Stantec

Memo

February 28, 2019

Reference: Operations Centre Parking Lot – Pavement Structure Design

Background

Parks Canada is proposing the construction of a new asphalt surface parking lot in the province of Alberta. The proposed parking lot is in Banff National Park, in the Lake Louise area.

Geotechnical Data

The Subgrade Resilient Modulus (M_R) used for design has been *assumed* to be a value of fifty megapascals (50 MPa).

Traffic Information

The *assumed* traffic loading and design inputs are presented below in Table 1.

Table 1: Traffic Loading at Parking Lot

	Trucks (2-axle, 6 tire, single unit)	Passenger Vehicles (PVs)
Truck Factor	0.3	0.0004
Vehicles per Day	30	15
Days per Year	365	365
Annual Growth (%)	0	0
Design Life (years)	20	20
Directional Factor	2	2
Design ESAL	**131,400**	**88**
Total Design ESAL	**131,488**	

The traffic loading assumes two-way traffic driving in the middle of the parking lot driving lane.

Design Parameters

Asphalt Concrete Pavement (ACP) design was completed in accordance with the "*AASHTO Guide for Design of Pavement Structures*" (AASHTO, 1993), following the Alberta Transportation "*Pavement Design Manual*" (Government of Alberta, 1997). A summary of the design input parameters is presented in Table 2 below.

Table 2: Pavement Design Parameters

Design Life:	20 Years
Initial Serviceability:	4.2
Terminal Serviceability:	2.5

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Serviceability Loss:	1.7
Reliability:	85%
Overall Standard Deviation:	0.45
Drainage Coefficient – New Aggregate:	1.00
Subgrade Resilient Modulus (M_R):	50 MPa
Materials Layer Coefficients	
Asphalt Concrete:	0.40
Granular Base Course:	0.14

Structural Design

The Required Structural Number (SN_{REQ}) for a 20-year design life was calculated to be 67.

Recommendations

Based on the SN_{REQ} of 67, the recommended pavement structure for the Operations Centre parking lot is:

Remove all topsoil and organic / sand mixed material and prepare roadbed then place:

Material	**Layer Thickness (mm)**
Asphalt Concrete	50
Asphalt Concrete	50
Granular Base Course	200
Woven Geotextile	-
Total Structure:	**300**

This proposed structure has an Effective Structural Number (SN_{EFF}) of 68.

Asphalt Concrete Material Specifications

All asphalt concrete materials, mixture design, and mixture physical properties should comply with Alberta Transportation "*Standard Specifications for Highway Construction*" (Government of Alberta, 2013), Section 3.50.

The Asphalt Concrete Pavement (ACP) mixture and Asphalt Binder Grade conforms to Alberta Transportation "*Design Bulletin #13*", Revised March 2017 (Government of Alberta, 2017). The ACP mixture type used for the pavement structure recommendation is summarized in Table 3 below.

Table 3: ACP Mixture Type

Temperature Zone:	2
Design ESAL (millions):	0.13
Application Type:	New Construction
Mix Type:	L1

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Asphalt Binder Grade:	PG 52-34
Aggregate Gradation:	Designation 1, Classification 12.5 mm

Emulsified asphalt (tack coat) shall be applied to ensure a bond between the surface being paved and the next course. Alberta Transportation "*Standard Specifications for Highway Construction*" (Government of Alberta, 2013), Section 3.19.2, specifies that asphalt grades SS-1 or MS-1 may be used throughout the construction season. RC-30 or RC-70 are options for construction past August 31 each season. Emulsified asphalt (tack coat) shall confirm with emulsified asphalt specifications in Table ASPH-7.

Granular Materials Specifications

A well graded crushed granular material should be used as the base course. The granular base materials should be in conformance with Alberta Transportation "Standard Specifications for Highway Construction" (Government of Alberta, 2013), Table 3.2.3.1, 25 mm of Designation 2 Base Course Aggregates.

The twenty-five-millimeter (25 mm) granular material should be placed in one-hundred-millimeter (100 mm) lifts and;

Each lift should be compacted to one-hundred percent (100%) of Standard Proctor Maximum Dry Density (SPMDD).

Subgrade Preparation

Prior to construction it is recommended that all topsoil or organic mixtures be removed. Slopes should be a minimum of 2 %, or as required by the construction drawings.

A woven geotextile fabric (Nilex 2006 or approved equivalent) is recommended at the top of prepared subgrade to prevent the migration of fines from the subgrade into the pavement structure. The geotextile fabric should be installed in accordance with the manufacturer's recommendations.

Limitations

This memo documents work that was performed in accordance with generally accepted professional standards at the time. No other representations, warranties or guarantees are made concerning the accuracy or completeness of the data or conclusions contained within this memo, including no assurance that this work has uncovered all potential liabilities associated with the identified property.

All information received from the client or third parties in the preparation of this memo has been assumed by Stantec to be correct. Stantec assumes no responsibility for any deficiency or inaccuracy in information received from others. Recommendations made within this memo consist of Stantec's professional opinion as of the time of the writing of this memo and are based solely on the scope of work described in the memo, the limited data available and the results of the work. This memo should not be construed as legal advice.

Stantec has relied upon limited provided information, and the notable absence of a geotechnical site investigation providing in-situ conditions, subgrade strength, traffic loading information, and drainage

information. The geotechnical assumptions are made based on the general geographical location of the site. This report does not reflect variations that may become evident during the construction stage, at which time re-evaluation of the recommendations may be necessary. The cause(s) of the existing pavement structure's failure has not been determined.

REFERENCES

AASHTO. (1993). *AASHTO Guide for Design of Pavement Structures.* Washington: AASHTO.
Government of Alberta. (1997). *Pavement Design Manual.* Edmonton: Alberta Transportation.
Government of Alberta. (2013). *Standard Specifications for Highway Construction.* Edmonton: Alberta Transportation.
Government of Alberta. (2017). *Design Bulletin #13.* Edmonton: Alberta Transportation.

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