

EXTENDING THE USEFUL LIFE OF PARKING STRUCTURES

Transportation Commission meeting.
February 27, 2019

Parking Garage useful life is influenced by:

- Design and Construction
- Use/exposure to weather and salt
- Maintenance and Repair

Age of Parking Structures

- Government East: 1958
- State Street Capitol: 1963, major addition 1995
- State Street Campus Lake: 1964
- Capitol Square North: 1971
- State Street Campus Frances: 1982
- Overture Center: 1982
- South Livingston Street: 2018
- Judge Doyle Garage: 2019

“Rule of thumb” for life of City garages is 60 years for older garages and 70 years for newer garages

Primary Causes of Deterioration

- Sun exposure limits life of joint sealers, expansion joints, and traffic coatings.
- Chlorides (salts) from snow laden vehicles penetrate the concrete.
- Once the chlorides reach steel reinforcing in the concrete, they undermine the ferric oxide layer on the steel surface, promoting corrosion of the steel.
- As corrosion occurs, the products of corrosion expand, causing fractures in the concrete.
- The fractures provide additional routes for water and chlorides to penetrate the concrete, resulting in an accelerated rate of deterioration and freeze-thaw damage.
- Salts can penetrate the sheathing or ends of post tensioned tendons resulting in corrosion and eventual failure of the tendons.

Maintenance procedures to Extend Garage Life

- Wash down garage decks twice per year
- Maintain membrane where present
- Apply penetrating sealer on a routine basis
- Replace caulking that has failed
- Replace expansion joints as needed
- Annual inspection and repairs as needed

Expansion Joint Replacement



09/28/2011

Expansion Joint Detail



Extending the useful life of Parking Structures

Tendon and Slab Repair



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Slab Repair

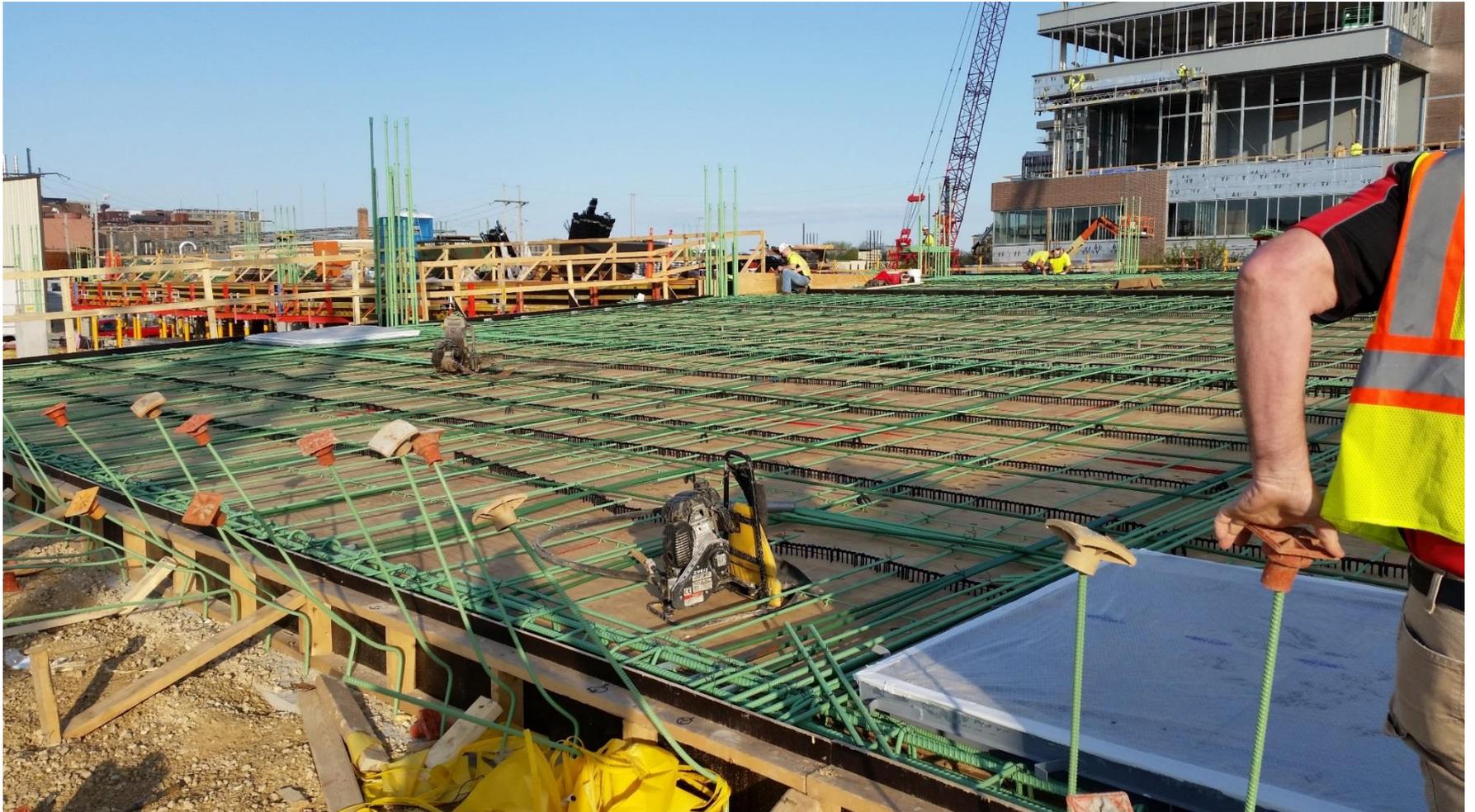


06/26/2009

Construction techniques to Extend Garage Life

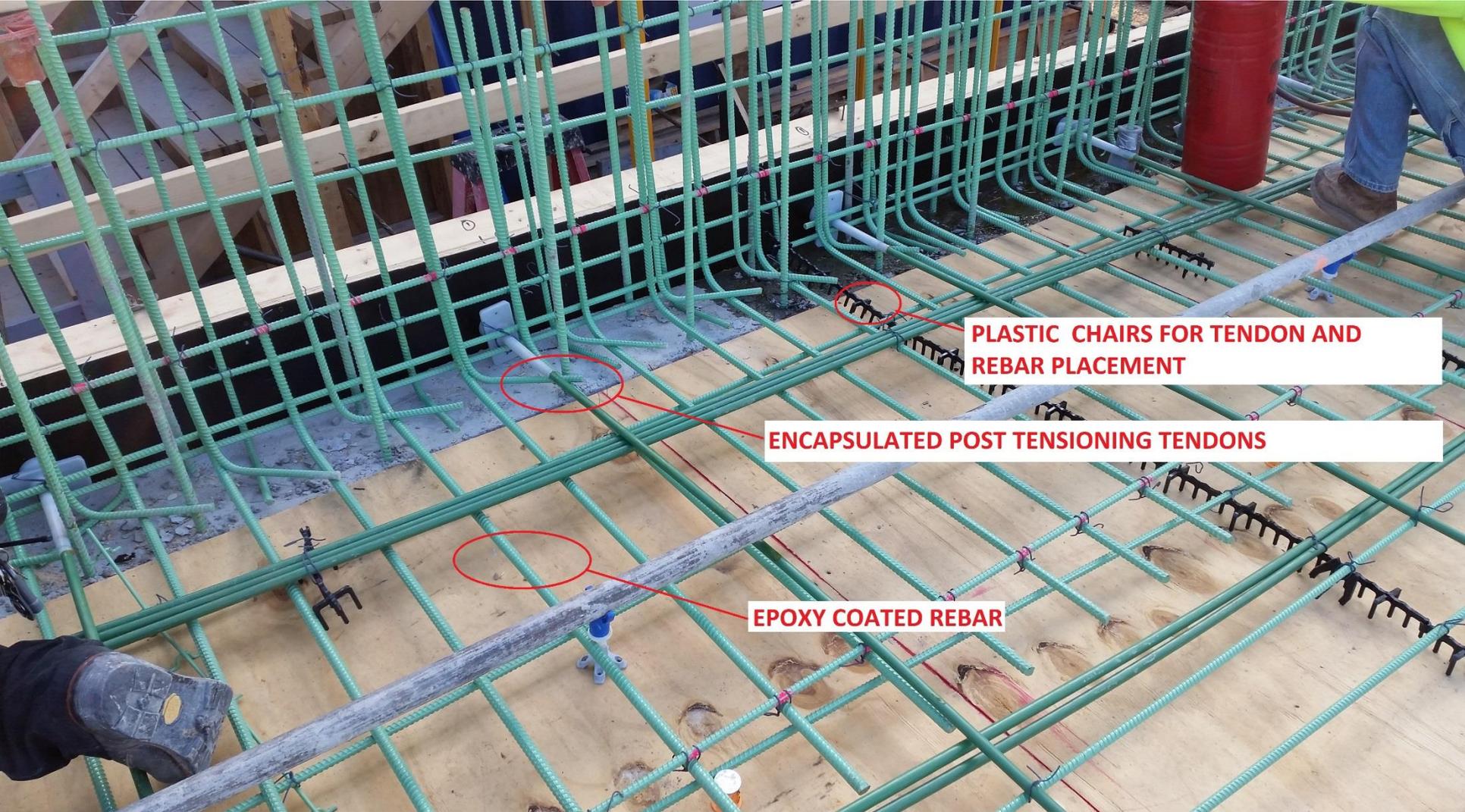
- Epoxy coating on reinforcing steel
- Encapsulate post tensioning tendons in plastic sheathing
- Crystalline waterproofing admixture to assist in self-sealing small cracks
- Concrete with air entraining admixture to resist freeze-thaw cycles
- Slag and Fly Ash in concrete mix to decrease permeability and increase wear resistance
- Corrosion inhibitor added to concrete mix

South Livingston Street Garage Construction



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Design Features at South Livingston Street Garage



PLASTIC CHAIRS FOR TENDON AND REBAR PLACEMENT

ENCAPSULATED POST TENSIONING TENDONS

EPOXY COATED REBAR

Design Features of new South Livingston Street Garage

- Stainless or galvanized steel hardware to reduce maintenance and extend life.
- On site water retention tank to reduce stormwater surcharge and allow solids to settle before water is discharged into the city storm sewer.
- Permeable pavers used to reduce stormwater runoff.
- Provision to accommodate future solar panels above garage.
- Commercial Building incorporated into project to enhance pedestrian experience along East Main Street and make site a destination.
- Open structure, eliminating need for active ventilation.

Design Features at South Livingston Street Garage



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Stormwater Tank reduces peak flows and suspended solids entering stormwater system



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Design Features at South Livingston Street Garage

Aluminum Screening for long life and low maintenance



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Questions?