



## LCC-Efficient Procurement of Bridge Infrastructures

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## Summary

Life-cycle cost analysis (LCCA) has recognized potential for rationalizing bridge procurement, but its use in this context is far from systematic and the integration of LCCA findings in decisions is often far from robust. Furthermore, although most bridge management systems (BMSs) include databases of relevant information, agencies do not use them effectively to improve future bridge investment decisions. This paper introduces a comprehensive approach for agencies to exploit their BMS to procure the most cost-efficient bridge design through fair design-build (D-B) tendering processes. The approach incorporates use of a novel LCCA technique, LCC Added-Value Analysis, that can be conveniently integrated with public agencies' established procurement procedures and maintains contractors' freedoms in D-B processes. The proposed approach allows bridge procurers to establish monetary LCC-efficient benchmarks and embed them in tender documents as core specifications. Hence the lowest LCC bid can be employed as the contract award criterion, rather than the lowest bid in initial investment terms. The Swedish Transport Administration (Trafikverket) has recently procured several bridges using the approach, thereby gaining considerable cost savings. A presented case-study provides insights into various aspects of bridges' LCC and illustrates analytical steps that other agencies could apply in bridge procurement. The study shows that use of D-Bs together with the lowest LCC bid as the contract award criterion affords greater opportunities to consider LCC aspects in bridge procurement than traditional contracts and the lowest bid criterion.

**Keywords:** Bridge, Life-Cycle Cost Analysis, Procurement, Tender, Contract, Bridge Management Systems, Repair, added-value, LCC, LCCA, BMS.

## 1. Introduction

Use of design and build (D-B) contracts in bridge procurement is increasing in Sweden and other European countries. Due to the contractors' freedom under D-B contracts, an agency might have to choose from several proposals, all of which meet the design standards and functional requirements, but may differ substantially in construction materials, bridge types, layouts and bridge structural-members (BSMs). Their associated initial investment (INV) costs, LCM costs and lifespans may also differ considerably. The bridge-related life-cycle measure (LCM) costs are eventually incurred by agencies under the D-Bs, but contractors are normally responsible during the lease period for LCMs required due to design or construction mistakes.

Due to the lack of other reliable, credible and transparent award criteria, the lowest bid is currently used as the sole criterion when choosing a contractor under D-Bs, and no consistent life-cycle cost (LCC) guidelines are stated in the tender documents. Consequently, the contractors usually only include their proposals' INV costs in bids, ignoring LCM costs. The combined use of D-B contracts and the lowest bid criterion does not normally stimulate the contractors to think about LCC aspects. Therefore, use of D-B contracts together with the lowest bid award criterion may lead to huge losses for agencies since it may result in implementation of proposals that are relatively cheap in terms of INV costs but very expensive in LCC terms. Moreover, it may disadvantage proposals