INSTITUT IGH
DEPARTMENT FOR MATERIALS AND STRUCTURES
Laboratory for Roads
Laboratory for Asphalt and Bitumen
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Working order 82012985

TEST REPORT No. 72563-3102/17

Client:	**BECHTEL ENKA GP**
Contract/purchase order:	**2-2152-1-12985/14**
Construction product:	**SMA 16 + 50/70 + TecRoad polymer additive**
Traffic load:	**Highways**
Tested property:	**Resistance to fatigue**
Date of test report:	**2017-10-16**

Test Overseer:
Jasna Putrić Brkić, B.Sc.

Head of Laboratory for Asphalt and Bitumen:
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1 SPECIMEN DATA

Type of Asphalt mixture:	SMA 16 + 50/70 + TecRoad polymer additive
Mix design mark:	-; samples taken from Gencor Asphalt Plant
Place of asphalt specimen preparation:	Institut IGH, Laboratory for Asphalt and Bitumen
Method of asphalt mixture preparation:	EN 12697-35:2016
Method of specimen compaction:	EN 12697-33:2003+A1:2007
Date of asphalt mixture preparation and specimen compaction:	2017-09-12
Time of specimen´s storage prior testing:	since 2017-09-12 till 2017-10-04
Storage conditions:	(21 ± 2)°C
Specimen laboratory identification number:	17-2450
Number of test specimens:	18 prismatic test specimens, sawed from asphalt plate prepared in laboratory

2 TEST DATA

Test standard:	EN 12697-24:2012 Bituminous mixtures - Test methods for hot mix asphalt - Part 24: Resistance to fatigue; Annex D (4PB-PR)
Used equipment:	Servo pneumatic universal test device CRT-SA4PT-BFAT
Test temperature:	(20 ± 0,5) °C
Date of test beginning:	2017-10-04
Date of test finishing:	2017-10-16

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3 TEST RESULTS

3.1 Determination of density of asphalt test specimens (EN 12697-6:2012; procedure B)

Table 1. Results of test specimens density determination

Specimen identification	Specimen height, h	Specimen width, b	Specimen length L_s	Mass of dry specimen, m_1	Specimen density, ρ_{bssd}
	[mm]	[mm]	[mm]	[g]	[Mg/m^3]
17-2450/1	49,4	48,4	400,3	2646,6	2,789
17-2450/2	49,1	48,9	400,2	2628,6	2,788
17-2450/3	49,3	48,8	400,2	2646,9	2,790
17-2450/4	49,2	48,4	400,1	2630,6	2,790
17-2450/5	49,3	48,7	400,0	2648,9	2,788
17-2450/6	51,4	48,5	400,1	2738,6	2,789
17-2450/7	51,1	48,4	399,7	2619,2	2,780
17-2450/8	48,9	48,6	399,8	2728,7	2,787
17-2450/9	49,1	47,8	399,8	2600,2	2,792
17-2450/10	49,5	48,6	400,2	2594,3	2,788
17-2450/11	48,9	49,0	399,9	2644,3	2,782
17-2450/12	49,2	49,1	399,9	2637,0	2,788
17-2450/13	49,0	48,7	400,0	2650,3	2,781
17-2450/14	48,9	48,6	400,2	2602,9	2,789
17-2450/15	49,1	48,2	400,2	2612,6	2,780
17-2450/16	48,6	48,6	400,1	2600,7	2,774
17-2450/17	48,9	48,3	400,0	2582,0	2,778
17-2450/18	49,2	48,0	399,9	2612,3	2,781

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3.2 Determination of air voids content of asphalt test specimens (EN 12697-8:2003)

Table 2. Results of test specimens air voids content determination

Specimen identification	Specimen density, ρ_{bssd}	Maximum density of bituminous mixtures	Air void content
	[Mg/m^3]	[Mg/m^3]	V_m [%(v/v)]
17-2450/1	2,789	2,845	2,0
17-2450/2	2,788	2,845	2,0
17-2450/3	2,790	2,845	2,0
17-2450/4	2,790	2,845	2,0
17-2450/5	2,788	2,845	2,0
17-2450/6	2,789	2,845	2,0
17-2450/7	2,780	2,845	2,3
17-2450/8	2,787	2,845	2,1
17-2450/9	2,792	2,845	1,9
17-2450/10	2,788	2,845	2,0
17-2450/11	2,782	2,845	2,3
17-2450/12	2,788	2,845	2,0
17-2450/13	2,781	2,845	2,3
17-2450/14	2,789	2,845	2,0
17-2450/15	2,780	2,845	2,3
17-2450/16	2,774	2,845	2,6
17-2450/17	2,778	2,845	2,4
17-2450/18	2,781	2,845	2,3

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3.3 Determination of resistance to fatigue by four point bending test on prismatic specimens (EN 12697-24; Annex D)

Table 3. Test parameters

Loading mode:	Constant deflection mode
Set of specimen deformation:	180 με; 200 με; 350 με
Loading frequency:	30 Hz
Test temperature:	(20 ± 0,3)°C
Specimen acclimatisation time:	4 h
Mass of the movable parts of the equipment:	8100 g
Failure criteria:	50 % stifness decrease

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Table 4. Measured results and calculated values of resistance of fatigue

Specimen identification	Strain level	Average number of cycles	Standard deviation	Natural logarithm of cycles number	Natural logarithm of strain	Slope of the fatique line	Initial strain at the 10^6 cycles	Confidence interval relative to Q	Estimation of the standard deviation
	ε [με]	N	S_N	ln (N)	ln (ε) [με]	p	ε_6 [με]	$\Delta\varepsilon_6$ [με]	$S_{x/y}$ [ln N]
17-2450	180	1133105	174556	13,93	5,193	-6,169	**176**	4,47	0,41
	200	394662	218083	12,75	5,298				
	350	15066	3176	9,60	5,857				

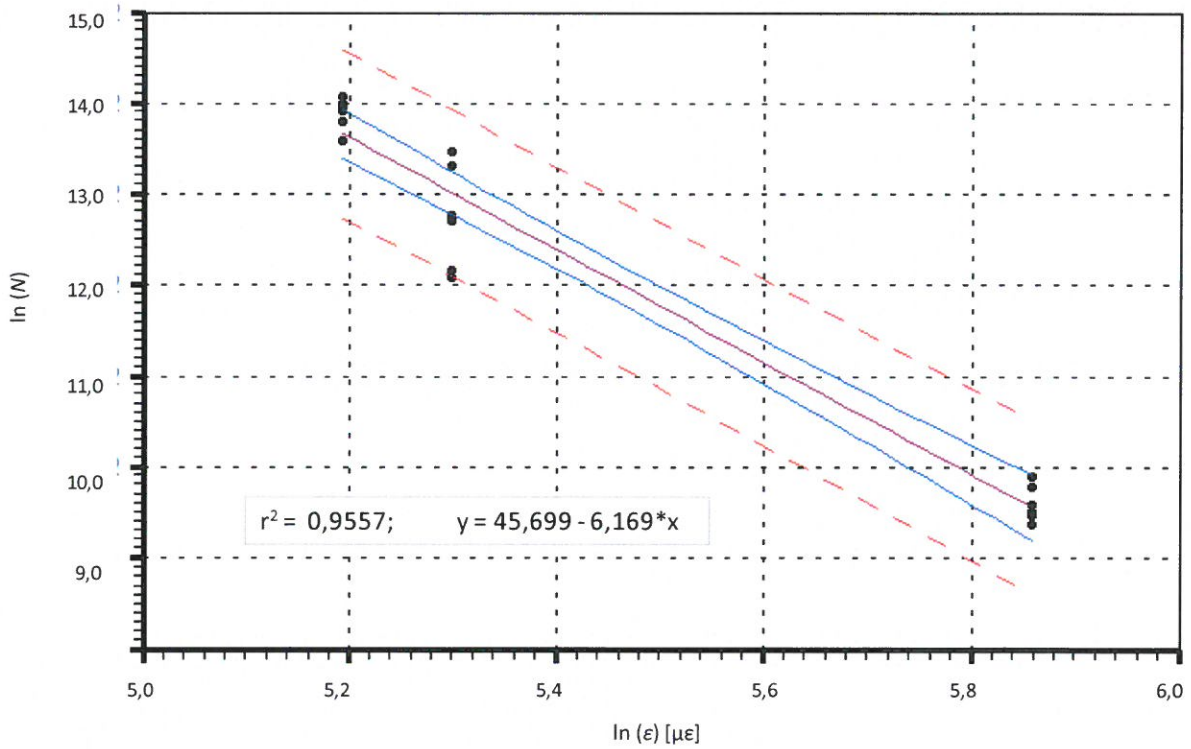

Figure 1. Fatigue line