



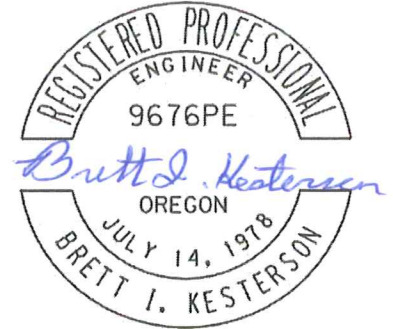
Calculation Book Report

Date: October 4, 2017

Technical Owner: Civil – Brett I. Kesterson, P.E.

Calculation Book No. 536 **Standard Drawing No.** P-536

Drawing Title: Driveway Connection Detail



Expires 06/30/2019

The following is the equivalent single angle load (ESAL) calculation for the 2-1/2-inch asphalt connection behind a driveway.



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The following is the equivalent single axle load (ESAL) calculation for the 4-inch concrete connection behind a driveway.



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The following is the flexural strength calculation for concrete that is designed for 3000psi compressive strength in 28 days using the ACPA recommended conversion.



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WinPAS

Pavement Thickness Design According to
1993 AASHTO Guide for Design of Pavements Structures
American Concrete Pavement Association

Flexible Design Inputs

Project Name: Driveway Connection, 2-1/2" ACC
Route: Anywhere
Location: City of Portland
Owner/Agency: Transportation
Design Engineer:

Flexible Pavement Design/Evaluation

Structural Number	0.88	Subgrade Resilient Modulus	3,000.00 psi
Total Flexible ESALs	1,000	Initial Serviceability	3.00
Reliability	50.00 percent	Terminal Serviceability	1.00
Overall Standard Deviation	0.45		

Layer Pavement Design/Evaluation

Layer Material	Layer Coefficient	Drainage Coefficient	Layer Thickness	Layer SN
Asphalt Cement Concrete	0.42	0.70	2.50	0.74
Graded Stone Base	0.10	0.70	2.00	0.14
			Σ SN	0.88

WinPAS

Pavement Thickness Design According to
1993 AASHTO Guide for Design of Pavements Structures
American Concrete Pavement Association

Rigid Design Inputs

Project Name: Driveway Connection, 4" PCC
Route: Anywhere
Location: City of Portland
Owner/Agency: Transportation
Design Engineer:

Rigid Pavement Design/Evaluation

Concrete Thickness	4.00 inches	Load Transfer Coefficient	3.20
Total Rigid ESALs	18,900	Modulus of Subgrade Reaction	149 psi/in.
Reliability	50.00 percent	Drainage Coefficient	0.70
Overall Standard Deviation	0.35	Initial Serviceability	3.00
Flexural Strength	478 psi	Terminal Serviceability	1.00
Modulus of Elasticity	3,250,000 psi		

Modulus of Subgrade Reaction (k-value) Determination

Resilient Modulus of the Subgrade 3,000.0 psi
Unadjusted Modulus of Subgrade Reaction 1 psi/in
Depth to Rigid Foundation 0.00 feet
Loss of Support Value (0,1,2,3) 0.0

Modulus of Subgrade Reaction	149 psi/in.
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/// STRENGTH CONVERTER ///

Strength (psi): English / Metric

Convert From:

Convert To:

CALCULATED RESULTS

English (psi)	Source
520	MEPDG
478	Mindess, Young, and Darwin; Raphael
411	ACI 318
478	ACI 330 *
438 to 548	Yoder and Witczak; Huang

*ACPA recommended conversion.

REFERENCES

- MEPDG, 'Guide for Mechanistic-Empirical Design of New and Rehabilitated Pavement Structures: Final Report - Part 2. Design Inputs - Part 2. Material Characterization,' NCHRP 1-37A, Mar 2004.
- Mindess, S., Young, J.F., and Darwin, D., 'Concrete,' 2nd Ed., 2003.
- ACI 318, 'Building Code Requirements for Structural Concrete and Commentary.'
- ACI 330, 'Guide for the Design and Construction of Concrete Parking Lots.'
- Yoder, E.J. and Witczak, M.W., 'Principles of Pavement Design,' 2nd Ed., 1975.

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