CONCRETE OVERLAYS: A COST–EFFECTIVE, ENVIRONMENTALLY–FRIENDLY REHABILITATION SOLUTION

BLOOR STREET/AUKLAND ROAD INTERSECTION, TORONTO, ON, AUGUST 24, 2014

Concrete overlays are a cost-effective, environmentally-friendly and long-lasting solution that can extend the life of streets and roads by 15 to 40 plus years.

Concrete overlays are ideally suited for a broad range of applications including mainline highways; high volume and residential streets; local roads; heavy industrial, intermodal, military facilities; airport runways, taxiways and aprons and parking lots.

There are two types of concrete overlays — bonded and unbonded. **Bonded** concrete overlays are relatively thin (between 50 and 125mm) and are placed directly on existing pavements that are in good to fair structural condition. **Unbonded** concrete overlays are thicker (between 100 and 275mm) and restore structural capacity to existing pavements that are moderately to significantly deteriorated. To learn more about concrete overlays visit http://www.cptechcenter.org/technical-library/documents/Overlays_3rd_edition.pdf.

A CASE STUDY

In 2003, the City of Toronto chose an unbonded concrete overlay to address the issue of rapid deterioration of the ashpalt pavement at the busy urban intersection of Bloor Street and Aukland Road. A first for the city.

Bloor Street is a four-lane major east-west arterial road with an average annual daily traffic of over 30,000 vehicles with high peak hourly volumes of approximately 1,000 vehicles and in excess of 15 transit buses. It meets Aukland Road, a north-south collector road, forming a T-intersection. Aukland Road leads directly into the nearby Kipling subway station, located approximately 500 metres south of the intersection. The high volumes of heavy bus traffic led to frequent pavement deterioration (rutting and fatigue cracking) beyond acceptable levels. Furthermore, most of the vehicles, in particular the articulated buses, travelling through the intersection slow down to turn or stop for the traffic signal, causing severe rutting, shoving and other safety concerns.

Based on the existing conditions and anticipated traffic loadings, the recommended alternative was a 150mm unbonded concrete overlay with 25mm high stability HL3 as a separation layer/bond breaker, on the milled and prepared existing concrete pavement for an 85 metre long section of Bloor Street. A 63 metre long section of Aukland Road was reconstructed as a conventional Jointed Plain Concrete Pavement, 225mm thick. Due to severe rutting into the aggregate base, 150mm of the base was replaced. The existing and new pavement structures are illustrated in Figure 1.

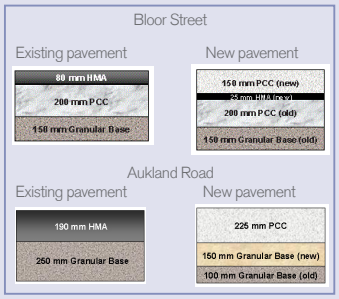

FIGURE 1 Existing and New Pavement Structures

The construction was staged in order to maintain partial access to traffic through the busy intersection and reduce delays. The unbonded concrete overlay was placed over the course of two weekend closures in July 2003 and the full depth concrete as well as part of the granular course were placed at the same time.

For research purposes, strain gauges were placed in the new concrete overlay and full depth concrete pavement to measure pavement responses over time in order to validate the pavement design. Sensors were also deployed and locations were strategically selected to capture the effects of accelerating, slowing and turning traffic, as well as the overall effects due to environmental changes. Seven gauges were installed on Bloor Street and five were placed on Aukland Road.

The decision to use an unbonded concrete overlay on Bloor Street has proven to be a sound rehabilitation strategy and has provided over 13 years of performance, with little maintenance. The recurring issues prior to rehabilitation have been eliminated and the overlay has an anticipated service life of 25 plus years.

The performance of the reconstructed Aukland Road demonstrates concrete's effectiveness in mitigating rutting and shoving at intersections that are subject to high volumes of heavy traffic. Concrete pavement does not deform under dynamic or slow moving vehicles, maintains the safety characteristics of the roadway and averts the need for inconvenient and expensive maintenance work associated with other pavement materials.

To learn about other successful projects visit http://overlays.acpa.org.