

NZTA M02: 2024

Specification for Bitumen Emulsion

1 Scope

1.1 General

This specification sets out the requirements for a bitumen emulsion intended for use in road pavements.

1.2 Definition

For the purposes of this specification a bitumen emulsion is defined as follows:

A bitumen emulsion is a dispersion (the dispersed phase) of finely divided droplets of bitumen in water (the continuous or aqueous phase). The dispersion is rendered stable by the addition of surface-active chemicals (emulsifiers). The emulsion may contain diluents or other additives (such as polymers), which may be incorporated in the bitumen or separately dispersed in the water.

2 Related Documents

2.1 Waka Kotahi:

- (a) NZTA M01 Specification for Bitumen
- (b) NZTA Z01 Minimum Standard for Quality Management Plans
- (c) NZTA Z08 Minimum Requirements for Inspection, Sampling and Testing

2.2 Other

- (a) Standards New Zealand: NZS ISO/IEC 17025 General Requirements for the Competence of Testing and Calibration Laboratories
- (b) Standards New Zealand: AS/NZS ISO 9001 Quality Systems – Requirements
- (c) Civil Contractors New Zealand: Guidelines for the Use of Bituminous Emulsion for Chip Sealing
- (d) Civil Contractors New Zealand: Requirements for Bitumen Sprayers (BPG02).

3 Quality

3.1 General

The emulsion supplier shall implement a quality management system that complies with the requirements of NZTA Z01 and Z08 specifications. The quality system shall be registered to AS/NZS 9001 and be regularly audited by a JAS-ANZ accredited agency.

All sampling and testing required by the Specification shall be undertaken in a laboratory accredited to NZS ISO/IEC 17025.

4 Materials

4.1 Binder

The emulsified binder shall consist of bitumen compliant with NZTA M01 specification. The binder may contain volatile diluents or modifiers as specified in 4.2 and 4.3 below. The bitumen grade shall be as specified in the contract.

4.2 Diluents

The binder may contain volatile diluents, such as automotive gas oil (Diesel fuel), kerosene or white spirits, or other distillate materials miscible with bitumen. The Contractor shall determine the type and quantity of added diluents in discussion with the emulsion manufacturer. The type and volume of volatile diluents shall be declared to the Contractor, and if requested to the Principal, for the purposes of determining the residual binder application rate.

4.3 Modifiers

The emulsified binder may contain rheology modifiers, such as polymers. These modifiers shall be as specified by the contract, or as agreed with the Contractor. The Contractor shall declare the modifier type and quantity of modifier residual solids as a percent of the residual bitumen to the Principal.

4.4 Emulsion Properties

4.4.1 General

Bitumen emulsions shall be manufactured to a quality standard. The standard may be published by the supplier, or by a third-party organisation, such as an industry group or independent publisher. The criteria specified in the quality standard shall be included in emulsion test reports.

The emulsion supplier shall declare the emulsion type, as Anionic, Cationic or Non-Ionic.

The quality standard shall set limits for performance-related properties including but not limited to physical criteria as follows.

4.4.2 Viscosity

The quality standard shall declare and set limits for the viscosity of the emulsion. The viscosity shall be such that the emulsion can be sprayed using a distributor certified as compliant with BPG02, shall not run off road cambers or gradients, and shall not exhibit streaking after spraying to such an extent that sealing chips are lost from the seal.

The viscosity shall be determined under both high shear to assess spraying characteristics, and under low shear to determine the propensity for run off.

4.4.3 Binder content.

The quality standard shall declare and set limits for the binder content of the emulsion. This shall include both residual bitumen and total dispersed phase. The binder content of the emulsion shall comply with the declared limits.

4.4.4 Breaking rate

Bitumen emulsions used for chip seals are normally fast breaking cationic emulsions. The quality standard shall provide evidence of, and a means to verify the emulsion breaking rate.

4.4.5 Coarse Particles

The quality standard shall set limits for the coarse particles content. This is to ensure the emulsion can be applied using distributors without causing blockages in spray nozzles. The emulsion shall comply with the coarse particles limit.

4.4.6 Storage and Shelf-Life

The emulsion supplier shall provide information on any requirements for emulsion storage and the "shelf-life" of the emulsion, and if needed, including means to minimise separation (settlement or creaming) and suitable processes to re-homogenise separated emulsions.

4.5 Modified Binder Emulsions

The emulsified binder may contain rheology modifiers, such as polymers. There are several ways to incorporate modifiers, which include but are not limited to the following:

- (a) Modification of the bitumen prior to emulsification.
- (b) Addition of a polymer emulsion (such as a latex) to the aqueous phase prior to emulsification.
- (c) Addition of a polymer emulsion (such as latex) to the finished emulsion.

The use of a modified binder emulsion shall be approved by the Principal prior to use. The chip sealing contractor shall provide information to the Principal on the properties of the modified binder, which shall include rheological properties and a logical basis for how the modification treats specific job site challenges and conditions.

The chip sealing contractor shall only select modified binder emulsions for use where the properties of the modified binder are such that they can be shown to treat specific job site problems.

4.6 Sampling and Testing

As a minimum, samples shall be drawn and tested for every 100 tonnes of emulsion produced. It is recommended that samples are drawn and tested for every batch of emulsion produced.

Notes: Bitumen emulsions are normally produced at a central plant and distributed to job sites in road tankers. For practicality reasons, samples of finished emulsion for acceptance testing against the agreed quality standard should be taken at the manufacturing facility.

Samples may also be taken from road tankers or distributor spray bars. However transportation, pumping and other handling can change emulsion properties, so such samples may not comply with the quality standard. This is normal and should not give rise to quality concerns unless the development of coarse binder particles is causing spray nozzle blockages.

5 Emulsion Designations

The following emulsion grade designations shall be used in order to provide uniformity across the bitumen emulsion supply industry.

- (a) Type: Type A is designated as anionic emulsion, type C as cationic emulsion, type N as non-ionic.
- (b) Break rate: Q is designated for rapid breaking emulsions, M for medium breaking emulsions, and S for slow breaking emulsions.
- (c) Binder content is designated by weight percentage.
- (d) The M01 compliant base bitumen grade is appended as the upper limit of the penetration grade.

The following table provides some examples.

Table 1: Bitumen emulsion grade example designations

Emulsion Grade Example	Description	Typical Application
CQ70/130	Cationic, rapid breaking, 70% binder, 130/150 bitumen	Chip sealing
CQ60/180	Cationic, rapid breaking, 60% binder, 180/200 bitumen	Tack coating
CM68/80	Cationic, medium breaking, 68% binder, 80/100 bitumen	Aggregate mixing
AQ60/80	Anionic, rapid breaking, 60% binder, 80/100 bitumen	Tack coating
AS55/180	Anionic, slow breaking, 55% binder, 180/200 bitumen	Aggregate mixing

Note: Anionic emulsions are rarely used as their breaking and adhesion properties are generally considered to be inferior to cationic emulsions.