

Pavement Design and Asphalt Construction

Specifications and Standards

Recommendation

That the December 1, 2020, Integrated Infrastructure Services report CR_8229, be received for information.

Previous Council/Committee Action

At the March 30, 2020, City Council meeting, the following motion was passed:

1. That Administration provide a report to Committee providing an overview of current internal specification and standards for pavement design and construction practices for asphalt construction. Report to include:
 - i. any available historical and current data on the condition and actual/expected performance of City roadway infrastructure;
 - ii. a work plan describing the activities, timelines and resources required for consulting with third party stakeholders and industry experts on areas of improvement with a specific focus of addressing development of potholes and asphalt deterioration.

Executive Summary

Edmonton roads are designed and constructed in alignment with the City's Design and Construction Standards. The Construction Specifications outline the construction and materials testing requirements for roadway construction whether funded and constructed by the City of Edmonton or contributed by developers. Assessing the condition of the City's road network is important in order to understand what type of maintenance, rehabilitation, and renewal treatments are needed when and where, as well as what type of treatment may be the most cost-effective. Data provided shows that the percentage of the Major Arterial, Arterial, Collector and Local roadways reported as being in Good or Very Good condition continues to increase, while the Alley network shows steady deterioration. A Work Plan has been developed to engage third-party stakeholders and industry experts on areas of improvement to address the development of potholes and asphalt deterioration. This information will help inform the recommendations that will be brought back to Council in Q2 2021.

Report

The City of Edmonton's Transportation Network consists of 10,763 lane-km of paved roadways, which the City manages throughout their lifecycle. For new roads, this means confirming infrastructure is designed and constructed to meet the current *City of Edmonton Complete Streets Design Standards and Construction Specifications* (Volume 2), which was updated in 2018, and ensuring those standards are appropriate for the physical impact (environmental, traffic, etc.) the roadway surface will experience. Additionally, as new roads are completed and become part of the City's inventory, they and the existing inventory are subject to the regular planning and delivery of appropriate maintenance, preservation, rehabilitation and renewal treatments that optimize the performance of the network. Lastly, the effective management of asphalt cuts into the roadway surface to facilitate underground utility work is also a critical influence of the lifecycle condition and expected life expectancy of the roadway.

As pavement ages, it shows signs of deterioration such as cracking, which can lead to pothole development. Potholes are pieces of asphalt physically separated from the pavement surface that develop after water enters pavement through cracks, and are a form of advanced pavement deterioration. The expansion and contraction of this water during freeze-thaw cycles weakens the pavement structure causing potholes. Pavement deterioration is expected over time and is managed through the planning and delivery of regular maintenance, preservation, rehabilitation, and renewal treatments.

- *Maintenance and Preservation* treatments include crack sealing, pothole repair, patching, surface seals and microsurfacing (Operating)
- *Rehabilitation* treatments include replacing the asphalt surface with a new asphalt overlay or placing additional structural thickness to strengthen the asphalt pavement structure (Capital)
- *Renewal* treatments include full-depth recycling and full reconstruction of the pavement (Capital)

Current Specification and Standards

Edmonton roads are designed and constructed in alignment with the City's Design and Construction Standards. The Standards apply to City of Edmonton contracts and private development projects. The Design Standards provide a single point of reference that supports the planning and design of Complete Streets in Edmonton. The Construction Specifications outline the construction and materials testing requirements for roadway construction.

Roadway Condition Data

Understanding the condition of Edmonton roadways is key to effectively managing the performance of the roadway network. Road condition information is used to identify and prioritize maintenance, rehabilitation, and renewal activities. By tracking the changes in the City's infrastructure inventory and annually reporting on the condition, the City is able to continually evaluate the effectiveness of capital investment decisions and subsequently provide the rationale for key budget decisions.

Attachment 1 provides data showing the network condition of Major Arterials, Arterials, Collectors, Local Roads and Alleys over time, including definitions for these road classes. The graphs show that the percentage of the Major Arterial, Arterial, Collector and Local roadways reported as being in Good or Very Good condition continues to increase. The Alley network shows a steady deterioration in network conditions. However, it is anticipated that the condition of the Alley network will begin to show gradual improvement as the Alley Renewal Program continues to develop and become fully funded.

Actual / Expected Performance

The performance of specific pavement treatments depends on many factors such as pavement condition, structure, traffic loading, and soil strength. Choosing the right treatment at the right time is critical for optimizing the return on investment in the City's road assets.

Attachment 2 outlines the expected performance based on remedial treatment for asphalt-based pavements. A limited field study was then completed to determine the projected actual service life of specific treatments. This was carried out by assessing three types of road classifications: arterial/major arterial, collector, and local. The treatments reviewed include new construction/full reconstruction, full-depth reclamation (treatments that recycle the existing road for use in the construction of a new pavement structure), structural overlay and, grind and overlay. Roads were assessed approximately ten years after the treatment was completed. The summary of this limited study is included in Attachment 2. Further analysis should be undertaken before a comparison of actual to expected service life is assessed.

Improvement Areas

There are many areas of Administration's work that impacts the performance, management, and life cycle of pavements. These areas were identified and prioritized for improvement related to the root causes of pothole formation and asphalt deterioration for further validation with external stakeholders. The following were identified as the highest priority improvement areas:

Improvement Area	Improvement Details
Pavement Design Standards & Construction Specifications	Update Pavement Design and Construction Specifications to improve decision making with a focus on improving pavement performance. Confirm Construction Specifications are aligned with current materials and construction activities in use at the City.
Coordination & Management of Utility Cuts	Improve coordination, management, and inspection of utility cuts to confirm compliance with City Specifications and create a clear process for issue resolution.
Information (Data) to Support Design & Construction	Align data collection and analysis activities with stakeholder needs and confirm clear standards for the collection, reporting, and visibility of data for use in decision making and performance monitoring.
External Stakeholder Relationships	Improve review processes for consultant and developer preliminary reports. Improve turnaround for reporting of test results and provide clear procedures to obtain sign-off for pavement reinstatement. Maximize benefit from third-party data. Provide a clear process for onsite issue resolution and dispute resolution.
Pavement Inspection and Reporting	Improve guidance and training related to appropriate testing and inspection practices for various circumstances including clear procedures for documentation.

External Stakeholder Engagement Next Steps

The areas of improvement identified above will be used to inform consultations with third-party stakeholders and industry experts, with a specific focus on addressing the development of potholes and asphalt deterioration. Further information on this consultation work plan is outlined in Attachment 3.

The next steps for this work will be to conduct a jurisdictional scan to determine what other communities and cities are doing to prevent the development of potholes, as well as complete the Consultation Work Plan described in Attachment 3. Administration will report back to Committee in Q2 2021 with recommendations for improvement. Some of the recommendations may be able to be addressed internally with current resources however, some may require funding to pursue.

Corporate Outcomes and Performance Management

Corporate Outcome(s): The City of Edmonton has sustainable and accessible infrastructure			
Outcome(s)	Measure(s)	Result(s)	Target(s)
The City of Edmonton has sustainable and accessible infrastructure	Edmontonians' Assessment: Access to Infrastructure, Amenities and Services that Improve Quality of Life (percent of survey respondents who agree/strongly agree)	68% (2017)	70% (2018)
Goods and services move efficiently	Business Satisfaction: Goods and Services Transportation (percent of survey respondents who are satisfied/very satisfied)	50.5% (2017)	53% (2018)

Attachments

1. Road Network Condition
2. Actual and Expected Road Performance
3. Consultation Work Plan

Others Reviewing this Report

- G. Cebryk, Deputy City Manager, City Operations
- S. McCabe, Deputy City Manager, Urban Form and Corporate Strategic Development
- C. Owen, Deputy City Manager, Communications and Engagement
- B. Andriachuk, City Solicitor