# POOLED-FUND PROJECTS IN DEVELOPMENT

The Transportation Association of Canada provides a fertile environment for the development and conduct of cooperative projects by providing:

- forums in which transportation professionals can share perspectives, identify issues of mutual interest, and develop projects in response;
- a network of leading experts in the transportation sector to contribute to or validate projects;
- an institutional mechanism for pooling resources, contracting and managing collaborative initiatives;
- professional staff to manage or undertake projects; and
- recognition and technical credibility in the Canadian and international transportation community.

Technical projects are considered to be "in development" if they have received support in principle from relevant TAC council(s), and are considered by the TAC Board of Directors or its Executive Committee to conform to TAC policies, but have not yet received sufficient financial support through the pooled-fund mechanism to enable work to begin. TAC members and other stakeholders are invited to consider projects in development and approach the TAC secretariat if they would like to fund one or more initiatives.

Funding partners are currently being sought for the projects in development that are listed below and described in more detail on the following pages. Potential funding partners who would like to make a financial contribution to a project and participate on the steering committee are invited to contact the staff member identified in the project description.

## Committed Funding Partners

As of August 2018

| | Guide to Bridge Deck HMA Paving in Canada | Synthesis of Practices for Management and Enhancement of Roadway Ecology | Urban Transportation Indicators - Sixth Edition | P3s - Lessons Learned from Transit Projects | Vehicle Loads Synthesis and Recommendations | Canadian Road Safety Engineering Handbook Scoping Study |
|---|---|---|---|---|---|---|
| *Date initiated* | *Spring 2018* | *Spring 2018* | *Spring 2018* | *Fall 2017* | *Fall 2017* | *Spring 2017* |
| **Federal, provincial & territorial governments** | | | | | | |
| Manitoba | | | | | | X |
| New Brunswick | | | | | X | |
| Ontario | | | | X | | X |
| Quebec | | | | X | | X |
| **Municipalities on Chief Engineers' Council** | | | | | | |
| Calgary | | | | | | X |
| Montréal | | | | | | X |
| **Other** | | | | | | |
| TransLink | | | | X | | |
| Autorité régionale de transport métropolitain | | | | X | | |
| Metrolinx | | | | X | | |
| **Total funds committed** | **$ -** | **$ -** | **$ -** | **$ 72,000** | **$** | **$ 60,000** |
| **Funds required for project** | **$ 160,000** | **$ 130,000** | **$ 225,000** | **$ 145,000** | **$ 100,000** | **$ 115,000** |
| **Amount remaining** | **$ 160,000** | **$ 130,000** | **$ 225,000** | **$ 73,000** | **$** | **$ 55,000** |
| **Percent committed** | **0%** | **0%** | **0%** | **50%** | **%** | **52%** |

## Guide to Bridge Deck HMA Paving in Canada

Recommended Spring 2018

| | |
|---|---|
| **Responsible Committee:** | Structures Standing Committee & Soils and Materials Standing Committee |
| **Responsible Council:** | Chief Engineers' Council |
| **Total Funding Estimate:** | $160,000 |
| **Staff Contact:** | Geoff Noxon |

Newly constructed or rehabilitated bridges are frequently surfaced with hot mix asphalt (HMA); however, achieving high quality asphalt mats on bridges presents many challenges. To prevent damage to the bridge, vibratory compaction is usually not permitted. Additionally, coring to determine in-place asphalt mix properties and level of compaction is not desirable due to the need to protect the deck surface and any water-proofing membranes from damage during core extraction.

Paving contractors often view and approach bridge paving in a similar way to roadway paving. Bridges introduce a substantial level of complexity to paving operations that are often not adequately evaluated or understood. Specialized compaction equipment is often required and attention to substrate surface preparation and tack coating may be lacking, resulting in a suboptimal final product.

Bridge deck paving usually requires small quantities of HMA, often hauled to remote locations. Hauling HMA for several hours can compromise available compaction temperature and result in under-compacted asphalt. Although asphalt mixes may be available from smaller local asphalt producers where the haul distances would be shorter, this may mean using HMA that does not meet agency specifications.

In order to ensure high quality, some agencies prescribe the method of compaction including size and type of rollers, specialized compaction equipment for compacting against bridge curbs/barriers/parapets, minimum compaction temperatures, and number of passes, in lieu of being able to measure the in-place density. Some agencies require a premium-quality HMA for bridge decks, regardless of the site-specific demands such as traffic count, bridge size and bridge importance. This can result in long haul of high-quality material from larger plants able to meet the specifications, usually arriving on site with less-than-optimal compaction temperatures. This long haul can negate the quality of the HMA if it cannot be properly compacted due to heat loss. Smaller local asphalt producers could be used to produce HMA for less important applications and reduce the difficulties related to the long haul.

Bridge decks with HMA should provide a smooth surface and adequate skid resistance, facilitate drainage, and protect underlying waterproofing membranes and reinforced concrete decks from deterioration due to penetration of water and deicing salts. The surface should be durable and able to withstand traffic and environmental demands over the selected design life. It must have a good bond to the substrate, and the bond must be durable over the design life. Both construction cost and life cycle cost should be considered in HMA specification selection to balance cost and longevity. The surfacing system should be one that can be installed and maintained by a trained local contractor. Speed of construction should be considered to minimize lane closures.

In several respects, a bridge deck wear surface can be subjected to more severe conditions than highway pavements. Bridge deck surface temperatures can vary significantly and be different from neighboring

highway pavements. Cracks in the asphalt will cause accelerated deterioration of the HMA and underlying membrane. Bridge deck pavement environmental conditions should therefore be treated separate from highway pavements, and the wear surface HMA should be specified considering these bridge-specific demands.

The project is intended to focus only on HMA paving of bridge decks. Wear surface selection considering other material types is an important aspect of the design process, but is not intended to be part of the present scope. Similarly, it is important that the owner satisfy themselves as to the condition of the underlying bridge deck structure before repaving. It is assumed that these aspects are covered by the owner agencies as part of their project planning.

The project's main objectives include:

- Development of a list of key input data for categorization of bridges with respect to HMA wear surface specification and construction considerations, for instance: traffic AADT and percent heavy trucks; bridge deck surface area; environmental demands (precipitation and temperature); bridge deck construction details; use of deicing chemicals; waterproofing system; distance to asphalt plant, minimum skid resistance, and design life.
- Suggested specifications and construction details for each category.
- A flowchart to determine the best HMA wear surface design/specification for any specific bridge HMA wear surface construction or renewal.
- Suggested QA/QC minimum requirements and test methods, preferably methods in keeping with an End Product type specification.

The final report for this project will be a *Guide to Bridge Deck HMA Paving in Canada* that includes findings from the literature review and survey of Canadian agencies; key performance indicators; selection criteria; a flowchart for individual projects; suggested specifications for various alternatives; and construction QA/QC minimum requirements and test procedures.

## Synthesis of Practices for Management and Enhancement of Roadway Ecology

Recommended Spring 2018

**Responsible Committee:** Environmental Issues Management Standing Committee
**Responsible Council:** Environment Council
**Total Funding Estimate:** $130,000
**Staff Contact:** Craig Stackpole

Differing levels of knowledge and limited information are available for transportation engineering/design and environmental practitioners from jurisdiction to jurisdiction. Poor planning of roadways can result in high wildlife-vehicle collision rates and related fatalities, and significant effects to wildlife including at-risk species. Additionally, regulatory processes commonly require project effects to be offset by the restoration or enhancement of habitat.

The aim of this project is to:

- Review costing tools and decision-making criteria for planning, design and mitigation options;
- Review current issues and practices for planning and mitigation of roadside ecological features (e.g., pollinator habitat, habitat compensation, edge management, predictive modeling for wildlife occurrence and use including species at risk, addressing barriers to movement);
- Provide opportunities for making roads more permeable for fish and wildlife and reduce conflicts between wildlife and vehicles (e.g., species at risk, ungulates, other large mammals, etc.);

Key tasks to accomplish the project objectives will include:

- A literature scan of typical roadway ecology practices.
- Survey of Canadian practitioners (agency staff, stakeholder groups and environmental specialists) to determine the most pertinent issues related to roadway ecology management.
- Develop a compendium of current practices.

The work will culminate in a synthesis of practices for the management and enhancement of roadway ecology.

## Urban Transportation Indicators – Sixth Edition

Recommended Spring 2018

**Responsible Committee:** Transportation Planning and Research Standing Committee
**Responsible Council:** Urban Transportation Council
**Total Funding Estimate:** $225,000
**Staff Contact:** Craig Stackpole

This project will be the latest in a series that has provided an important picture of transportation behaviour and trends in Canadian urban areas. The overall goal is to build a consistent, reliable database on urban transportation and to develop indicators for Canadian municipalities and transportation stakeholders. Interpreting the data and understanding urban transportation trends has helped all levels of government, as well as numerous research groups and agencies, in studying and establishing the integrated land use and transportation policies and plans that are needed to achieve sustainable urban transportation, as well as measuring the performance of investments made.

The project will solicit the direct collaboration of Canada's 35 census metropolitan areas (CMAs), and build on previous urban indicator surveys in 1995, 1999, 2003, 2008 and 2013. The new survey will be based on reference year 2016, building on data collected during the 2016 Canadian Census. The project will result in an electronic database as well as a comprehensive report describing the survey results and analyses in which data from the previous surveys will be integrated to permit time-series analysis.

The major objectives of this project are to:

- Conduct a general evaluation of the 5th survey results and a review of the survey scope and methodology, as well as confirmation of the data sources to be used.
- Conduct the 6th survey and deliver the study products, including a comparison with previous surveys results and a discussion of progress.

Key tasks for accomplishing the project objectives will include:

*PHASE A: Review the 5th UTI Study*

- Review the 5th survey and assess the strategic quality and consistency of the results produced.
- Discuss ways to address any challenges encountered in the 5th survey and propose relevant adjustment to the survey content, data sources, geography and tools (questionnaire).

*PHASE B: Conduct the 6th UTI Study*

- Develop the 6th UTI survey tools consistent with Phase A results and previous survey parameters.
- Confirm key geography for all metropolitan areas, based on UTI 5th survey strategy.
- Obtain and process all the higher level data and commercial sourced data as needed for the UTI study.
- Issue surveys to participating municipalities and manage the data collection, including offering technical support and validating the received data.
- Process and analyse all the data, including a time-series perspective of the new indicators, and derive an integrated and consistent database.
- Prepare the 6th UTI Study final report.

The work will culminate in a stand-alone Urban Transportation Indicators Sixth Survey report and database, integrating work from Phases A and B.

## P3s – Lessons Learned from Major Transit Projects

Recommended Fall 2017

**Responsible Committee:** Transportation Finance Standing Committee
**Responsible Council:** Urban Transportation Council
**Total Funding Estimate:** $145,000
**Staff Contact:** Craig Stackpole

Over the past decade, public-private partnerships (P3s) have become a common method for delivering major capital projects in Canada. It is expected that P3s will continue to play an important role in delivering major transit infrastructure across Canada, as evidenced at the national level by creation of the Canada Infrastructure Bank.

There is an opportunity to draw on experience across Canada to clarify the role of P3s, learn key challenges and opportunities and how P3s can be best applied by the public sector to reduce risk and improve effectiveness in project funding and delivering.

A number of major P3 transit projects are at various stages of implementation – from consideration, to delivery, to up to a decade of operating experience, providing a broader lifecycle perspective on these initiatives.

The major objectives of this TAC project are to:

- Clarify the role and intended goals of P3s in delivering major transit projects and determine key opportunities and challenges for public agencies in achieving these goals.
- Identify lessons learned, recommendations, and considerations for public agencies to improve application of P3s for transit projects. The lessons learned include those related to both construction and operation of transit projects with respect to risk management, project delivery, financing and project outcomes.
- Determine potential applicability (e.g. common themes, differences etc.) to other transportation infrastructure projects (e.g. roads, bridges etc.) at different scales (e.g. small to medium size projects).

Key tasks for accomplishing the project objectives will include:

- A literature review to compile key findings from past research and analysis on P3s.
- Organizing a panel session of P3 experts and practitioners from the public (federal, provincial, and local agencies) and private sector, conducting web-surveys, telephone interviews, in-person discussions and workshops to solicit input on key aspects of the P3 projects delivery including considerations, challenges, project outcome, performance indicators, etc.

The work will culminate in a report outlining key objectives for P3s and findings from past research, state of practice and experiences with P3s. The report will also include a summary of lessons learned from major transit projects and recommendations regarding the need for a study on applicability to other project types and scales.

## Vehicle Loads Synthesis and Recommendations

Recommended Fall 2017

**Responsible Committee:** Structures and Pavements Standing Committees
**Responsible Council:** Chief Engineers' Council
**Total Funding Estimate:** $100,000
**Staff Contact:** Geoff Noxon

The load-carrying capacity of the roadway system depends upon highway structures, such as bridges and pavements. Bridge design considers various loading combinations the structure may carry during its service life such as dead load (weight of the bridge), live load (the weights of vehicles using the bridge), wind, seismic and thermal forces as per the *Canadian Highway Bridge Design Code* (CHBDC).

Traffic and vehicle axle load data are critical components of structural design and management. Legal vehicle axle loads can vary across Canadian provinces or within a province due to local conditions and requirements and there is a growing need to understand the increase in vehicle loads and their impacts on pavement and bridge structures.

The objective of this TAC project is to collect and compile relevant traffic and vehicle load data from various jurisdictions and determine whether traffic load provisions for bridge design in the *Canadian Highway Bride Design Code* (CHBDC S6) as well as standard agency-specific truck factors for pavement design, expressed as equivalent single axle loads (ESAL), are adequate (e.g. for pavements, are the agency design truck factors still valid given the number of overload truck permits?).

Key tasks to accomplish the project objectives will include:

- Data collection from Canadian jurisdictions, including: number of annual or single trip overweight permits issued, weigh-in-motion (WIM) and bridge weigh-in-motion (BWIM) data, infraction data etc.
- Review of data to determine vehicle loads with different axle configurations present on the roadway networks in Canadian jurisdictions.

The work will culminate in a discussion paper with recommendations about vehicle loadings and truck pavement design ESAL factors to the road authorities and the Regulatory Authority Committee of the Canadian Standards Association, responsible for establishing overall priorities and objectives of the *Canadian Highway Bridge Design Code* as well as monitoring its development.

## Canadian Road Safety Engineering Handbook Scoping Study

Recommended Spring 2017

**Responsible Committee:** Road Safety Standing Committee
**Responsible Council:** Chief Engineers' Council
**Total Funding Estimate:** $115,000
**Staff Contact:** Geoff Noxon

In absence of a comprehensive Canadian reference document, Canadian practitioners have been using road safety engineering guideline documents published by various international organizations, developed to suit their respective environments and operating conditions. Despite the best efforts to adopt or adjust those guidelines to the Canadian context, there appear to be inconsistencies in application and road safety engineering practices that may cause inappropriate decision making on road safety matters and thus, result in undue costs and unintended operational issues.

There is a need for a comprehensive road safety engineering reference document to address unique Canadian climate conditions, roadway network characteristics, vehicle fleet and road users' expectations as well as to complement geometric design and traffic operation practices recommended in the *Geometric Design Guide for Canadian Roads* and the *Manual of Uniform Traffic Control Devices for Canada.*

Largely through volunteer efforts, the Canadian Road Safety Engineering Handbook is being developed as the primary reference for road safety engineering in Canada. It is intended to identify, define and share good practices in road safety engineering in order to assist Canadian road authorities and road safety engineering practitioners in providing service to the public and addressing road safety issues at the local level. The Handbook is envisioned as a series of publications to address specific subjects as follows:

| No. | Subject/Publication | Status |
|---|---|---|
| 1 | Road Safety Engineering Management Guide | Published (2009) |
| 2 | Canadian Road Safety Audit Guide | Published (2001) |
| 3 | Canadian Guide to In-Service Road Safety Reviews | Published (2004) |
| 4 | Rural Road Safety Engineering | In development (volunteer project) |
| 5 | Urban Road Safety Engineering | In development (volunteer project) |
| 6 | Speed Management Guide | Published (2016) |
| 7 | Access Management | To be developed |
| 8 | Road Safety Engineering in Transportation Planning | To be developed |
| 9 | Applied Human Factors in Road Safety Guide | Published (2013) |
| 10 | Guidelines for Network Screening of Crash Prone Locations | Published (2011) |

Development of components of the Canadian Road Safety Engineering Handbook has been ongoing for almost two decades and a few outstanding major topics must be addressed to ensure comprehensive guidance is provided. Furthermore, some of the earliest publications in the Handbook series are over ten years old and require updating to recognize rapidly advancing industry research and the state-of-practice tools.

To that end, a scoping study is proposed to determine the extent of work that is required to update and complete the Handbook. As part of the study, a strategy regarding implementation of the completed Handbook will be recommended.

Key tasks to accomplish the project will include:

- Review of existing Handbook publications, other TAC road safety related publications and work in progress to identify content that needs to be updated, refreshed or included in the Handbook.
- Review of other road safety reference documents used by Canadian practitioners (e.g. AASHTO *Highway Safety Manual)*.
- Identify the impact of emerging technologies and other potential uncertainties, risks, challenges or issues which will need to be resolved to complete and establish the Handbook as the primary reference for road safety engineering in Canada.
- Identify means to ensure the Handbook complements existing content and ongoing or future updates to the *Geometric Design Guide for Canadian Roads* and the *Manual of Uniform Traffic Control Devices for Canada*.

The major deliverable will be a report documenting the work with recommendations for the extent of effort and suggested methodology to complete the Canadian Road Safety Engineering Handbook in the most efficient and cost-effective manner.