WAKA KOTAHI
NZ TRANSPORT AGENCY

NZTA Q05: 2022

SPECIFICATION FOR MANAGING BITUMEN QUALITY

New Zealand Government

1 SCOPE

This document sets out the standard processes required to assure the quality of bitumen imported into New Zealand and supplied to Waka Kotahi. It defines where in the supply chain compliance must be demonstrated and requires a minimum frequency of testing.

2 RELATED DOCUMENTS

(a)	NZTA M01	Specification for Bitumen
(b)	NZTA M01-A	Specification for Performance-Graded Asphalt Binder
(c)	NZTA Z08	Minimum Standard for Inspection, Sampling and Testing
(d)	AS/NZS ISO 9001	Quality Systems – Requirements
(e)	NZS ISO/IEC 17025	General Requirements for the Competence of Testing and Calibration Laboratories
(f)	ASTM D5	Standard Test Method for Penetration of Bituminous Materials
(g)	ASTM D140	Standard Practice for Sampling Asphalt Materials
(h)	ASTM D2171	Standard Test Method for Viscosity of Asphalts by Vacuum Capillary Viscometer

3 QUALITY SYSTEM

Bitumen importers, processors and suppliers shall establish, implement, and maintain a quality management system certified as compliant to AS/NZS ISO 9001 and in accordance with NZTA Z08. The quality system shall be regularly audited by a JAS-ANZ registered agency in accordance with AS/NZS 9001.

The bitumen supplier shall develop and maintain a quality plan that describes the specific processes for inspection and testing, acceptance/rejection criteria, details of proposed methods and other quality-related issues. It shall describe how the requirements of this specification will be met at all times and how evidence demonstrating this compliance is provided and maintained. The quality plan shall be audited for compliance with this specification by the JAS-ANZ registered agency with audit outcomes available for review by Waka Kotahi on request.

The quality assurance plan shall at least describe:

(a) How New Zealand manufactured, or an imported shipment of bitumen is demonstrated to be manufactured from the same or similar crude oil feedstock blend as that used for the approval sample

(b) The bitumen sampling frequency, method and agency

(c) Processes used to convert imported feedstock into bitumens compliant with M01 or M01-A specifications

(d) The sample testing scheme, including that to be adopted for blended grades

(e) For any non-conformance, what reporting and corrective actions will be carried out.

All sampling and testing required by this specification shall be undertaken by a laboratory accredited to NZS ISO/IEC 17025.

4 APPROVAL OF BITUMEN

All bitumen manufactured in New Zealand or imported for use in road pavements shall be subject to an approval process. The approval is based on assessment of the physical properties by laboratory testing, the refining process and crude oil feedstock. An approval which shall be valid for five years may be granted to an entity or organisation following submission of all the information listed below. Applications shall be made to the Waka Kotahi Principal Surfacings Engineer and may be granted at the sole discretion of the Waka Kotahi Lead Advisor Pavements.

The criteria for approval to be granted include the following:

(a) Provision of test results for the bitumen properties listed in M01 Table 5.1 and compliance with the property requirement where specified

(b) Identification of the refinery where the bitumen is produced. The refinery shall be ISO 9001 registered and documentary evidence of this shall be submitted

(c) Information on the crude oil or crude oil blend feedstock used to produce the bitumen

(d) Information on the refining process used to produce the bitumen

(e) Information to show that the imported bitumen can be supplied, blended or otherwise processed to make bitumens fully compliant with M01 Table 6.1, and/or M01-A compliant grades and/or M32 Table 2.3, as appropriate

(f) Evidence, based on laboratory testing, to verify that the behaviour of the bitumen, when mixed with diluents to make cutback bitumen, is neither atypical nor likely to require changes to normal construction processes

Note: A spreadsheet-based protocol for assessing the effects of mixing bitumen with kerosene is available from the Waka Kotahi Principal Surfacings Engineer at pavements@nzta.govt.nz.

(g) Evidence, based on laboratory testing, to verify that the behaviour of the bitumen, when mixed with commonly used adhesion (anti-stripping) agents and tested with commonly used sealing chip aggregate, is neither atypical nor likely to require changes to normal construction processes

(h) Review and acceptance by Waka Kotahi of the Quality Assurance Plan required by clause 3 Quality System above.

Any material changes to the crude oil or crude oil blend feedstock or refining process used to manufacture bitumen shall be reported to the Waka Kotahi Principal Surfacings Engineer. If these changes materially affect the quality and expected performance of the bitumen a reapproval process may be required.

5 BITUMEN IMPORTATION

All bitumen imported shall have a current approval as required by clause 4 above.

The Lead Advisor Pavements, or their delegate, shall be notified of all bitumen import cargoes. Notification shall include importer, source, approval code, bitumen grade, delivery date and points of delivery. Notification shall be provided prior to delivery or use of the imported bitumen in New Zealand. As this information is commercially sensitive it shall be held securely by Waka Kotahi and not released to any third-party agency.

All bitumens imported shall be tested and demonstrated to be compliant with NZTA M01 specification.

6 BITUMEN SUPPLY

6.1 General

Bitumen imported for use in New Zealand road pavements will normally be handled and processed into grades compliant with NZTA M01 or NZTA M01-A specifications. Such handling and processing shall be carried out under a registered quality assurance system as required by clause 3 above and in accordance with this specification.

All bitumens that have been supplied to comply with M01 or M01-A specifications shall be regularly tested as required in 6.2 and 6.3 below to:

(a) Confirm compliance with the specified requirements, and

(b) Establish a benchmark parameter that can be used to confirm compliance as the bitumen passes though the supply chain.

The benchmark parameter shall be based on a simple test that is sensitive to changes in bitumen rheology. This test can be used to monitor bitumen quality as it is passed through the supply chain. Suitable tests are:

(c) ASTM D5 Standard Test Method for Penetration of Bituminous Materials, and/or

(d) ASTM D2171 Standard Test Method for Viscosity of Asphalts by Vacuum Capillary Viscometer

If ASTM D2171 is used to establish the benchmark parameter then the temperature of test must be 60°C for the reproducibility criteria of clause 6.2(d) to be valid.

Other test temperatures or tests may be approved for use to establish a benchmark parameter. Approval shall be obtained from the Waka Kotahi Principal Surfacings Engineer prior to use and shall exhibit equal or better sensitivity to changes in bitumen rheology as the tests listed above.

Where an intermediate grade of bitumen is prepared by blending bitumen grades that have previously been demonstrated to comply with M01 Table 6.1 then the intermediate grade shall also be considered fully compliant provided the Penetration complies with the specified range in M01 Table 6.1.

6.2 Chip Seal Bitumens

All bitumen supplied for use as a chip seal binder shall comply with the requirements of M01 Table 6.1 prior to blending with diluents, anti-stripping agents, polymers, or further processing into bitumen emulsions. Such bitumens may be directly imported or processed in a bitumen terminal from imported feedstock into compliant bitumens.

The minimum testing frequency shall be:

(a) One sample of each chip seal bitumen grade supplied shall be tested against and comply with all the criteria of M01 Table 6.1 for every bulk delivery of bitumen into a bulk terminal. The supplied grades shall be prepared using the newly delivered feedstock bitumen. These test results shall be provided on request

(b) One benchmark parameter test for every 200 tonnes of chip seal bitumen supplied.

The result for the benchmark parameter shall be passed through the supply chain so that bitumen quality can be monitored. The bitumen shall comply with the benchmark parameter plus or minus the published reproducibility of the test method. These may be found as follows:

(c) For ASTM D5, clause 11.2 (acceptable range at 25 °C, original Penetration ± 0.5 x (σ x 2.83))

(d) For ASTM D2171, clause 11.2.2 (reproducibility, i.e. ±10% of the benchmark value).

6.3 Asphalt Binders

All bitumen supplied for use as an asphalt binder shall comply with the requirements of M01-A. Such bitumens may be directly imported or processed in a bitumen terminal from imported feedstock into compliant bitumens.

The minimum testing frequency shall be:

(a) One sample of each asphalt binder grade supplied shall be tested against and comply with all the criteria of M01-A for every bulk delivery of bitumen into a bulk terminal. These test results shall be provided on request

(b) One benchmark parameter test for every 200 tonnes of asphalt binder used for asphalt production.

The result for the benchmark parameter shall be passed through the supply chain so that bitumen quality can be monitored. The bitumen shall comply with the benchmark parameter plus or minus the published reproducibility of the test method. These may be found as follows:

(c) For ASTM D5, clause 11.2 (acceptable range at 25 °C, original Penetration ± 0.5 x (σ x 2.83))

(d) For ASTM D2171, clause 11.2.2 (reproducibility, i.e. ±10% of the benchmark value).

7 QUALITY CONTROL PROCESSES

7.1 General

Operators of bitumen supply terminals, depots and plant tanks shall maintain a quality system as in 3 above that shows how the requirements of this document will be met at all times.

Records shall be kept for all custody transfers of bitumen through the supply chain. These records shall be maintained for at least two years and made promptly available for audit on request.

7.2 Quality Control Testing

Bitumen held hot in a storage tank at a terminal, depot or asphalt production plant shall be subject to regular sampling and testing to demonstrate compliance with specified requirements. Samples shall be taken in accordance with ASTM D140, or equivalent recognised method, and tested by a laboratory accredited to NZS ISO/IEC 17025.

Samples shall be taken on a representative basis every for 200 tonnes of bitumen delivered into the terminal, depot or plant tank, or weekly, whichever is the more frequent.

Note: Samples can be taken immediately prior to delivery, at or following delivery. A pragmatic approach to sampling and testing is expected, such that the quality of the bitumen is tracked through the supply chain without unnecessary duplication of sampling and testing.

Testing shall at least be the benchmark parameter test established in 6 above. Test reports shall be held for a period of at least two years and be available for audit on request.

All test results shall comply with the acceptable range established in 6 above. If a test result falls outside of the acceptable range, then the non-compliance processes of 7.4 below shall be followed.

Test data shall be monitored using a process control system. This may be numerical or graphical, but it shall provide a means to consider test results in context, identify trends and to determine if individual test results are statistical outliers.

7.3 Random Verification Testing

On request, operators of bitumen supply terminals, depots and plant tanks shall provide representative samples of bitumen from supply tanks (i.e. “day tanks”, not bulk storage tanks) to Waka Kotahi or their agent to verify compliance with this specification. Reasonable prior notice shall be given to the operator so that samples can be safely taken and made ready for collection by Waka Kotahi.

At least two samples shall be taken. One of the samples shall be submitted to an independent agency for testing and the second sample retained in case of dispute.

If testing of the first sample returns a non-compliant test result, then the second sample shall be forwarded to another independent testing agency to confirm the non-compliance of the first test. If the second sample returns a compliant test result, then the bitumen shall be accepted as compliant with this specification.

If the non-compliance is confirmed by testing the second sample, then the procedures of 7.4 shall be followed.

7.4 Non-Compliances

If a test result falls outside of the acceptable range established in 6 above, then the non-compliance procedures of the quality system shall be immediately invoked. As a minimum, these processes shall require:

(a) Logging a non-compliance report (NCR) or equivalent

(b) Drawing of another bitumen sample from the same bulk lot if practical and testing it to confirm the non-compliance

(c) Review of the sampling and testing processes to confirm that the sample and test result are representative of the bitumen

(d) Review of the process control system to determine if previous test data were trending towards a non-compliance, or if the non-compliant result is unexpected

(e) Review of the degree, and assessment of the materiality, of the non-compliance

(f) Identification of the project or works that has received the non-compliant bitumen.

If the non-conformance is material and confirmed, then the Waka Kotahi Principal Surfacings Engineer at pavements@nzta.govt.nz shall be immediately informed of the non-compliance and the planned corrective or remedial actions. Corrective or remedial actions shall be agreed with the Principal and taken as soon as practically possible to minimise the impact of the non-compliance.

A non-compliant test result may be regarded as not material, and hence require no corrective or remedial actions if:

(g) A subsequent sample from the same bulk quantity of bitumen returns a compliant test result, or

(h) Other performance-related testing as agreed with the Principal demonstrates that the bitumen is suitable for use. Contact pavements@nzta.govt.nz, or

(i) The Principal accepts the non-compliant material. Written records of such acceptances should be obtained and held.

Records shall be kept of all sampling, testing, corrective or remedial actions and determination of materiality. Records shall be retained and be readily accessible for audit for at least two years.