AUDIT KUARI

Audit Kuari

Bagi menambahbaik kualiti kerja menurap jalan, auditan ke atas kuari telah mula dijalankan sejak penghujung tahun 2011 bagi memastikan kuari yang membancuh dan membekalkan asphalt bagi kerja penurapan jalan mematuhi spesifikasi JKR sepenuhnya. Ini akan disusuli dengan auditan ke atas *trial lay*, sebelum auditan semasa kerja penurapan sedang dijalankan dan auditan ke atas kerja penurapan yang telah siap dilaksanakan.

Bagi menyeragamkan pelaksanaan auditan kuari, senarai semak disediakan berpandukan **Klausa 4.3.3.4. JKR/SPJ.** Antara perkara yang disenaraikan ialah:

1. Sumber bitumen diluluskan dan diuji terlebih dahulu di *independent lab* yang dilantik oleh kuari berdasarkan MS 124.

2. Sumber agregat kasar dan agregat halus diluluskan dan diuji terlebih dahulu di *independent lab* yang dilantik oleh kuari berdasarkan **JKR/SPJ**.

Nota: ***JKR/SPJ*** *merujuk kepada Standard Specification For Road Works JKR/SPJ/2008-S4 Flexible Pavement.*

3. Agregat halus (fine aggregate) ditutup dengan penutup kalis air.

- Permukaan agregat halus hendaklah kering sepenuhnya sebelum digaul dengan bitumen. Permukaan batu yang lembap semasa dibalut dengan bitumen akan menyebabkan *stripping* dan menjejaskan daya tahan *asphalt*.
- Selain itu, ianya juga dapat menjimatkan bahan bakar semasa proses pemanasan dan pengeringan agregat.

4. Rekabentuk campuran (mix design) disediakan dan diluluskan oleh Pegawai Penguasa (S.O.).

- Bagi setiap jenis *asphalt* yang digunakan dalam kerja penurapan, kontraktor perlu menyediakan rekabentuk campuran. Pemilihan gredan agregat semasa menyediakan rekabentuk campuran mestilah selari dengan keupayaan *hot bin (batch plant)* atau *cold bin (drum mix plant)* dalam menghasilkan gredan tersebut. Penetapan *job mix formula* selepas *trial lay* semestinya mendapat kelulusan S.O.
- Kelulusan S.O. ke atas *job mix formula* perlu dipatuhi sepenuhnya oleh kontraktor dalam menghasilkan *asphalt* dengan gredan agregat dan kandungan bitumen yang tepat dalam lingkungan toleransi yang ditetapkan dalam **JKR/SPJ**.

5. Makmal perlu dilengkapi dengan peralatan ujian bitumen *penetration, flash point,* dan *ring and ball softening point,* bagi membolehkan pihak kuari menjalankan sendiri ujian ke atas bitumen yang dibeli dan tidak hanya bergantung kepada *Certificate of Quality* (COQ) yang diperolehi dari pembekal bitumen. Kualiti bitumen mungkin telah terjejas semasa diangkut dari loji penapis minyak ke kuari-kuari di serata negara.

6. Makmal perlu dilengkapkan dengan peralatan ujian *tack coat* bagi menentukan kandungan bitumen (gred *bitumen emulsion*).

7. Kuari perlu ada tidak kurang 10 unit 25 kg *test weights* bagi memeriksa dan membuat kalibrasi yang sewajarnya ke atas *weight box/hopper/bucket*.

- Dengan adanya *test weights* ini, pihak kuari akan dapat membuat pemeriksaan ke atas ketepatan *weight box/hopper/bucket* dari semasa ke semasa dan tidak hanya menjalankan kalibrasi setiap tahun. Dalam tempoh 12 bulan selepas kalibrasi oleh pihak ketiga, ketepatan *weight box/hopper/bucket* mungkin telah terjejas tanpa disedari oleh pihak kuari.

8. *Aggregate screen* dalam keadaan baik.

- *Screen* bagi menapis *hot aggregate* (bagi *batch plant*) dan *cold aggregate* (bagi *drum mix plant*) sewajarnya tidak bocor bagi menghasilkan *asphalt* dengan gredan agregat yang tepat.

9. Ruang di antara *paddle blades* dengan dinding dalam *pugmill* tidak lebih dari 20 mm.

- Sekiranya ruang di antara *paddle blades* dengan dinding dalam *pugmill* lebih daripada pada 20 mm, sebahagian agregat dan bitumen yang terperangkap dalam ruang itu tidak akan dibancuh dengan sebati.

10. Jangka suhu dipasang pada tangki bitumen.

- Suhu bitumen yang disimpan dalam tangki perlu dikawal agar tidak melebihi 350 ˚F (177 ˚C) yang akan menjejaskan kualiti bitumen.

Berdasarkan senarai semak kerja tersebut, kuari adalah layak membekalkan *asphalt* bagi kerja penurapan jalan sekiranya semua item mandatori dipatuhi. Walau bagaimanapun, kuari terbabit perlu mengambil tindakan yang sewajarnya ke atas perkara-perkara yang tidak dipatuhi sekiranya salah satu item mandatori tidak dipatuhi sebelum dapat disahkan layak menghasilkan *asphalt* bagi kerja penurapan jalan.

ASPHALT PLANT CHECKLIST (DRUM MIX)

Asphalt Plant :.....

Date :.....

No.	ACTIVITIES	YES	NO
1	**PAST RECORDS**		
	• Aggregate approval/test results.		
	• Bitumen approval/test results.		
	• Mix design approval (including trial lay).		
	• Binder content, aggregate gradation& Marshall test results. *Note: One (1) test for every 200 tonne asphalt.*		
2	**BITUMEN**		
M	• Source of bitumen approved. *Note: Bitumen fully tested at independent lab based on MS 124 and all results were passed*		
M	•Equipped with the following laboratory test apparatus; > Penetration > Ring & Ball Softening Point > Flash Point		
3	**AGGREGATES & COLD BINS**		
M	• Source of coarse aggregate approved. *Note: Coarse aggregate fully tested at independent lab based on JKR/SPJ/2008 and all results were passed.*		
M	•Source of fine aggregate approved. *Note: Fine aggregate fully tested at independent lab based on JKR/SPJ/2008 and all results were passed*		
M	•Each aggregate stored in a separate stockpile.		
M	•Stockpiles of fine aggregate are kept dry using waterproof covers.		
M	•Each aggregate stored in a separate cold bin.		
4	**MIX DESIGN**		
M	•Mix design prepared & approved by S.O. *Note: Mix design report must be attached with bitumen and aggregate's approval.*		

No.	ACTIVITIES	YES	NO
5	**COLD FEED BINS**		
	•Cold feed system shall consist of not less than 5 bins with suitable capacity.		
	•Each bin is equipped with a control gate and measuring feeder for accurate blending of aggregates on to cold feed collecting conveyor.		
	•Cold feed system shall incorporate a device for moisture compensation capable of producing an accurate and continuous blend of individual aggregate sizes from the cold feed compartment.		
M	•Equipped with a screen of size ≤ 50 mm to discard oversized aggregates before entering the drum mixer.		
6	**DRUM MIXER**		
	•Drum mixer shall be inclined, oil-fired and sufficiently insulated.		
	•A bypass chute is provided for sampling of cold aggregate.		
	•Fresh mixed asphalt material shall be delivered and stored in a surge silo through a proper conveyor system.		
7	**COMPUTERISED SYSTEM**		
	•Computer able to display details of mixing proportion (and flow rate) according to approved mix design and mix temperatures.		
	•The accuracy of aggregates, filler and bitumen flow rate have been checked and verified.		
8	**BITUMEN STORAGE TANK**		
	•Have means of measuring the volume of contents at all times.		
	•Have means of drawing off samples.		
	•Provides for continuous circulation of hot bitumen through the bitumen feeding system and back into the bitumen storage tank.		
	•The end of the return line discharging into the bitumen storage tank shall be kept submerged in the bitumen in the tank to prevent oxidation of the returning hot bitumen.		
M	•A thermometer is fitted to the bitumen storage tank or bitumen feed line.		
	•Tank and bitumen feeding system are equipped with heating system and insulating jackets.		
9	**EQUIPMENT**		
	•Paver with automatic leveling device is available.		
	•A pneumatic tyre roller and two steel wheel tandem rollers are available for each paving session.		

No.	ACTIVITIES	YES	NO
10	**TACK COAT**		
M	•Equipped with laboratory test apparatus to determine binder content (i.e. grade of tack coat). *Note: Quarry to provide three (3) beakers of 1 litre capacity and three (3) glass rods even though not supply the tack coat and/or doing paving work.*		
11	**LORRY TRANPORTER SCALES**		
	•Has weigh bridge been checked and certified (annually)? > Date checked ..... > Certified by ..... > Is copy of certification available?		
12	**LABORATORY TEST EQUIPMENT**		
M	•Have laboratory test equipment been checked and certified/calibrated (annually)? > Date checked ..... > Certified by ..... > Is copy of certification/calibration available?		
13	**QC DEPARTMENT**		
	•Is QC department set up?		
	•Quality officer available.		
14	**QA(BITUMEN & AGGREGATES)**		
	• Independent laboratory has been identified?		
	• Ready to carry out complete set of tests on bitumen and aggregates 4 times a year at independent laboratory.		

Note: M – Mandatory
Remarks:.....
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Is the plant qualified to produce asphalt for use in JKR paving works?

☐ **YES** ☐ **NO**

Note: i) YES – if all mandatory items COMPLIED.
ii) NO – if any one of mandatory items NOT COMPLIED.

Auditor:

.....
(Name: .....)
(Organisation: .....)
Head of Audit Team

Auditee:

.....
(Name: .....)
(Organisation: .....)

The Member of Audit Team

1. Name: .....
   Organisation: .....
2. Name: .....
   Organisation: .....
3. Name: .....
   Organisation: .....
4. Name: .....
   Organisation: .....
5. Name: .....
   Organisation: .....

ASPHALT PLANT CHECKLIST (BATCH)

Asphalt Plant :.....

Date :.....

No.	ACTIVITIES	YES	NO
1	**PAST RECORDS**		
	•Aggregate approval/test results.		
	•Bitumen approval/test results.		
	•Mix design approval (including trial lay).		
	•Binder content, aggregate gradation & Marshall test results. *Note: One (1) test for every 200 tonne asphalt.*		
	•Gradation analysis of aggregates in hot bins. *Note: One (1) test for every hot bin for everyday.*		
2	**BITUMEN**		
M	•Source of bitumen approved. *Note: Bitumen fully tested at independent lab based on MS 124 and all results were passed.*		
M	•Equipped with the following laboratory test apparatus; > Penetration > Ring & Ball Softening Point > Flash Point		
3	**AGGREGATES AND COLD BINS**		
M	•Source of coarse aggregate approved. *Note: Coarse aggregate fully tested at independent lab based on JKR/SPJ/2008 and all results were passed.*		
M	•Source of fine aggregate approved. *Note: Fine aggregate fully tested at independent lab based on JKR/SPJ/2008 and all results were passed.*		
M	•Each aggregate stored in a separate stockpile.		
M	•Stockpiles of fine aggregate are kept dry using waterproof covers.		
M	•Each aggregate stored in a separate cold bin.		
4	**MIX DESIGN**		
M	•Mix design prepared & approved by S.O. *Note: Mix design report must be attached with bitumen and aggregate's approval.*		

No.	ACTIVITIES	YES	NO
5	**SCREENS**		
	•Equipped with four (or more) screens.		
	•Shall be readily accessible for inspection.		
M	•Condition of each screen is satisfactory.		
6	**HOT BINS**		
	•Equipped with four (or more) hot bins.		
	•Each bin is equipped with an overflow pipe to prevent backing up of aggregates into other bins.		
M	•Samples can be readily obtained from each bin.		
	•Have means for observing the aggregate level.		
	•Thermometers are fitted in each bin.		
	•Separate dry storage is provided for mineral filler.		
	•Equipped to feed mineral filler into the mixer.		
M	•Equipped with a weigh box or hopper for accurately weighing out aggregate from each bin.		
	•Discharge gate does not leak when closed.		
	•Scale dial visible to operator without significant parallax errors.		
M	•Test weights (not less than ten 25 kg test weights) present for checking, adjusting and calibrating scales.		
	•The accuracy of weights has been checked.		
M	•Have scales been checked and certified/calibrated (annually)? > Date checked ..... > Certified by ..... > Is copy of certification/calibration available?		
7	**BITUMEN STORAGE TANK**		
	•Have means of measuring the volume of contents at all times.		
	•Have means of drawing off samples.		
	•Provides for continuous circulation of hot bitumen through the bitumen feeding system and back into the bitumen storage tank.		
	•The end of the return line discharging into the bitumen storage tank shall be kept submerged in the bitumen in the tank to prevent oxidation of the returning hot bitumen.		

No.	ACTIVITIES	YES	NO
M	•A thermometer is fitted to the bitumen storage tank or bitumen feed line.		
	•Tank and bitumen feeding system are equipped with heating system and insulating jackets.		
8	**BITUMEN PROPORTIONING**		
	•Equipped with weigh bucket for accurately weighing the quantity bitumen entering the mixer.		
	•Discharge mechanism does not leak or drip when closed.		
M	•Have scales been checked and certified (annually)? > Date checked ..... > Certified by ..... > Is copy of certification available?		
9	**BATCH MIXER**		
	•The clearance of the paddle blades from all fixed & moving parts of the mixer shall be not more than 20 mm.		
	•Pugmill is closed or equipped with dust hood to prevent loss of fines from mixture.		
	•Discharge gate does not leak when closed.		
10	**EQUIPMENT**		
	•Paver with automatic leveling device is available.		
	•A pneumatic tyre roller and two steel wheel tandem rollers are available for each paving session.		
11	**TACK COAT**		
M	•Equipped with laboratory test apparatus to determine binder content (i.e. grade of tack coat). *Note: Quarry to provide three (3) beakers of 1 litre capacity and three (3) glass rods even though does not supply the tack coat and/or doing paving work.*		
12	**LORRY TRANPORTER SCALES**		
	•Has weigh bridge been checked and certified (annually)? > Date checked ..... > Certified by ..... > Is copy of certification available?		

No.	ACTIVITIES	YES	NO
13	**LABORATORY TEST EQUIPMENT**		
M	•Have laboratory test equipment been checked and certified/calibrated (annually)? > Date checked ..... > Certified by ..... > Is copy of certification/calibration available?		
14	**QC DEPARTMENT**		
	•Is QC department set up?		
	•Quality officer available.		
15	**QA (BITUMEN & AGGREGATES)**		
	•Independent laboratory has been identified?		
	•Ready to carry out complete set of tests on bitumen and aggregates 4 times per year at independent laboratory.		

Note: M – Mandatory
Remarks:.....
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Head of Audit Team

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