

MATERIALS, MIX DESIGN & LAB EQUIPMENT

1.1 AGGREGATE TEST RESULT (Annually by an independent laboratory).

COARSE AGGREGATE (KLAUSA 4.3.3.2 (a) JKR/SPJ)			
Test		Specification	Test Method
1.	Nilai lelasan Los Angeles (Los Angeles abrasion)	< 25 %	ASTM C131
2.	Ketahanan Magnesium Sulfat (magnesium sulphate soundness)	< 18%	AASHTO T104 / ASTM C88
3.	Index kepingan (flakiness index)	< 25%	MS30
4.	Serapan air (Water absorption)	< 2%	MS30
5.	Nilai penggilapan batu (polished stone value: wearing coarse sahaja)	> 40	MS30

FINE AGGREGATE (KLAUSA 4.3.3.2 (a) JKR/SPJ)			
Test		Specification	Test Method
1.	Sand equivalent value (passing 4.75mm)	> 45%	ASTM D2419
2.	Kepersegian agregat halus (fine aggregate angularity)	> 45%	ASTM C1252
3.	Methylene blue value	< 10mg/g	Ohio DOT
4.	Ketahanan magnesium sulfat (magnesium sulphate soundness)	< 20%	AASHTO T104 / ASTM C88
5.	Serapan air (Water absorption)	< 2%	MS30 / ASTM C127 / 128

1.2 BITUMEN TEST RESULTS (Annually by an independent laboratory).

BITUMEN TEST (KLAUSA 4.3.3.2 (c) JKR/SPJ)			
<i>Gred piawai bitumen yang digunakan di Malaysia adalah 60-70 & 80-100 dan mematuhi MS124</i>			
Test		Specification	
		PG 60-70	PG 80-100
1.	**Penusukan (penetration), 77 °F @ 25 °C, 100g, 5 s, dmm	60-70 mm	80-100 mm
2.	**Titik lembut (softening point), °C	48– 56 °C	45 – 52 °C
3.	Kebolehlarutan di dalam Trichloroethylene (solubility in Trichloroethylene), %	Min 99.0%	Min 99.0%
4.	Kemuluran (ductility), 5 cm/minutes, cm	Min 100 cm	Min 100 cm
5.	**Titik kilat (flash point), °C	Min 250 °C	Min 225 °C
6.	Pengekalan penusukan selepas ketuhar selaput nipis (retained penetration after thin film oven), %	Min 52%	Min 47%
7.	Penurunan penusukan selepas pemanasan (drop in penetration after heating), %	Loss on heating: max 0.2% Drop in penetration after heating: max 20%	Loss on heating: max 0.5% Drop in penetration after heating: max 20%

**** Setiap asphalt premix plant perlu menjalankan ujian tersebut (dan direkod) selepas menerima bitumen sebaik sahaja lori bitumen tiba di plant. Keputusan ujian perlulah mematuhi spesifikasi dan sepertimana yang dinyatakan di dalam Certificate of Quality (COQ) daripada pembekal bitumen.**

*****Perlu sertakan setiap rekod terdahulu bagi ujian ** yang dijalankan di makmal asphalt premix plant dan disahkan oleh Pengurus Asphalt Premix Plant dan COQ yang diterima dari pembekal**

P/S: Arahan KPKR menyatakan bahawa penggunaan PG80-100 adalah tidak dibenarkan untuk jalan di bawah seliaan JKR.

1.4 BINDER CONTENT, AGGREGATE GRADATION & MARSHALL TEST RESULT

- Binder Content (Table 4.3.4 JKR/SPJ)

TABLE 4.3.4: DESIGN BITUMEN CONTENTS

AC 10 - Wearing Course	5.0 - 7.0%
AC 14 - Wearing Course	4.0 - 6.0 %
AC 28 - Binder Course	3.5 - 5.5%

- Aggregate Gradation (Table 4.3.3 JKR/SPJ)

TABLE 4.3.3 GRADATION LIMITS FOR ASPHALTIC CONCRETE

Mix Type	Wearing Course	Wearing Course	Binder Course
Mix Designation	AC 10	AC 14	AC 28
BS Sieve Size (mm)	Percentage Passing by Weight		
28.0			100
20.0		100	72 - 90
14.0	100	90 - 100	58 - 76
10.0	90 - 100	76 - 86	48 - 64
5.0	58 - 72	50 - 62	30 - 46
3.35	48 - 64	40 - 54	24 - 40
1.18	22 - 40	18 - 34	14 - 28
0.425	12 - 26	12 - 24	8 - 20
0.150	6 - 14	6 - 14	4 - 10
0.075	4 - 8	4 - 8	3 - 7

- Marshall Test (Table 4.3.5 JKR/SPJ)

TABLE 4.3.5: TEST AND ANALYSIS PARAMETERS

Parameter	Wearing Course	Binder Course
Stability, S	> 8000 N	> 8000 N
Flow, F	2.0 - 4.0 mm	2.0 - 4.0 mm
Stiffness, S/F	> 2000 N/mm	> 2000 N/mm
Air voids in mix (VIM)	3.0 - 5.0%	3.0 - 7.0%
Voids in aggregate filled with bitumen (VFB)	70 - 80%	65 - 75%

Penentuan kandungan *Binder Content* perlu mengambil kira lima (5) nilai kandungan dibawah dan diplotkan di dalam graf:

- | | |
|--|---|
| i) Graf <i>Bulk SG vs Bitumen Content</i> | - Nilai puncak lengkungan graf |
| ii) Graf <i>Stability vs Bitumen Content</i> | - Nilai puncak lengkungan graf |
| iii) Graf <i>Flow vs Bitumen Content</i> | - Aliran (<i>flow</i>) = 3mm |
| iv) Graf <i>VFB vs Bitumen Content</i> | - Nilai 75% untuk <i>wearing course</i> |
| | - Nilai 70% untuk <i>binder course</i> |
| v) Graf <i>VIM vs Bitumen Content</i> | - Nilai 4% untuk <i>wearing course</i> |
| | - Nilai 5% untuk <i>binder course</i> |

- Tolerances Asphalt (Table 4.3.6 JKR/SPJ)

Asphalt dengan gredan agregat dan/atau kandungan bitumen yang tersasar dari toleransi, walaupun masih dalam had yang ditetapkan dalam Jadual 4.3.3 dan 4.3.4 sepatutnya dianggap tidak mematuhi Job Mix Formula (JMF) dalam kerja penurapan.

JMF perlu ditunjukkan di dalam setiap *Design Mix / Plant Trial / Trial Lay*

TABLE 4.3.6: TOLERANCES FOR ASPHALTIC CONCRETE MIXES

Parameter	Permissible Variation % by Weight of Total Mix
Bitumen content	$\pm 0.2 \%$
Fractions of combined aggregate passing 5.0 mm and larger sieves	$\pm 5.0 \%$
Fractions of combined aggregate passing 3.35 mm and 1.18 mm sieves	$\pm 4.0 \%$
Fractions of combined aggregate passing 425 μm and 150 μm sieves	$\pm 3.0 \%$
Fractions of combined aggregate passing 75 μm sieve	$\pm 2.0 \%$

4.4 LABORATORY TEST EQUIPMENT **(Calibrated annually)**

Oven
(Temperature)



Balance
(Weight)



Marshall Stability Test
(Dial Gauge & Proving Ring)



Water bath
(Temperature)



Penetrometer
(Dial Gauge)

