LOW-RISE CATEGORY

PROJECT OF THE YEAR FINALIST

Courthouse Square

Salem, OR

Submitted by Structural Group

Courthouse Square is a five-story complex that contains municipal space, retail, offices, a public transportation center, and an underground parking garage

Marion County Commissioners in Salem, OR, began their quest to consolidate county services in one location in the 1970s. By consolidating these services in one location, the goal was to have efficient means of providing citizens with access to the County.

By the late 1990s, the County had secured 100% ownership of the block located between Court and High streets. They then began to design a facility to accommodate office building space and a central transit facility through a public partnership with Salem-Keizer Transit. A contract for construction of the building and adjoining transit mall was awarded in February 1999.

In September 2000, the five-story, 163,000 ft^2 (15,143 m^2) Courthouse Square complex was opened to the public. The complex included municipal space, retail, offices, a public transportation center, and underground parking.

WHAT PROMPTED REPAIR

Issues with the building and transit mall started to emerge in 2002. Imperfections, thought at first to be repairable and purely cosmetic, included minor cracks in some wall areas, leaking windows, and buckling floor tiles in restrooms. The transit mall's brick paving and drainage systems also began showing visible defect signs.

County officials had a comprehensive structural analysis performed on the complex, including load-testing of the building slabs, tendon tests, and concrete core samples. The results showed flawed design and construction practices with cracks in the concrete causing deterioration. Preliminary findings concluded that the weight of the transit drive surface highly stressed the columns in the parking garage and the office building was showing early signs of serious deficiencies.

Installation of the FRP composite strengthening system

Significant defects were found in the columns, shear walls, slabs, footings, and the masonry-clad building envelope. The findings led the owner to close the entire structure and develop an economically feasible plan to repair and return the complex to service safely.

TASK FORCE ENGAGED

Following the findings of the structural analysis of the complex, the transit mall was closed and the office building followed suit 2 months later. County business offices were relocated into leased building space and the bus mall was relocated a few blocks away.

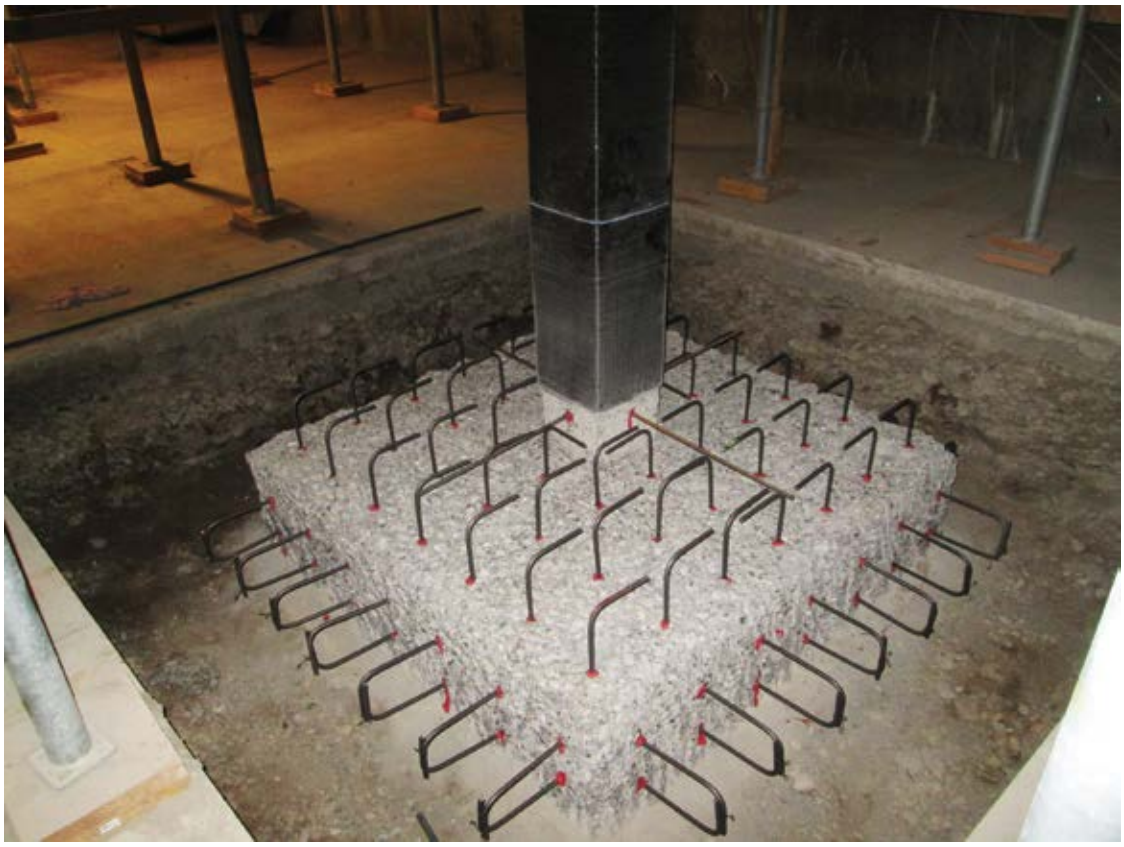
A 30-member Courthouse Square Solutions Task Force was appointed to identify and develop some possible solutions for a future course of action. This team was comprised of transit, county, and citizen representatives with expertise in a variety of subjects, including engineering, construction, finance, real estate, and community relations. A technical subcommittee of this group researched and presented innovative technology solutions to demonstrate remediation as a viable solution.

MOVING FORWARD WITH REPAIRS

A number of criteria were identified for consideration for the future of the complex. After carefully evaluating the financial feasibility, the highest and best use of the site, a cost-benefit analysis, and the future needs of the community, the most viable solution was determined to be remediation through a design-build approach. Through this delivery method, all members of the team worked with shared interests toward a shared goal, allowing decisions to be made that were best and most efficient for the project.

Column capital enhancement and full column wrap with a composite strengthening system for axial strength

Remediation encompassed repairs essential to the complex's structural integrity, seismic upgrades, refreshed interior finishes, and passenger waiting areas on the transit mall. Many structural repairs also occurred in the underground parking garage and within the building's interior walls.



Enlargement systems were used to strengthen the column footers in the parking structure

FRP system installed

Prior to placement of concrete, reinforcement of the bonded overlay was performed on the transportation area deck

Proven construction techniques and technology-driven products were chosen for the repairs to the columns, slabs, and walls. This required concrete enlargement, column capitals, and use of fiber-reinforced polymer (FRP) reinforcing systems. The FRP systems combine lightweight, high-strength carbon fibers with premium resins to create an externally bonded reinforcing system for application to existing structural elements.

After materials were selected, site preparation began by implementing a detailed safety plan for the project, which included access and protection to ensure the safety of the general public and crews working on site. A stringent quality control program was implemented that included four different agencies: special inspector, city, owner's agent, and the contractor's inspections.

To prepare the surface for the concrete, different methods were used as the conditions required. For locations in the garage, crews used a sponge blaster to achieve surface profiles between ICRI concrete surface profile (CSP) 3 and 6. This was necessary for CFRP installation, column enlargements, and shear cap installations. For locations within the office building, crews used conventional chipping and power washing for column enlargements and shear cap installations, and grinding for CFRP installation preparation. For locations on the transit mall deck,

hydrodemolition was used to achieve a 1/4 in. (6 mm) profile for the concrete overlay.

Repairs to the building envelope were also necessary on the masonry façade. Several bricks were displaced, as well as the entire top portion of the brick exterior, which required replacement. Deficiencies had caused the building frame to shift, requiring window replacements. A self-leveling overlay was used throughout the building to correct uneven surfaces caused by deflected slab conditions.

Delivery of a structurally safe complex with sound engineering and a 50-year service life were the primary foci. Throughout the project, a series of inspections occurred as repairs were completed. Repairs only moved forward when each inspector was satisfied with the level of quality of work.

AN AWARD-WORTHY REPAIR

During the 18 months of construction, over 150,000 ft² (13,935 m²) of Class A office space was renovated. Over 125 shear capitals were installed, over 250 columns were enlarged, 275 columns were wrapped in FRP, and over 2000 yd (1830 m) of concrete was placed. The repair methodology was quite varied and involved a combination of strengthening methods. In all locations of concrete overlay and section enlargement, three-dimensional ground-penetrating radar was used to avoid hitting embedded utilities and post-tensioned cables. More than 25,000 dowels were installed on the project using this technology.

One of the unique factors with this project is the spatial restrictions faced in the design approach. Dealing with an existing building, it was essential to work with and often maintain existing clearances, as well as work around critical utilities and lines. This was particularly important for garage space sizes and heights, match line and drainage elevations for the transit mall overlay, ADA restrictions with column enlargements within the building, and utility relocation for section enlargements.

A very challenging part of this project involved the finished spaces around which crews had to work. The column enlargement and shear cap installation were performed with self-consolidating concrete, pumped as high as five stories and as far away as 300 ft (91 m), all while protecting interior finishes.

The path to success in completing a project of this magnitude included the more than 100 construction workers—including 40 local contractors that came together with one goal—to become one. A significant effort was placed in not only establishing a repair method that would be substantially cost-effective compared to complete rebuilding but also in communicating this to the client and public to win support.

Placement of bonded overlay over the parking structure created a strengthened deck for the public transportation area

Crews apply a traffic-bearing coating in the public transportation area

The Courthouse Square complex project is a successful collaborative model project for cooperation and teamwork. County representation, the community, and contractors and vendors remained committed to a final outcome that delivered a structurally sound facility for the public.

Courthouse Square

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Salem, OR

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