



PROJECT PROFILE

P.T.T. Parking Garage

Structural Strengthening | Riyadh, Saudi Arabia



CLIENT

Kingdom of Saudi Arabia, Ministry of Public Works and Housing

BACKGROUND

A cast-in-place, flat plate parking garage was constructed and immediately experienced several serviceability problems. The garage has two parking levels and a plaza roof. The plaza contained gardens and a fountain.

A poorly conceived structural design concept caused two major problems for the structure. Drying and thermal shrinkage of the concrete caused shear cracking of the columns, and large dead loads on a plaza slab caused the flat plate bending moments at the column supports to be well above normal service load levels. The high flexural stresses caused large flexural cracks in the slab and excessive deflections of the cantilever portion of the structure. Deflection serviceability was aggravated by long-term creep. WJE was retained to develop repair options.



SOLUTION

WJE engineers investigated the existing conditions and developed several repair scenarios and alternate use proposals. A strengthening program that restored the capacity of the structure to its original intended level was devised, using a combination of column jacketing, installation of drop panels, and structural floor overlays.

WJE developed a repair scheme for forming and placing concrete for the new column drop panels, overcoming a major obstacle in the repair construction process. The repair scheme included selection of prepackaged concrete materials for the repairs because of their controlled quality and flow characteristics; production of consistent, high-quality concrete for the duration of the project; and selection of concrete with strength that well exceeded design requirements. Although the structural repairs caused major changes geometry of the column region, the new structural system appeared natural as though no retrofitting had been done.