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Test Report

on

Indirect Tension Test for

Resilient Modulus of Conventional and Chemcrete Modified Bituminous Mixtures

Cored From The Yong Peng (South) Interchange of The North-South Interurban Toll Expressway 1 1/2 Years After Construction

For

Hume Quarries Sdn Bhd

Prepared by

Radin Umar Radin Sohadi
Department of Civil and Environmental Engineering
Universiti Pertanian Malaysia

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1.0 Introduction

The Indirect Tension Test for Resilient Modulus of Bituminous Mixtures was carried out based on ASTM D 4123 (1987). The Australian Standard Test Method drafted by the National Asphalt Research Committee, Australia was also referred for the above tests.

2.0 Equipment

The tests were conducted using the following equipments:

1. IPC Material Testing Apparatus (MATTA)
2. IPC Data Logger and Microcomputer
3. Temperature Control Chamber (20 - 60 Celcius)

Details of test equipments are shown in Appendix 1.

3.0 Specimen

The specimens tested were cored by Pavetech Sdn. Bhd. from the asphaltic concrete binder course in Yong Peng (South) Interchange, of North-South Interurban Toll Expressway(Package 12B-1) eighteen months after construction. Pavetech Sdn. Bhd. have been engaged by Hume Quarries Sdn. Bhd., the supplier of the Chemcrete Modifier in Malaysia, to conduct a falling weight deflectometer (FWD) analysis as a means of assessing the structural properties of the conventional and Chemcrete modified asphalt pavements in this location. The resilient modulus results obtained in this report will form part of the analysis undertaken by Pavetech Sdn. Bhd. A total of four samples containing Chemcrete modifiers and four samples of conventional asphaltic concrete

material were provided for the test. The conventional asphaltic concrete samples were marked A, B, C , D while the Chemcrete modifiers samples were designated as E, G H and K.

4.0 Experimental Procedures

The resilient modulus test involves the application and the measurement of a stress and measurement of the resultant displacement and hence strain. The test specimens were carefully placed into the MATTA 150 mm tensile jig. The built-in MATTA (UMATTA ver.3) software was then used to set up the test parameters to the required temperature, loading duration, preconditioning pulses, frequency and pulse rate, dimensions, Poisson ratio etc. After preconditioning the samples, the tests were then executed and the applied stress and strain for an additional of five typical test cycles were measured and logged on the microcomputer. The tests were carried out at 25° , 40° C and 55° C with a tolerence of 0.5°C. Since the tests are rather sensitive to specimen temperatures, both skin and core temperature were measured to the nearest 0.5 degree Celcius. The resilient modulus of each specimen was then determined automatically by dividing the stress by the strain in accordance with the formulae set forth in the applicable testing procedure.

5.0 Results

6.1. Resilient Modulus at 25°C

The resilient modulus at 25 degree Celcius obtained for the supplied specimens are as follows:

Specimen Designation	Temperature (Degree C)	Resilient Modulus (MPa) 0.33Hz	0.5Hz	1.0Hz	Mean
A	25	5106	4929	5037	5024
B	25	4434	4403	4600	4479
C	25	4242	4379	5674	4765
D	25	5294	4880	5350	5175
Mean	25	4769	4648	5165	4861
E	25	9746	9979	9110	9612
G	25	8519	8955	8760	8745
H	25	9688	9623	8999	9437
K	25	8343	8820	9103	8755
Mean	25	9074	9344	8993	9137

6.2. **Resilient Modulus at 40°C**

The resilient modulus at 40 degree Celcius obtained for the supplied specimens are as follows:

Specimen Designation	Temperature (Degree C)	Resilient Modulus (MPa) 0.33Hz	0.5Hz	1.0Hz	Mean
A	40	2290	2172	2363	2275
B	40	1722	1376	2232	1777
C	40	1235	1674	1494	1468
D	40	1612	1558	1758	1643
Mean	40	1715	1695	1962	1791
E	40	4434	5256	4190	4627
G	40	5197	4722	5521	5147
H	40	4022	4328	4263	4204
K	40	3627	3459	3372	3486
Mean	40	4320	4441	4337	4366

6.3 Resilient Modulus at 55°C

The resilient modulus at 55 degree Celcius obtained for the supplied specimens are as follows:

Specimen Designation	Temperature (Degree C)	Resilient Modulus (MPa) 0.33Hz	0.5Hz	1.0Hz	Mean
A	55	623	560	569	584
B	55	623	477	667	589
C	55	461	581	437	493
D	55	588	556	658	601
Mean	55	575	544	583	567
E	55	2127	1925	2083	2045
G	55	2180	2607	1549	2112
H	55	2498	2359	2145	2334
K	55	1433	2367	1235	1678
Mean	55	2060	2315	1753	2042

Details of the individual test results are in Appendix 2A,B and C for 25, 40 and 55°C respectively.

7.0 Conclusion

The mean values of resilient modulii for the control specimens are 4,861, 1,791 and 567 MPa at 25, 40 and 55 ° C respectively. The mean values of resilient modulii for specimens modified with Chemcrete modifiers are 9,137, 4,366 and 2,042 MPa at 25, 40 and 55° C of respectively. The values of resilient modulii for specimens with Chemcrete modifiers range from about twice the values of conventional specimens at 25 ° C up to more than 3.5 times the control specimens at 55 ° C. Furthermore, the modulus values of the Chemcrete specimens cored from the pavement 18 months after construction show good agreement with the modulus values obtained previously from Chemcrete modified asphal-

tic concrete binder course materials sampled loosed condition at the time of construction of this project and later compacted in the laboratory (See Radin, March 1993) .