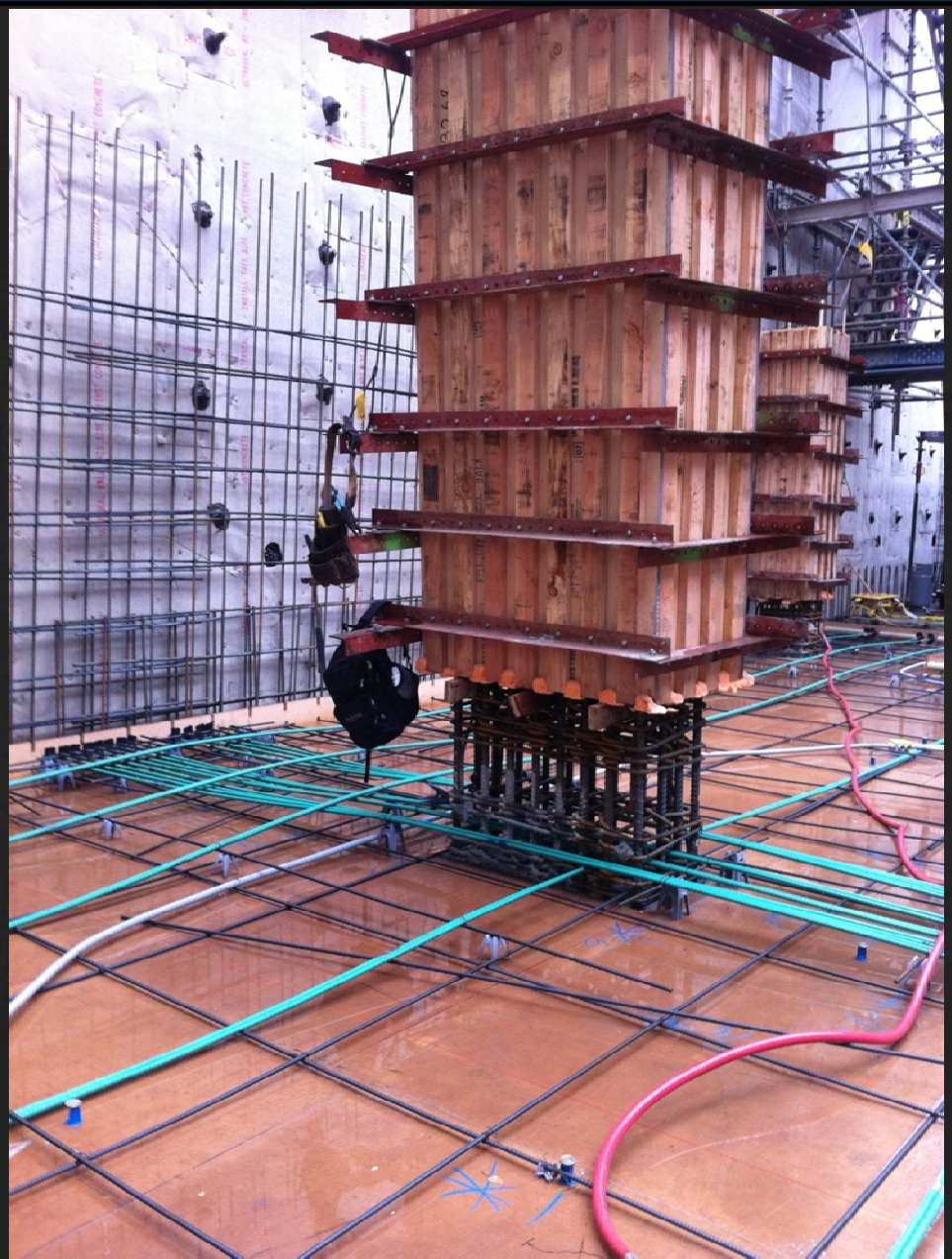


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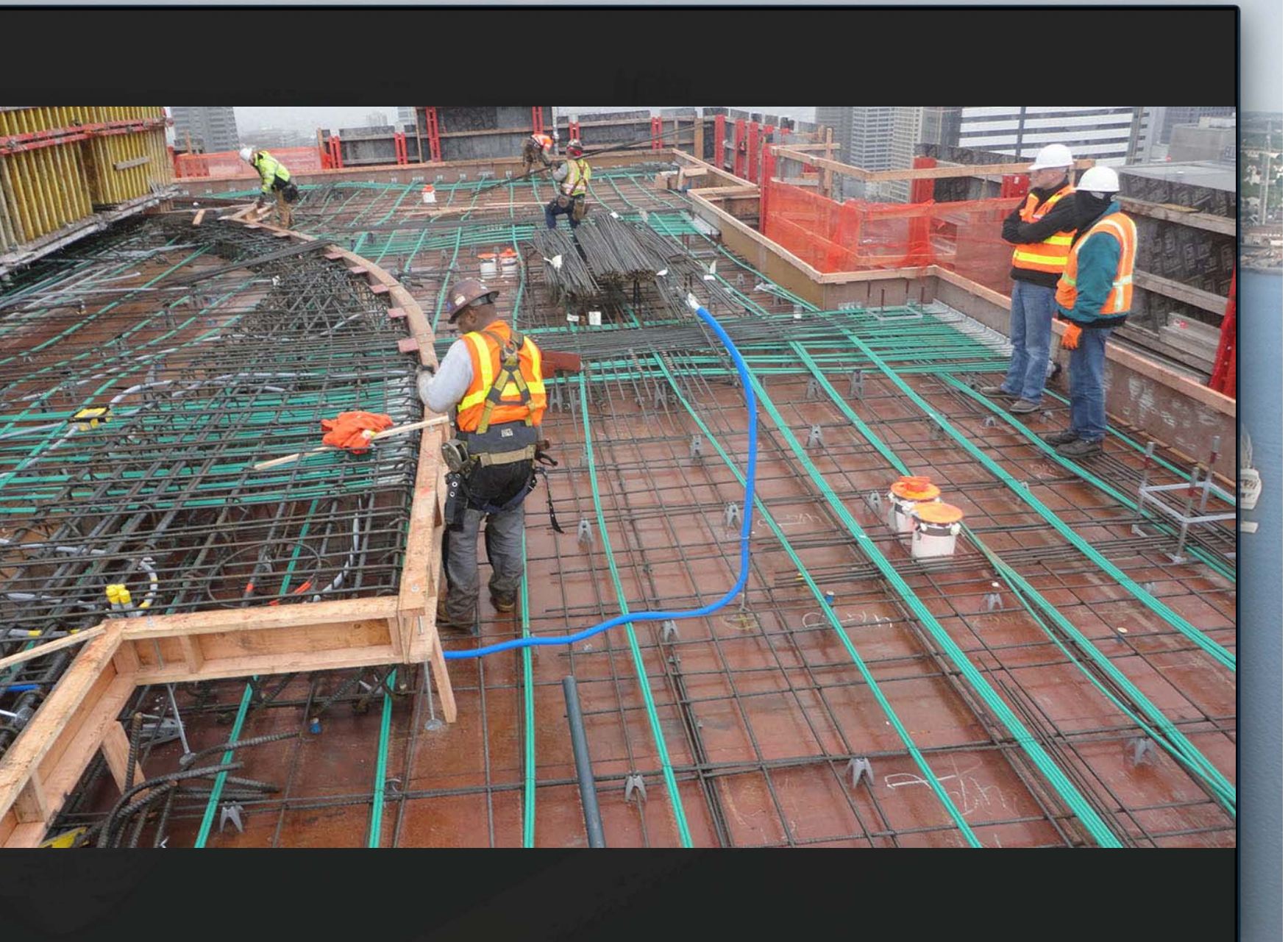

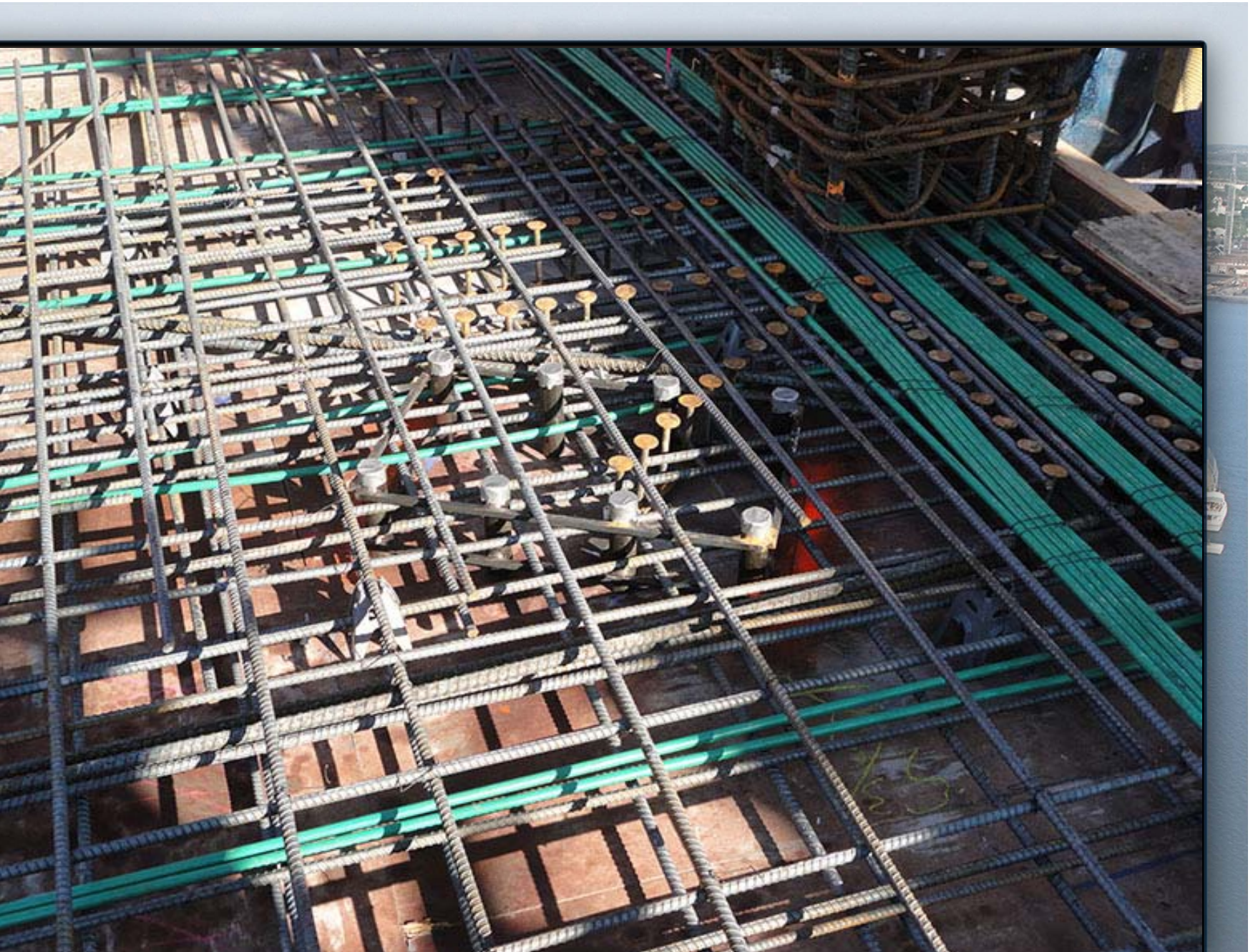


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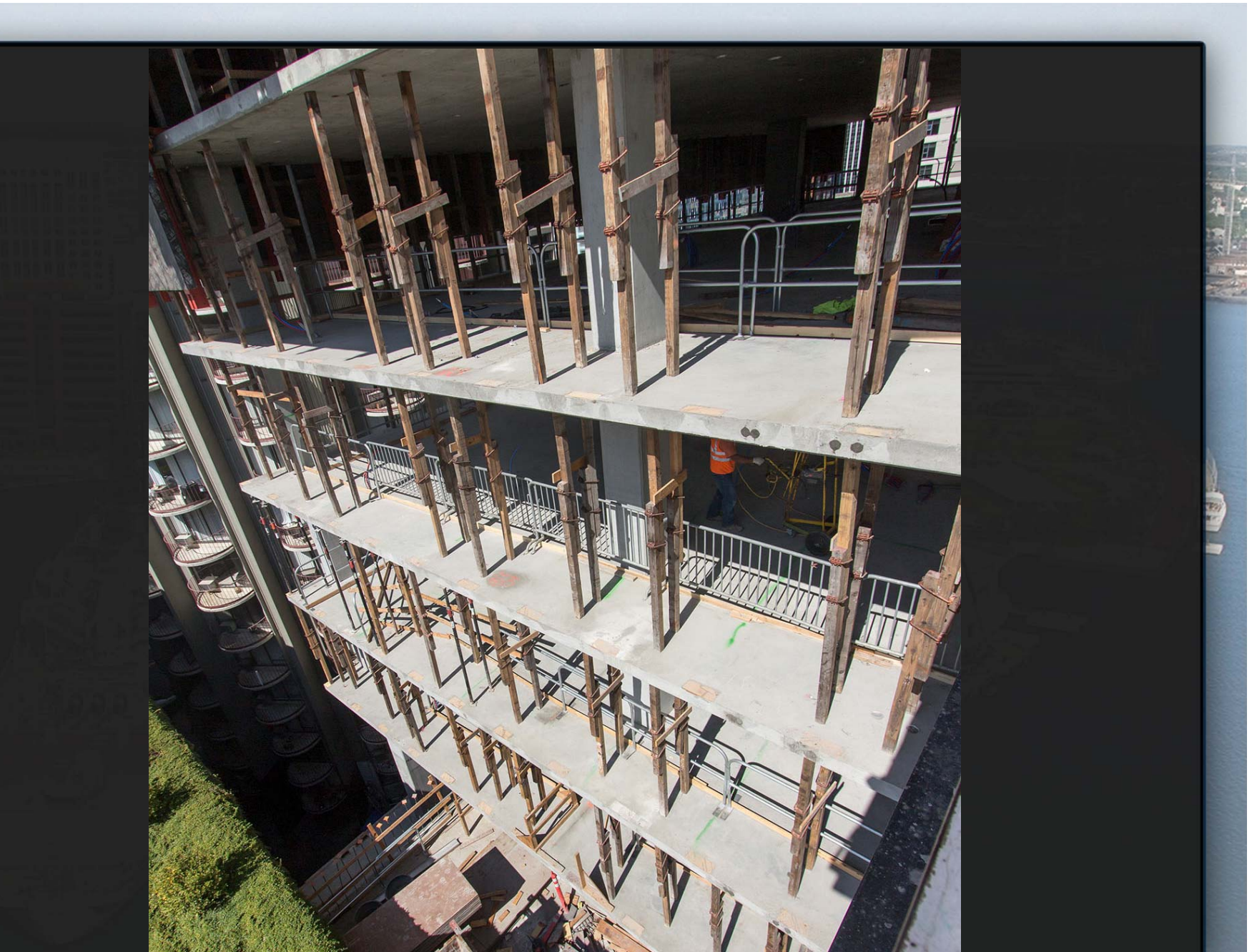

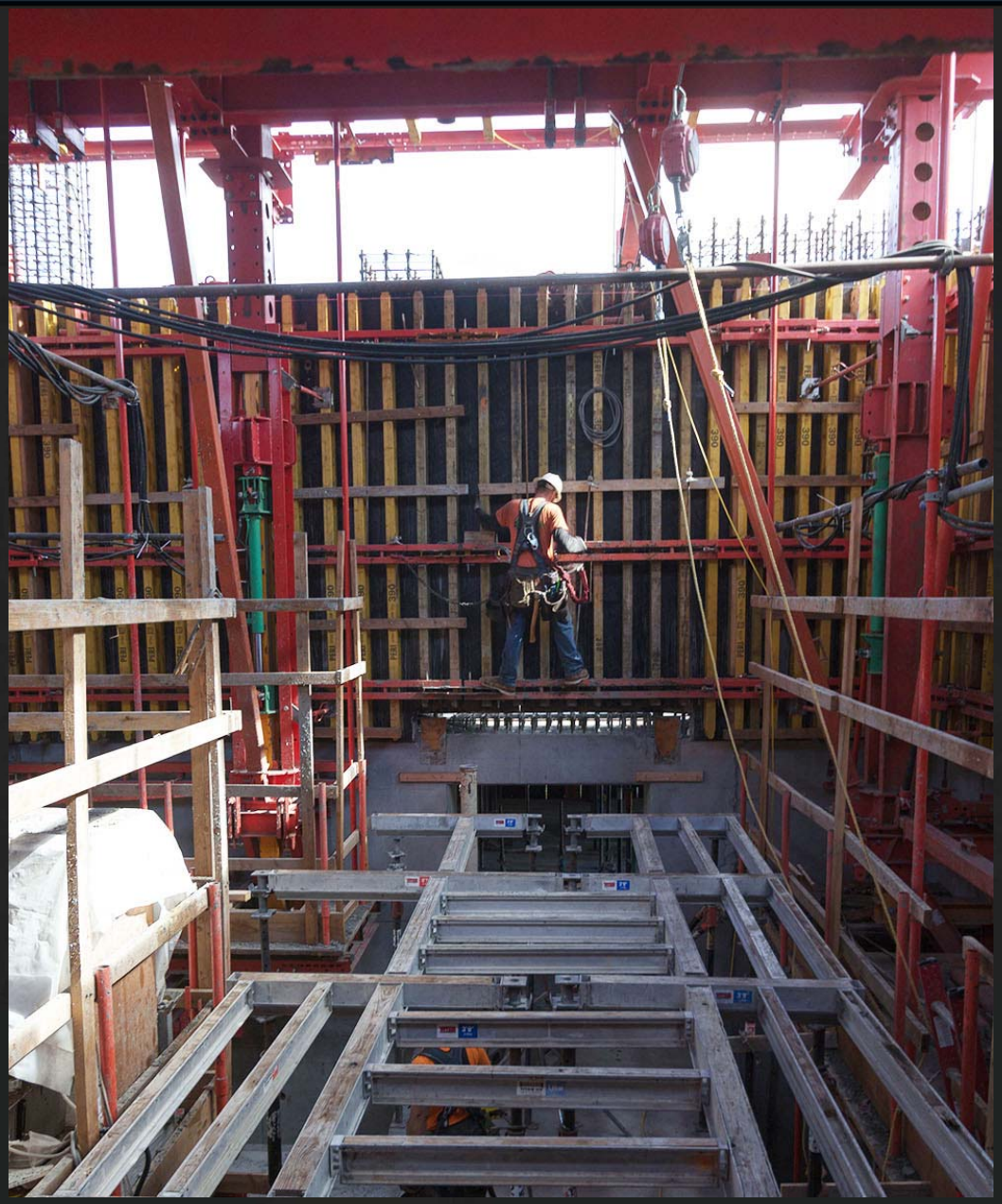

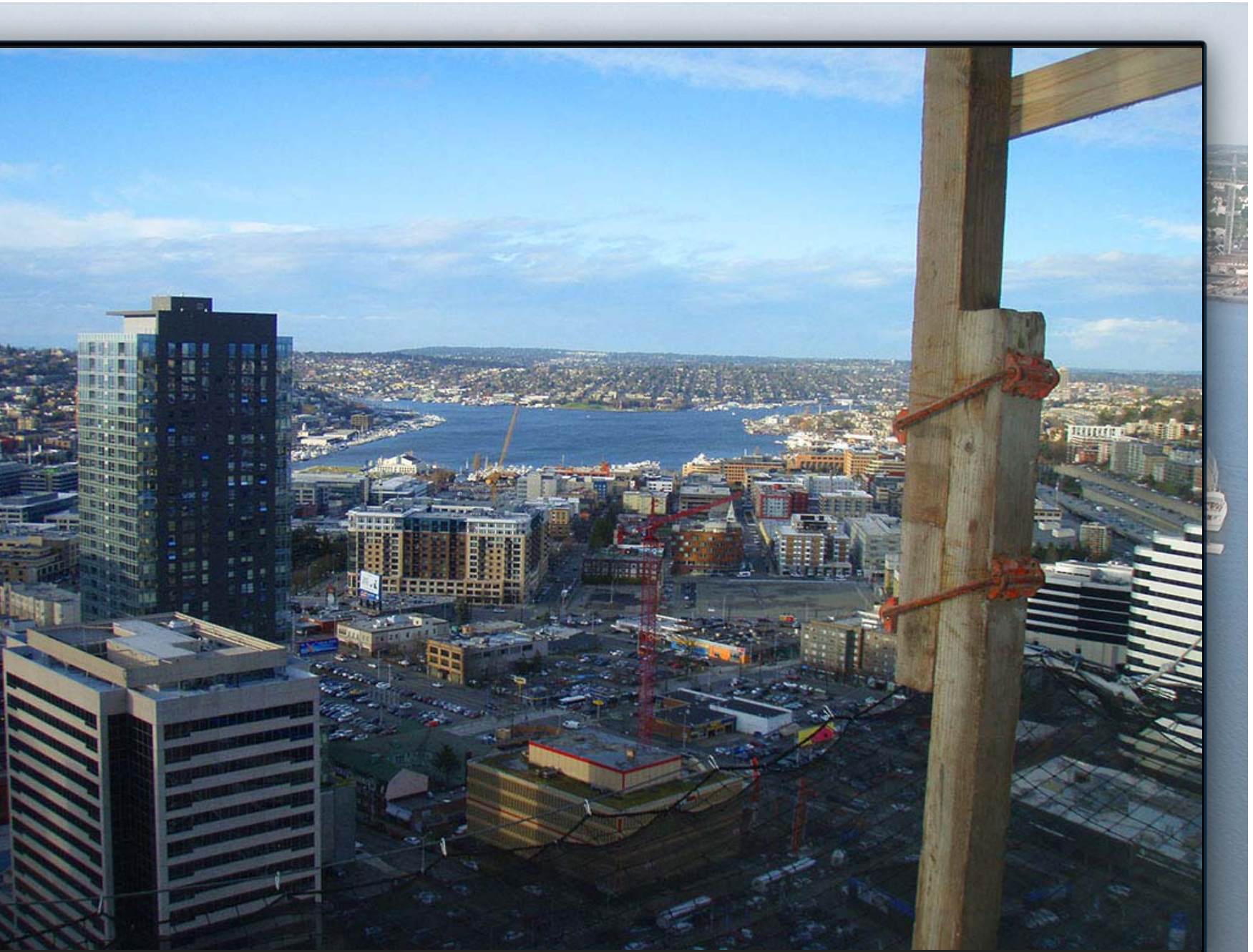

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