

To NZTA Network Management Consultants and Contractors

Cc NZTA Regional Operations Managers and Area Managers
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Subject M1 Bitumen Testing

Highways and Network Operations Technical Memorandum No. TM6003 –
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Purpose: To advise you on the use of bitumen test results, both bitumen quality control records and verification testing.

Background: There have been increasing amounts of imported bitumen used in road construction and maintenance in New Zealand, especially since the issue of TNZ M1:2007 Specification for Roading Bitumens (M1).

Bitumen produced from the New Zealand Refining Company (NZRC) at Marsden Point has been showing more variation within the specification than was experienced 15 years ago.

There have been concerns expressed about the variability of bitumen in New Zealand, and regarding more temperature susceptible bitumens that are still within specification.

Bitumen Quality Bitumen must meet M1 specification when it leaves the manufacturer e.g.

- At the time of shipping (when loaded onto a vessel at an overseas refinery or at the NZRC), or,
- If bitumen is manufactured in New Zealand from imported products, it must meet M1 when it leaves the manufacturer.
- In rare instances it may be found that after sailing, a cargo of bitumen from an overseas refinery is slightly outside the specification. In these cases a bitumen waiver may be granted by NZTA National Office following an investigation.

Bitumen Test Data: Bitumen quality control records to verify the above statements are available on request from your supplier or contractor. These can be regarded as "source property tests", in a similar manner to aggregate source property tests.

Verification Testing: For verification of quality the client or purchaser may take samples of bitumen at different times for testing. It is desirable that the following properties are tested for verification:

- Penetration at 25° C
- Viscosity at 60° C

These two properties (Penetration and 60° C Viscosity) and are related to on-road performance (see Appendix 1), and are easily re-tested. Consider these tests as “production tests” in a similar manner to aggregate production tests.

Note that the bitumen in a contractor’s tank will be a mixture of a number of different shipments and therefore the penetration and viscosity may not be the same as on the delivery certificate of the last bitumen supplied.

There is no need to go to the expense of repeating all the tests in M1 Table 1.

Heavy Duty Asphalt

Based on research results, rutting resistance in asphaltic concrete is very dependant on binder properties. If bitumen is to be used in an asphaltic concrete in a high traffic and high stress environment, it is recommended that the wheel tracking test (AG-PT/T231) be specified in the contract documents as part of the asphalt mix design process. The wheel tracking test will be specified in the new NZTA M10 Asphalt Specification. Inclusion of the wheel tracking test is especially important when the bitumen viscosity is found to be close to the minimum M1 viscosity specification limit.

Responsibilities:

NZTA is working with Roading New Zealand to update the Quality of Bitumen document to clarify the roles and responsibilities relating to the quality of bitumen during production, shipping and when in use.

Your Action:

Request and review bitumen quality control records. Build up experience and records. If the viscosity of the bitumen appears about the same as last time, there is no need to retest (however, note any changes). If the viscosity of the bitumen is significantly different from previous shipments you should be aware of the following:

Bitumen Property	Relationship to M1 Specification Limits	Significance	Actions Recommended
Penetration	Within specification limits	Bitumen is within specification	None
Penetration	Outside specification limits	Due to the variability of the penetration test, the bitumen may actually be within spec.	Contact your supplier and NZTA National Office. The requirements of <i>NZTA TM6004 Procedure for Assessing Bitumens for Acceptance by the Penetration Test</i> must be complied with.
Viscosity at 60° C	Higher or lower, or substantially different to previous shipments	If the number is lower than usual, the bitumen may be less viscous (runnier) than usual. The bitumen may perform slightly differently at higher road temperatures (e.g. asphalt may be more likely to rut). This property could affect the results of tests using TNZ T/9 Estimation of Kerosene Content.	Discuss with contractor. Advise pavement designers the asphalt modulus may be different.

Advice:

There is no need to run every test in M1 Table 1 as many of the tests can be regarded as source properties and are related to the crude oil source and refining method rather than on-road performance.

There is no need to test the properties of every tanker load of bitumen. Instead, use quality control records to provide reassurance of a consistent product over time.

If you have any questions please contact Joanna Towler at NZTA National Office, 04 894 6316, joanna.towler@nzta.govt.nz

Appendix 1

The following information is available on request from your supplier or contractor as part of their bitumen quality control records:

1. At time of loading onto the vessel (either from an overseas refinery or NZRC) bitumen properties of:

Bitumen Property	M1 Specification Requirement	Significance	Retest recommended?
Specific Gravity	No		No
Flash point	Yes	Safety	No
Penetration	Yes	Primary indicator of bitumen grade and on-road performance.	Yes
Softening point	No	May indicate likelihood of bitumen pick-up on tyres.	No
Solubility in 1, 1, 1 Trichloroethane	Yes	Indicator of contaminants in the bitumen	No
Viscosity at 60° C	Yes	Secondary indicator of bitumen grade and on-road performance.	Yes
Viscosity at 135° C	Yes	Indicator of bitumen performance in a hot-mix asphalt plant.	No
Ductility of residue at 25° C, RTFO	Yes	Indicator of the internal structure of the bitumen	No
Penetration at 25° C after RTFO test	Yes	Indicator of bitumen performance after going through a hot-mix asphalt plant	No

2. At the time of unloading at the destination port:

Bitumen Property	M1 Specification Requirement	Significance	Retest recommended?
Penetration	Yes	Primary indicator of bitumen grade and on-road performance.	Yes
Viscosity at 60° C	Yes	Secondary indicator of bitumen grade and on-road performance.	Yes

3. After any manufacturing or blending process undertaken at a facility in New Zealand:

Bitumen Property	M1 Specification Requirement	Significance	Retest recommended?
Penetration	Yes	Primary indicator of bitumen grade and on-road performance.	Yes
Viscosity at 60° C	Yes	Secondary indicator of bitumen grade and on-road performance.	Yes
Viscosity at 135° C	Yes	Indicator of bitumen performance in a hot-mix asphalt plant.	No