Canadian Concrete Pipe & Precast Association

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Pay Now, or Pay Big Later: Why Infrastructure Should be Built Based on Life Cycle Cost.

Reinforced Box Culvert for a storm sewer under a busy street

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The old British phrase probably sums it up best: 'Penny wise, pound foolish.' And so it is with traditional design-bid- build procurement methods for infrastructure projects. Sure, we save a small amount of money up front, but if life expectancy and life cycle cost aren't factored into the equation, it can end up costing far more in the long run.

Costs for emergency repairs; costs for increased maintenance; it can even cost public works employees their jobs, or elected officials their seats in the next election.

For the public, underground infrastructure – water supply and sewer systems – is often a case of 'out-of-sight, out-of-mind'. Until it fails; when the watermain bursts and there's a boil water order and the streets are flooded; or a steel culvert collapses and cars fall into a sinkhole, as happened on Hwy 174 near Ottawa, Ontario in September 2012.

Yes, sometimes investigations and engineering reports are prepared. But those reports are not easy for the public to understand. They know little about materials selection and system design. They just know they're increasingly falling victim to failing infrastructure.

Those of us in the industry know that materials and design receive the majority share of the accolades, or blame, for a project's performance throughout its life cycle. Yes, installation quality is important, and all assets will require some regular maintenance, that, if left undone, can accelerate deterioration. But materials also matter. When the steel culvert in Ottawa collapsed, it was replaced with 3000 mm diameter 100D reinforced concrete pipe – in an emergency repair that cost over $5 million. Imagine the savings if reinforced concrete pipe had been selected from the beginning. There likely wouldn't have been a culvert collapse causing a gaping hole in the highway which swallowed a driver and his car. Reinforced concrete pipe is a rigid pipe system that relies mostly on the strength of the pipe and is only slightly dependent on the strength derived from the soil envelope. The opposite is true for a steel culvert.

Why design-bid-build doesn't work

It's completely structured around lowest-first-cost procurement. The infrastructure owner releases a tender for design of a system. The engineering firm that bids the lowest price wins the contract. When the design is complete, a tender is issued for construction. The contractor who bids the lowest price to construct gets to build.

Infrastructure products, like pipes, used on projects are pre-approved by the owner. Each type of pipe material, once approved, is treated equally in the process. So if

plastic, steel, and concrete pipes are all permissible, the choice is left up to the contractor, who often opts for the cheapest and easiest to install. There is no consideration of life cycle cost.

This process does little to ensure the best value for taxpayers' money in the long term. Nor does it create confidence that the best materials and methods are employed.

Car falls into Highway 174 sinkhole after steel culvert collapses underneath
Courtesy: Ottawa Fire Services

Risk is only being shifted with Public Private Partnerships

Many large infrastructure projects in Canada are now funded by a public private partnership (P3) model. Some are design-build-finance-maintain, which means the successful bidders (again based on lowest cost) must provide maintenance for the system for a period of time. But the maintenance period is usually much shorter than the infrastructure's life cycle. For The Herb Gray Parkway, currently under construction in Windsor, Ontario, the maintenance period is 30 years – well below the expected life cycle of the bridges, roads and tunnels. The Ministry of Transportation Ontario will be maintaining the assets of the Herb Gray Parkway long after the consortium constructing it now has received their last payment. In September 2012, Canada's first national report card on the state of municipal infrastructure was released. The results were unsurprising.

Reinforced concrete pipe, maintenance holes and catch basins for storm sewers, now underground

First National Report Card on Canadian Infrastructure (Excerpt)

Wastewater infrastructure
- 40.3% of plants, pumping stations and storage tanks were in fair to very poor condition
- 30.1% of pipes were in fair to very poor condition
- Replacement cost: $39 billion

Drinking water infrastructure
- 15.4% of drinking water pipes were in fair to poor condition
- Replacement cost: $25.9 billion

Stormwater management:
- 12.5% of the stormwater installations surveyed fall below good condition
- 23.4% of the stormwater pipes fall below good condition
- Replacement cost: $15.8 billion

The total replacement cost to upgrade all of these linear assets is $80.7 billion – $6,488 per Canadian household.

We need to start examining what materials and processes we use to construct or rehabilitate our infrastructure.

All infrastructure product materials are not created equal when we consider longevity and life cycle cost. If they were, the steel culvert that collapsed and caused the Ottawa sinkhole would have been replaced with another steel culvert, because they're still less expensive than reinforced concrete pipe. But those who made the decision to purchase the replacement materials knew that reinforced concrete pipe was a better, longer-lasting material. Safety and longevity governed, not low initial cost, but that decision should have been made at the start.