CORRUGATED STEEL PIPE INSTITUTE

CSP Caissons for Construction of False Integral Bridge Abutments

Townline Road Bridge, Cambridge

Owner: Ministry of Transportation Ontario

Consultant: McCormick Rankin Corporation, Mississauga

Contractor: Looby Construction Limited, Dublin

In the late nineteen eighties **False Integral Bridge Abutments** were introduced. They permitted the movement of bridge girders but eliminated the need for both expansion joints and bridge bearings at the abutments. Their design involved constructing a concrete bridge abutment on top of single row of H-piles. Expansion is accommodated, by flexing of the pile as the abutment moves.

According to the bridge engineer James Sherlock PEng. ”Integral abutments have become the abutment design of choice throughout the province for reasons of economy (costly expansion joints and bearing are eliminated), and perhaps even more important, superior durability and lower maintenance costs (expansion joints and bearings are costly, maintenance prone components of the bridge). Furthermore, all joints eventually leak, resulting in the corrosive deicing salts damaging the ends of the girders and the abutment bearings. Repairs of these components significantly drive up the bridge maintenance costs.”

Compacting Fill Against the Caissons

Second Phase of Overpass Replacement

Corrugated Steel Pipe (CSP) is a key component in this design. Vertical CSP caissons make it possible for the tops of the piles to move freely without transferring horizontal forces to the

bridge embankment or retaining walls. Retaining walls can be built close to the piles optimizing clearance and reducing cost. Heavy equipment and fill are kept away from the upper piles reducing the ultimate load on the piles and the potential for damage. Backfilling and compaction are made easier.

The girders and decks of all bridges move. Expansion and contraction, largely due to temperature change, can be significant and must be designed for.

Expansion joints are required on conventional bridges. The joints can add significantly to the initial cost. They are exposed and thus are susceptible to wear and tear.

Minimal Clearance to Retaining Walls

Closing in the Caisson

Corrugated Steel Pipe (CSP) gains its tremendous strength through flexibility and its interaction with compacted backfill material. By adjusting to load, rather than rigidly resisting it, strong culverts and bridges are built. The flexibility of steel makes it possible to support rigid bridges and eliminate many of the problems associated with traditional bridge construction and maintenance.

Typically a 600mm diametre CSP are slipped over the top 3 metres of the H-piles and is filled with loose sand. This allows the top of the piles to move with the false integral abutment and the bridge. An 800mm pipe is slipped over the smaller pipe so the inner pipe and pile have an additional 100mm of unrestricted space for movement. The 800mm pipe is compacted in place and does not move but protects the fill and adjacent structures from the dynamic horizontal forces.

050112

CORRUGATED STEEL PIPE INSTITUTE
652 Bishop St., Unit 2A
Cambridge, Ontario N3H 4V6
Phone: (519) 650-8080 • Fax: (519) 650-8081
Email us at: info@cspi.ca
Visit our web site at www.cspi.ca