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PROJECT REPORT

Project Number: 17435B

Performance of Viacore AC 11 Resistance to Permanent Deformation - Triaxial Cyclic Compression Test (TCCT)

by

**Ass. Prof. Dipl.-Ing. Dr. techn.
Bernhard Hofko**

and

Ing. David Valentin

On behalf of
Österreichische Vialit GmbH
Josef-Reiter-Straße 78
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Vienna, August 2018

This report contains 5 pages and one annex with test reports.

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1. Contents of this Project

The Institute of Transportation, Research Center of Road Engineering, Vienna University of Technology was contracted by Österreichische Vialit GmbH, Josef-Reiter-Straße 78, A-5280 Braunau, represented by Mr. Thomas Schinkinger to carry out performance based tests for a Viacore AC 11.

The following tests have been conducted:

Test Method	Standard	Remarks
Production of asphalt mix slabs by steel segment compactor	EN 12697-33	
Dimensions of specimens	EN 12697-29	
Bulk density	EN 12697-6	SSD Method
Triaxial cyclic compression test	EN 12697-25	according EN 13108-20, table D.2, reference D.2.2

2. Materials and Specimen Production

For this project, asphalt mix samples of Viacore AC 11 were provided by the client in January 2018. Triaxial Cyclic Compression Tests (TCCT) were carried out.

For specimen production, the asphalt mix was homogenized in a laboratory mixer according to EN 12697-35 at room temperature with 3 M% of water. Subsequently, the loose mixture was conditioned in a metal pan for 24 h at room temperature and for another 5 h at 155°C in a heating cabinet. The mix was then compacted to slabs in a steel segment compactor. After another 24 h storage at room temperature, the slabs were cut and cored into specimens. Dimensions and bulk density of the specimens were determined before testing.

3. Asphalt Mix Test Results

3.1. Resistance to Permanent Deformation of Viacore AC 8 - TCCT

Figure 1 presents the results of the TCCT at a temperature of +50°C. The diagram shows the dynamic creep curve, which represents a link between cumulative, axial strain and the number of load cycles. Each single test is marked in a different color, as well as mean value and standard deviation in black.

The tests resulted in a mean creep rate f_c of 0.4. This corresponds to a category $f_{c \max 0,4}$ according to EN 13108-1.

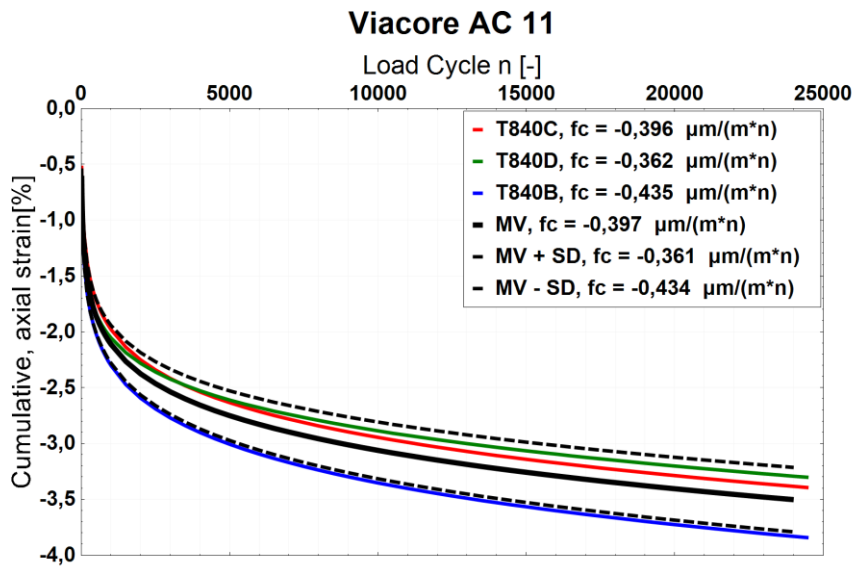



Figure 1: TCCT results of Viacore AC 11


Ass. Prof. DI Dr. Bernhard Hofko
Head of Laboratory

Vienna, August 2018


Ing. David Valentin
Project Manager

APPENDIX

Project Number: 17435B

This Annex contains all test reports.

Test report: bulk density, dimensions, space density and voids content
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Client	Österreichische Vialit GmbH
Date	22.06.2018
Project	17435
Project manager	David Valentin
Tested by	David Valentin
	-
Standard	EN 12697-6, edition 2012

Sample information

Asphalt mixture	Viacore AC 11	Lab Code	AS1210
Asphalt sample	Viacore AC 11	Laboratory ID	A688
Origin	Österreichische Vialit GmbH		

Results

Bulk density of the mixture			
Bulk density [Mg/m³]	2,5	Test method	A - Volumetric method
Test temperature [°C]	-	Test liquid	air-free water

Specimen	Height [mm]	Diameter [mm]	Weight dry [g]	Space density Method B [Mg/m³]	Voids content [V%]
T840A	196,6	100,0	3687,1	2,386	
T840B	196,7	100,0	3693,1	2,388	
T840C	197,2	100,1	3698,5	2,386	
T840D	196,5	100,0	3669,0	2,378	

**Test Report: Resistance to Permanent Deformation - Triaxial
 Cyclic Compression Test (TCCT)**
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Client	Österreichische Vialit GmbH
Date	10.07.2018
Project	17435
Project Manager	David Valentin
Tester	Daniel Maschauer
Standard	EN 12697-25, Version 2005

Sample Data

Lab Code	T840B	Production	Produced in lab
Asphalt	AS1210 Viacore AC 11		
Diameter	100,0 mm	Bulk density	2,388 Mg/m ³
Initial height	196,7 mm	Air void content	

Device data

Device	Servohydraulische Prüfmaschine LFV 63/50		
Software	GEOSys 8.7.8.2	Test Program	EN_TCCT_Pruefvorschrift_110701

Test Settings

Test Temperature	50 °C		
Axial Loading	sinusoidal	Confining Pressure	constant
Frequency	3 Hz	Confinement	150 kPa
Axial Amplitude	300 kPa		

Test Results
Cumulative, axial strain after 10000 load cycles (recorded)

$$\epsilon_{\text{axial}} = -3,34 \%$$

Creep Rate f_c

$$\epsilon_n = A_1 + B_1 * n$$

$$A_1 = 2,897$$

 Regression between
 LC 6000 and LC 20000

$$B_1 = -0,0000435$$

$$f_c = B_1 * 10^4 = -0,435 \mu\text{m}/(\text{m} * \text{n})$$

Determination of parameter B and $\epsilon_{1000, \text{calc}}$

$$\epsilon_n = A * n^B$$

$$A = 0,625$$

 Regression between
 LC 10 and LC 25500

$$B = 0,182$$

$$\epsilon_{1000, \text{calc}} = A * 1000^B =$$

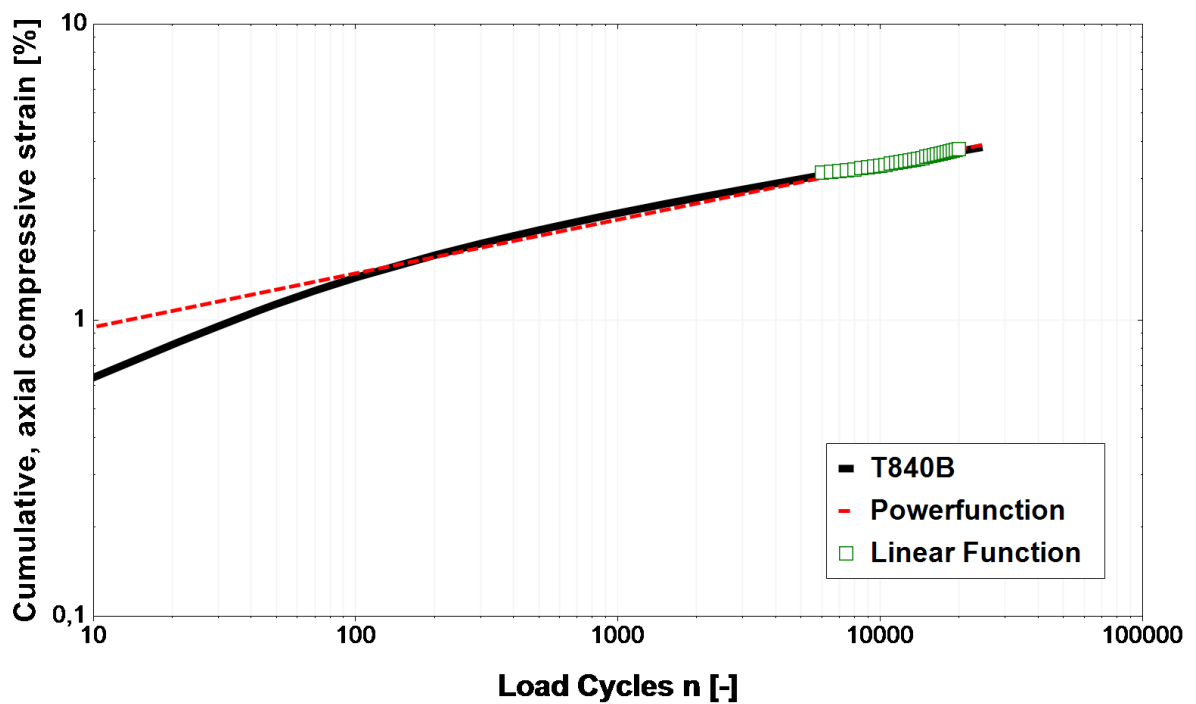
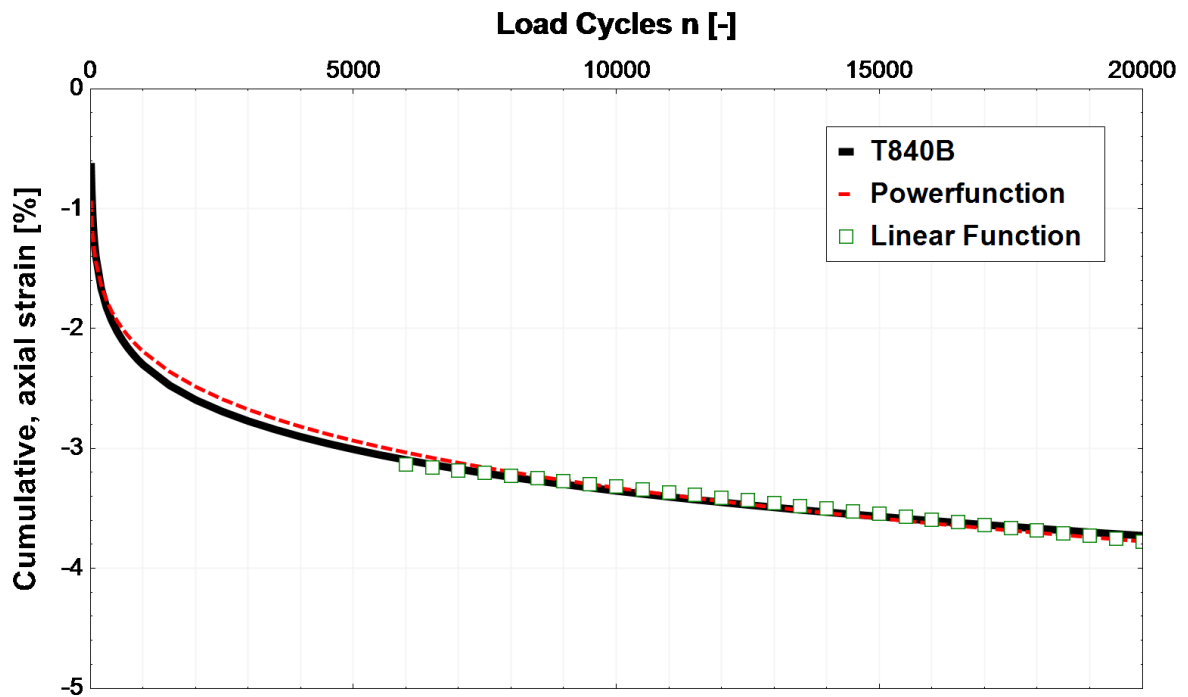
$$2,19 \%$$
 at LC 1000

$$\epsilon_{10000, \text{calc}} = A * 10000^B =$$

$$3,33 \%$$
 at LC 10000

Remarks:

TestResults



**Test Report: Resistance to Permanent Deformation - Triaxial
 Cyclic Compression Test (TCCT)**
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Client	Österreichische Vialit GmbH
Date	09.07.2018
Project	17435
Project Manager	David Valentin
Tester	Bernhard Hadler
Standard	EN 12697-25, Version 2005

Sample Data

Lab Code	T840C	Production	Produced in lab
Asphalt	AS1210 Viacore AC 11		
Diameter	100,1 mm	Bulk density	2,386 Mg/m ³
Initial height	197,2 mm	Air void content	

Device data

Device	Servohydraulische Prüfmaschine LFV 63/50		
Software	GEOSys 8.7.8.2	Test Program	EN_TCCT_Pruefvorschrift_110701

Test Settings

Test Temperature	50 °C		
Axial Loading	sinusoidal	Confining Pressure	constant
Frequency	3 Hz	Confinement	150 kPa
Axial Amplitude	300 kPa		

Test Results
Cumulative, axial strain after 10000 load cycles (recorded)

$$\epsilon_{axial} = -2,93 \%$$

Creep Rate f_c

$$\epsilon_n = A_1 + B_1 * n$$

$$A_1 = 2,531$$

 Regression between
 LC 6000 and LC 20000

$$B_1 = -0,0000396$$

$$f_c = B_1 * 10^4 = -0,396 \mu\text{m}/(\text{m} * \text{n})$$

Determination of parameter B and $\epsilon_{1000,calc}$

$$\epsilon_n = A * n^B$$

$$A = 0,501$$

 Regression between
 LC 10 and LC 25500

$$B = 0,191$$

$$\epsilon_{1000,calc} = A * 1000^B =$$

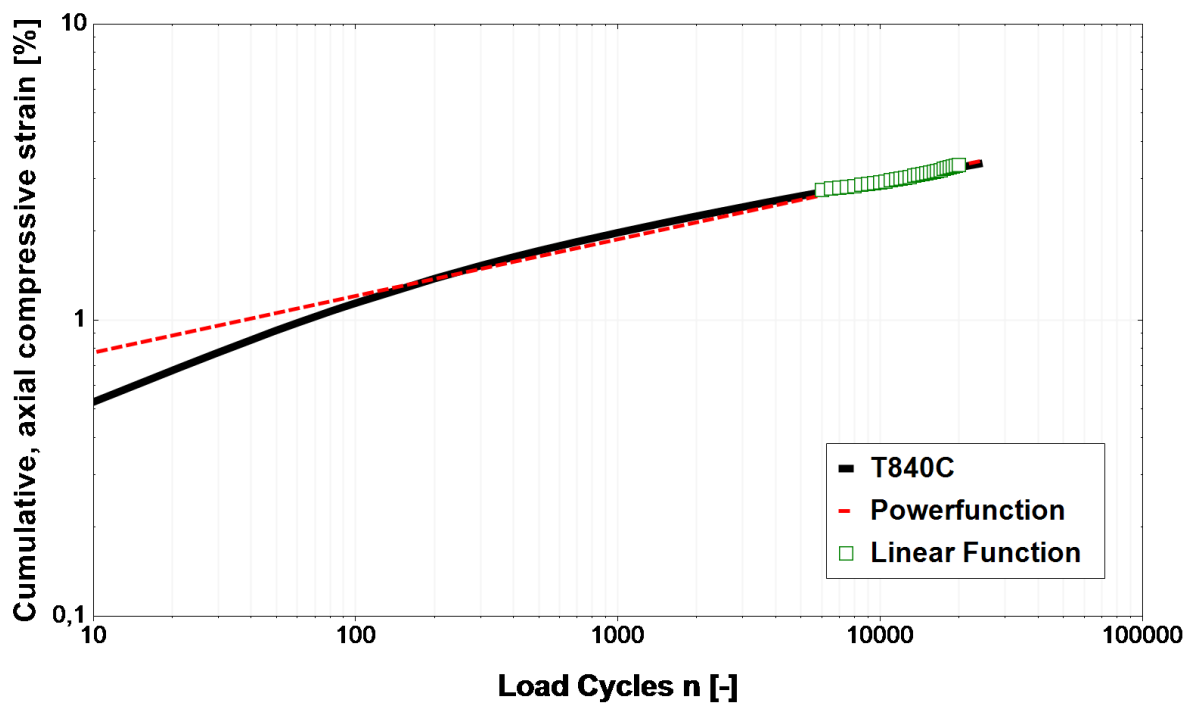
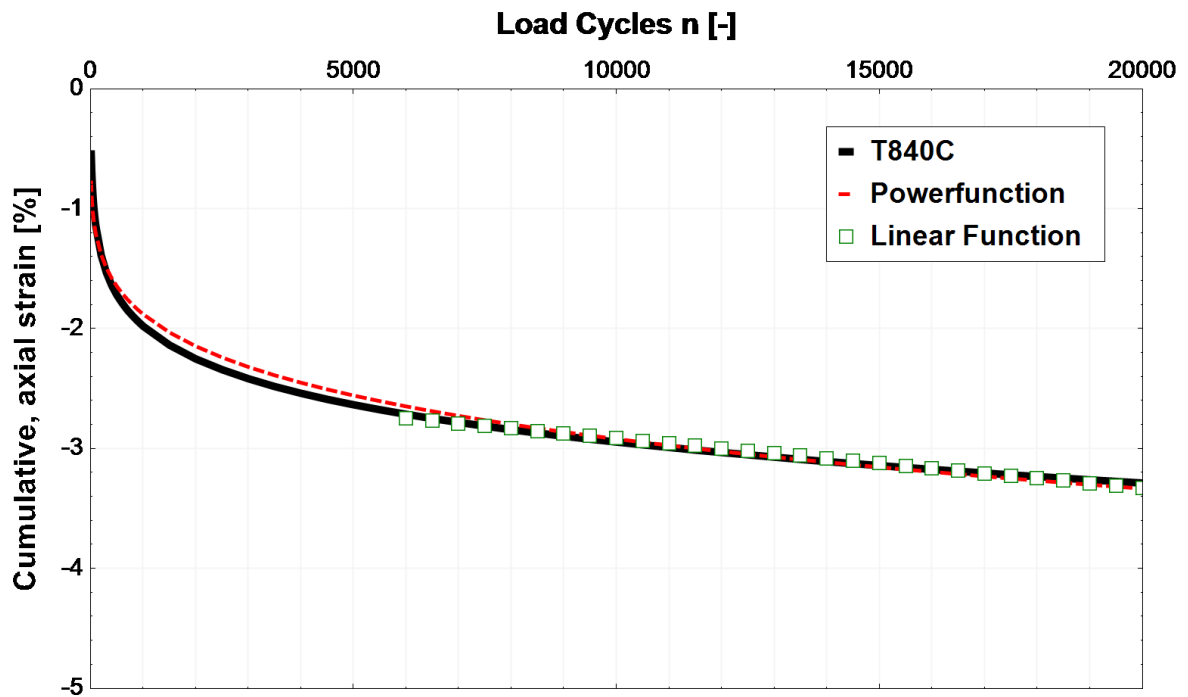
$$1,88 \% \text{ at LC 1000}$$

$$\epsilon_{10000,calc} = A * 10000^B =$$

$$2,92 \% \text{ at LC 10000}$$

Remarks:

TestResults



**Test Report: Resistance to Permanent Deformation - Triaxial
 Cyclic Compression Test (TCCT)**
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Client	Österreichische Vialit GmbH
Date	16.07.2018
Project	17435
Project Manager	David Valentin
Tester	David Valentin
Standard	EN 12697-25, Version 2005

Sample Data

Lab Code	T840D	Production	Produced in lab
Asphalt	AS1210 Viacore AC 11		
Diameter	100,0 mm	Bulk density	2,378 Mg/m ³
Initial height	196,5 mm	Air void content	

Device data

Device	Servohydraulische Prüfmaschine LFV 63/50		
Software	GEOSys 8.7.8.2	Test Program	EN_TCCT_Pruefvorschrift_110701

Test Settings

Test Temperature	50 °C		
Axial Loading	sinusoidal	Confining Pressure	constant
Frequency	3 Hz	Confinement	150 kPa
Axial Amplitude	300 kPa		

Test Results
Cumulative, axial strain after 10000 load cycles (recorded)

$$\epsilon_{axial} = -2,89 \%$$

Creep Rate f_c

$$\epsilon_n = A_1 + B_1 * n$$

$$A_1 = 2,509$$

 Regression between
 LC 6000 and LC 20000

$$B_1 = -0,0000362$$

$$f_c = B_1 * 10^4 = -0,362 \mu\text{m}/(\text{m} * \text{n})$$

Determination of parameter B and $\epsilon_{1000,calc}$

$$\epsilon_n = A * n^B$$

$$A = 0,624$$

 Regression between
 LC 10 and LC 25500

$$B = 0,166$$

$$\epsilon_{1000,calc} = A * 1000^B =$$

$$1,96 \% \text{ at LC 1000}$$

$$\epsilon_{10000,calc} = A * 10000^B =$$

$$2,88 \% \text{ at LC 10000}$$

Remarks:

TestResults

