COMPARISON OF TMR, RMS AND STANDARD BITUMEN TEST METHODS

Variance between test methods	Minimal	Low	Medium	High

TMR test	RMS test	Std. test	Parameter	Test Method Differences
AG:PT/T101[1]	AG:PT/T101[2]	AG:PT/T101	PMB Sampling	AG:PT/T101 sets out the method of sampling Polymer Modified Binders, Polymers and Crumb Rubber.
AS 2008[3]	AS 2008[4]	AS 2008	Bitumen Sampling	The protocol for sampling residual bitumens is set out in Appendix B of AS 2008.
AS 2341.2[5]	AS2341.21[6]	AS2341.21	Bitumen Preparation	AS 2341.21 sets out the protocol for preparing materials designated by AS 2008 as bitumens and cutback bitumens designated as AMC 5, 6 or 7 by AS 2157. AS 2341.2 sets out the test method for determining dynamic viscosity.
Q330	AS 2341.2[7]	AS 2341.2	Dynamic Viscosity	AS 2341.2 is identical to Q330 and sets out procedure for determining the dynamic viscosity of residual bitumens using two different types of vacuum capillary viscometers.
Q331	AS 2341.7 (T502)	AS 2341.7	Density	T502 and Q331 are identical to AS 2341.7 except that: ➢ AS 2341.7 measures the binder density in kg/m^3 at 25°C and calculates the binder density at 15°C by applying the appropriate conversion factor given in ASTM D 4311. ➢ Q331 permits the binder density at 15°C to be reported in kg/L by dividing its density at 15°C by 999.973 ➢ T502 permits the binder density at 25°C to be converted to its density at 15°C by adding 6kg/m^3

[1] AG:PT/T102, Cl. 4.2(a) specifies that PMB samples shall be obtained in accordance with the procedures set out in AGPT/T101
[2] AG:PT/T101 is the sampling test method specified in RMS Specification 3252, Annexure 3252/L, Clause L.1
[3] AS 2008 is referenced in MRTS17, Table 3. It is therefore presumed that TMR requires residual bitumen samples to be procured in accordance with AS 2008, Appendix B.
[4] RMS Specification 3253, Annexure 3253/L specifies that samples for testing are to be taken from rail tankers, road tankers, sprayers or consignments of drums in accordance with AS 2008, Appendix B.
[5] AS 2341.2 (sic) is the standard sample preparation test method referenced in MRTS17, Table 3.
[6] A bitumen preparation test method is not explicitly specified in RMS Specification 3253. However, AS 234.21 is the implied bitumen preparation test method as it is referenced in the specified test methods.
[7] RMS Specification 3253, Table 3253.2 specifies that the viscosity of bitumen binders must be determined at 60°C in accordance with AS 2341.2 before and after it is tested in accordance with AS 2341.10

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TMR test	RMS test	Std. test	Parameter	Test Method Differences
Q332	AS2341.20[8]	AS 2341.8[9]	Insoluble Content of Bitumen	Q332 is identical to AS 2341.8 which sets out the procedure for determining the proportion of bituminous material that is insoluble in toluene by washing the binder through a No. 4 porosity sintered crucible. AS 2341.8 is applicable to: a) Road tars of pavements in accordance with AS 1507. b) Residual bitumen for pavements in accordance with AS 2008. c) The residue from the distillation of cutback bitumen in accordance with AS 2157. d) The residue from the evaporation of bituminous emulsions in accordance with AS 1160 AS 2341.20 is applicable to liquid road tars, semi-solid road tars and other bituminous materials. AS 2341.20 permits solvents other than toluene to be used to wash the soluble bitumen fraction through a 150µm or 75µm sieve.
Q333[10]	AS 2341.14 (T504)	AS 2341.14	Flash Point of Bitumen	Q333 and T504 both require the flash point of conventional and multigrade bitumens to be determined in accordance with AS2341.14.
	AG:PT/T112	AG:PT/T112	Flash Point of PMB	Q333 requires the flash point of polymer modified binders to be determined in accordance with Austroads AG:PT/T112 which is applicable to any binder type.
Q334[11]	T505[12]	AG:PT/T131	Softening Point	Q334 is identical to AS2481.18 for bitumens and is identical to AG:PT/T131 for polymer modified bitumen. According to Q334, AS2341.18 and AG:PT/T131 are identical in their procedural operations.
Q335[13]	AS 2341.12[14] (T506)	AS 2341.12	Penetration	Q335 and T506 are identical to AS2341.12.

[8] RMS Specification 3253, Table 3253.2 specifies that AS2341.20 shall be used to determine the percentage of insoluble material in residual bitumen
[9] RMS Specification 3253, Table 3253.2, Note 6 advises that AS 2341.8 may be used in lieu of AS 2341.20 to determine the percentage of insoluble material in residual bitumen
[10] Q333 is specified in MRTS17, Table 6.1 and MRTS18, Table 7.1-A
[11] Q334 is specified in MRTS18, Table 7.1
[12] T505 appears in RMS's Materials Testing Manual (MTM). However, neither T505 nor AG:PT/T131 is specified in RMS Specification 3252 or 3253
[13] MRTS17, Table 6.1 specifies that AS 2341.12 shall be performed on C170, C320 and C600 bitumens at 25˚C

COMPARISON OF TMR, RMS AND STANDARD BITUMEN TEST METHODS

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TMR test	RMS test	Std. test	Parameter	Test Method Differences
Q336[15]	-	AS 2341.3	Kinematic Viscosity	AS 2341.3 is identical to Q336 and sets out the method determining the kinematic viscosity of residual bitumens for pavements (as specified in AS 2008), cutback bitumens (as specified in AS 2157) and road tars for pavements (as specified in AS 1507) that exhibit a kinematic viscosity between 2 mm^2/s and 300 000 mm^2/s (approximate dynamic viscosities 0.002 Pa.s to 300 Pa.s) using two different types of reverse flow capillary tube viscometers.
Q337[16]	T519	AS2341.5	Apparent viscosity	Q337 and T519 are identical to AS2341.5 which measures binder viscosity using slide plates.

[14] RMS Specification 3253, Table 3253.2 specifies that AS 2341.12 shall be performed on AS2008 bitumens at 25˚C and on M500/170, AR320, AR450, AR1000/320 at 25˚C before and after AS 2341.10

[15] Q336 is specified in MRTS19, Table 4 and MRTS20, Table 4 but not in MRTS17 or MRTS18.

[16] Q337 is not specified in MRTS17 or MRST18 or MRTS19 or MRTS20 or MRTS21.

COMPARISON OF TMR, RMS AND STANDARD BITUMEN TEST METHODS

Variance between test methods	Minimal	Low	Medium	High

TMR test	RMS test	Std. test	Parameter	Test Method Differences
Q338[17]	T511[18]	AG:PT/T103	Loss on Heating (RTFO)	These tests differ as follows: • Applicability of test methods: ➢ Q338 only applies to residual bitumens manufactured to AS 2008 ➢ AG:PT/ T103 and T511 are applicable to conventional, polymer modified and multigrade binders • Sampling and sample preparation: ➢ Q338 requires the binder to be sampled in accordance with AS 2008, Appendix B. ➢ AG:PT/ T103 requires PMB samples to be provided in accordance with AG:PT/T101 and AG:PT/T102 and bitumen and multigrade samples shall be provided in accordance with AS2008, Appendix B. ➢ T511 requires bitumen samples to be prepared in accordance with AS2341.21 and requires PMB samples to be prepared in accordance with AG:PT/ T102. • RTFO test procedure: ➢ Q338 and AG:PT/ T103 both require 35 ±0.5 g subsamples of binder to be heated to 163˚C, poured into bottles then cooled to room temperature then reheated to 163˚C for 30 minutes (without air flow or rotation) then rotated for 60 minutes while the air flow rate is4 ± 0.5 L/min after which each subsample is then poured into a single container for further testing with 24 hours. ➢ T511 requires 25 ±0.5 g subsamples of binder to be poured into bottles (to create a film thickness of 1.5mm) then the bottles placed in an oven held at 163˚C for 5 to 5¼ hours then cooled to 23 ± 3˚C prior to being weighed and then reheated to 163˚C for 15 ± 1 minutes prior to subsequent testing.

[17] Q338 is the RTFO method specified in MRTS17. However, AG:PT/T103 is the RTFO method specified in MRTS18

[18] T511 is the RTFO method specified in RMS Specification 3253, Table 3253.2. However, AG:PT/T103 is the RTFO method specified in RMS Specification 3252, Table 3252.2.

COMPARISON OF TMR, RMS AND STANDARD BITUMEN TEST METHODS

Variance between test methods	Minimal	Low	Medium	High

TMR test	RMS test	Std. test	Parameter	Test Method Differences
Q340[19]	-	-	Kinematic viscosity	Q340 sets out the procedure for determining the kinematic viscosity of binders using a rotational viscometer.
Q341[20]	AG:PT/T121[21]	AG:PT/T121	Consistency	Q341 is identical to AG:PT/T121 and measures the consistency, stiffness, elastic recovery and tensile modulus of polymer modified binders using ARRB's Elastometer.
Q342[22]	AG:PT/T122	AG:PT/T122	Torsional Recovery	Q342 is identical to AG:PT/T122 and measure the torsional recovery of polymer modified binders.
Q343[23]	AG:PT/T111	AG:PT/T111	Viscosity	Q343 is identical to AG:PT/T111 and measures the handling viscosity of polymer modified binders
AG:PT/T102 (Q344)[24]	AG:PT/T102[25]	AG:PT/T102	PMB Sample Preparation	Q344 is identical to AG:PT/T102 which adopts the principles of AS 2341.21 and defines the handling protocol options for polymer modified bitumen sampled in accordance with AG:PT/T101.
Q345[26]	T740[27]	AG:PT/T108	Segregation	Q345 is identical to AG:PT/T018. Q345 requires the PMB sample to be heated to 180˚C for 48 hours, cooled to room temperature then halved prior to testing each half in accordance with AS2341.8. T740 requires the binder sample to be heated to 163˚C for 72 hours then cooled to room temperature then placed in a refridgerator for 30 minutes then reheated to 50-80˚C. Seggregation is reported if any differential flow is observed.

[19] Q340 is not specified by MRTS17 or MRST18 or MRTS19 or MRTS20 or MRTS21
[20] Q341 is specified in MRTS18, Table 7.1-A
[21] AG:PT/T121 is specified in RMS Specification 3252, Table 3252.3
[22] Q342 is specified in MRTS18, Table 7.1-A
[23] Q343 is specified in MRTS18, Table 7.1-A
[24] AG:PT/T102 is the handling and preparation test method specified in MRTS18, Table 4
[25] AG:PT/T102 is the handling and preparation test method specified in RMS Specification 3252, Annexure 3252/L, Clause L.2
[26] Q345 is specified in MRTS18, Table 4
[27] RMS test method T740 is not specified in RMS specification 3252

COMPARISON OF TMR, RMS AND STANDARD BITUMEN TEST METHODS

Variance between test methods	Minimal	Low	Medium	High

TMR test	RMS test	Std. test	Parameter	Test Method Differences
Q346[28]	-	AG:PT/T109	Ease of Remixing	AG:PT/T109 is identical to Q346 and quantifies the ease of remixing polymer modified binders. RMS specification 3252 does not require AG:PT/T109 to be performed on polymer modified binders.
Q348[29]	AG:PT/T132[30]	AG:PT/T132	Compression Limit	Q348 is identical to AG:PT/T132 and measures the compressive limit of all modified binders that do not have a viscous response at 70°C and at long loading times when confined to film thicknesses in the range 0.1 to 1mm.
-	AG:PT/T124[31]	AG:PT/T124	Toughness	AG:PT/T124 measures the toughness of polymer modified binders using an extensiometer. MRTS18 does not require the toughness of polymer modified binders to be determined.
AG:PT/ T142[32]	T737[33]	AG:PT/ T142	Crumb Rubber Content	RMS test method T37 is similar to Austroads Test method AG:PT/ T142 which is the test method that TMR specifies in MRTS18 shall be used to assess the grade of rubberised sprayed seal binder classes S1.8R, S15RF and S18RF.
-	T507[34]	AS 2341.11	Ductility	T507 and AS 2341.11 are identical and set out the method for measuring the ductility of bitumen. MRTS17 does not require the ductility of bituminous binders to be determined.

[28] Q346 is specified in MRTS18, Table 4
[29] MRTS18 requires Q348 to be performed on S1.8R, S15RF and S18RF binders only.
[30] RMS specification 3252 specifies that Austroads' test method AG:PT/T124 must be performed on polymer modified binder classes S45R, S55R, S15RF and S20RF
[31] Austroads' test method AG:PT/T124 is specified in RMS Specification 3252, Table 3252.3
[32] AG:PT/T142 is specified in MRTS18, Table 4
[33] RMS test method T737 is specified in RMS Specification 3252, Table 3252.3
[34] T507 appears in RMS's MTM. However, AS 2341.11 is the method specified in RMS Specification 3253 and is only performed on Class M500/170, AR320 & AR1000/320 binders at 15°C after RTFO.