

NZTA M07: 2022

SPECIFICATION FOR ROAD MARKING MATERIALS

1 SCOPE

This specification sets out the minimum requirements for a road marking, or delineation material for use on the State Highway network. It requires all marking materials to be formally approved prior to use and describes the process by which approval is obtained.

2 INTRODUCTION

This specification is applicable to products which are intended for use as road markings on asphalt or chip seal road surfaces. Road marking are defined in this document as white or yellow markings as described in the NZTA Manual of Traffic Signs and Markings (MOTSAM) Part 2 Clauses 2 and 3.

Waka Kotahi NZ Transport Agency (Waka Kotahi) maintains a list of products approved as fulfilling the properties and performance requirements of this specification. This list is published on the Waka Kotahi web site. Unless specified otherwise, road markings applied on the State Highway must use only products on the List of M07 Approved Products at the time of application. This specification outlines the process for obtaining entry to the List of M07 Approved Products and maintenance of that list.

A product may be an individual material such as a self-adhesive tape or may be a system comprising more than one material such as paint with drop-on glass beads. This specification outlines the performance of materials to be determined by laboratory tests and the performance of products to be demonstrated by field trials.

Use of an approved product does not guarantee road marking performance as appropriate product selection and application are required. Specifiers and applicators are encouraged to understand products in direct consultation with manufacturers/suppliers.

3 QUALITY SYSTEMS

Manufacturers, suppliers and contractors in the supply chain shall establish, implement and maintain a quality system in accordance with this specification, NZTA Z08 and the requirements of AS/NZS ISO 9001. The quality system shall be certified and regularly audited by a JAS-ANZ registered agency.

Throughout implementation of the specification, all equipment used for testing shall be in current calibration and operated by personnel who are deemed competent. Laboratory testing shall be undertaken by a laboratory accredited to ISO/IEC 17025.

Suppliers/Manufacturers making a statement of compliance with this specification (including statements on labelling, other packaging, or in promotional material) shall ensure that such statements are true and accurate and supported by appropriate documentation.

This specification and the List of M07 Approved Products are available on both the Waka Kotahi NZ Transport Agency (NZTA) website and the Highway Information Portal (HIP) <https://www.nzta.govt.nz/roads-and-rail/highways-information-portal/>.

4 RELATED DOCUMENTS

The following documents are referenced by this specification:

- | | | |
|-----|---------------|---|
| (a) | AS 1580 | Paints and Related Materials – Methods of Test |
| (b) | AS 4049 | Paints and related Materials – Pavement Marking Materials |
| (c) | AP-D192 | Australian Paint Approval Scheme – Rules Governing the APAS® Product Certification Scheme |
| (d) | AS/NZS 2009 | Glass Beads for Pavement-Marking Materials |
| (e) | ISO 9001 | Quality Management Systems - Requirements |
| (f) | ISO/IEC 17025 | General requirements for the Competence of Testing and Calibration Laboratories |
| (g) | NZTA MOTSAM | Manual of Traffic Signs and Marking |

(h)	NZTA P22	Specification for Reflectorised Pavement Marking
(i)	NZTA T08	Specification for Road marking Applicator Testing
(j)	NZTA T12	Specification for Long-Life Pavement Marking Material Applicator Testing
(k)	NZTA T16	Determination of Retroreflectivity
(l)	NZTA T17	Determination of Heavy Metal Content in Glass Beads Intended for Use in Pavement Marking Materials
(m)	NZTA Z08	Minimum Requirements for Inspection, Sampling and Testing

5 ROADMARKING PRODUCT APPROVALS

5.1 General

All road marking materials applied to the State Highway network in accordance with this specification shall undergo an approval process and be recorded on the M07 List of Approved Products prior to use.

5.2 Classification

A road marking product will be given a classification as in Table 1 below depending on the durability as determined by a field trial. Once the approval process is complete and approval has been granted it will be included in the M07 List of Approved Products and approved for use on the State Highway network.

Classifications are based on:

- the type of surfacing the material is placed on
- the durability of the product
- The visibility performance maintained through that on-road performance trial.

Surfacing type is either asphalt or chip seal. Approval for one surfacing type does not imply approval for another surfacing type.

Trial duration depends on the expected product durability and may be nominated as either “normal”, “extended” or “long” as defined in the On-Road Performance Trial. The trial duration (in months/years) will be determined and agreed with the Waka Kotahi Principal Surfacing Engineer based on the characteristics of the trial site. The trial duration relates to expected service life but is not the sole determinant or consideration for expected service life (see NZTA M07 Notes: 2022).

Visibility performance is classified according to the requirements of clause 8.3 of this specification.

Table 1: Approval Classifications

Product Visibility	Surface Type Product Durability					
	Asphalt			Chip Seal		
	Normal	Extended	Long	Normal	Extended	Long
High	AN1	AE1	AL1	CN1	CE1	CL1
Standard	AN0	AE0	AL0	CN0	CE0	CL0

5.3 Management of the List of M07 Approved Products

The Waka Kotahi Lead Advisor Pavements can add or remove products from the List of M07 Approved Products at their discretion.

Any product accepted to the List of M07 Approved Products may be removed from the list or given a different classification by the Lead Advisor Pavements if the product is found to not comply with this specification, has

an unsatisfactory in-service performance, or if formulation of the product is found to have changed without notification to the Lead Advisor Pavements.

On request from the Lead Advisor Pavements, a manufacturer/supplier must provide a sample of an approved product for testing within ten working days after receipt of the request.

Any deviations from the approvals process or non-conformances with any of the requirements are allowed only with the written permission of the Lead Advisor Pavements.

The default period for which a product is accepted onto the List of M07 Approved Products is seven years from the date of product approval of the original formulation. The Lead Advisor Pavements may select a different period for approval for a specific product or grant provisional approval based on further supporting data being supplied.

If a manufacturer/supplier wishes their product to remain on the List of M07 Approved Products beyond the product approval expiry date, they shall arrange a timely submission. The submission should be made not less than six months before the expiry date for the product requesting ongoing product approval. This submission will provide updated information in accordance with clause 5.7.

A manufacturer/supplier may remove their product(s) from the List of M07 Approved Products by request to the Principal Surfacing Engineer. Where the manufacturer is aware that the product no longer complies with the specification or that the performance does not match that of the approved product, they shall advise the Principal Surfacing Engineer accordingly who will remove the product from the list.

The manufacturer/supplier is responsible for ensuring that their product(s) on the List of M07 Approved Products continue to comply with this specification and performance matches that of the product as approved.

It is accepted that from time to time manufacturers will find it necessary to change the formulation of an approved product. The manufacturer/supplier shall notify the Principal Surfacing Engineer of any changes to the formulation of their approved product and shall provide evidence that the new formulation provides performance equivalent to, or better than, that of the existing approved formulation.

Waka Kotahi will meet costs of administration of the List of the M07 List of Approved Products. All other costs shall be met by the manufacturer/supplier of the product for which approval is sought.

5.4 Written Information

Applications for approval of a road marking material shall be made in writing to the Principal Surfacing Engineer. As a minimum the following written information is required:

- (a) The product and classification for which approval will be sought
- (b) Evidence of the manufacturer's quality assurance registration
- (c) A Safety Data Sheet that complies with the requirements of the New Zealand Environmental Protection Authority
- (d) The intended application method and targeted dry material thickness
- (e) A list of the laboratory tests to be undertaken for the purposes of approval and quality control and results of laboratory tests performed on the product demonstrating compliance with this specification. See clause 6 of this document.

5.5 Approval Process

Approval of road marking materials and inclusion on the M07 list of approved products is at the sole discretion of the Lead Advisor Pavements.

Applications for approval shall be made to the Principal Surfacing Engineer who will manage the approval process and recommend granting of approval to the Lead Advisor Pavements.

Full approval of a road marking may be granted by the Lead Advisor Pavements following submission of evidence of field performance, provided:

- (a) All of the information required by 5.4 above and as follows has been submitted to the Principal Surfacing Engineer and complies with the requirements of this specification, and
- (b) The road marking material used for the trial has been tested by an accredited laboratory and shown to be compliant with clause 6 of this specification, and

- (c) The performance of the road marking material in the field has been shown to comply with the requirements of clause 5.6 of this specification.

The Principal Surfacing Engineer will assess the evidence as provided for compliance with this specification and make a recommendation for approval (or not) to the Lead Advisor Pavements. The Lead Advisor Pavements may ask for additional information if the compiled evidence is incomplete or unclear.

5.6 Evidence of Performance

5.6.1 General

Independent evidence of the durability and performance of the road marking material shall be provided to the Principal Surfacing Engineer. Such evidence may be from 5.6.2 or 5.6.3 below, or both. The performance from a conforming trial is the preferred input for the approval.

5.6.2 Field Performance Trial

Evidence of performance may be generated from a field performance trial as in clause 9 of this specification. Prior to the construction of the field trial the following information shall be provided to the Principal Surfacing Engineer:

- (a) Documentation outlining the on-road performance trial, undertaken in accordance with the requirements of this specification including procedures used for application of the road marking product (see clause 9)
- (b) The location and timing for the on-road performance trial
- (c) The names and qualifications of personnel involved in laying the trial and assessing performance and their competence
- (d) Quality control tests proposed with acceptance limits together with test reports showing results of all quality control tests performed
- (e) Results of all tests performed on the product during the on-road performance trial.

5.6.3 Australian Paint Approval Scheme Certification

As an alternative to a field trial, evidence of performance may be considered based on the following:

- (a) The road marking material has Class 1 certification of product conformity from the Australian Paint Approval Scheme (APAS) operated by CSIRO. See APAS publication AP-D192, and
- (b) The road marking material complies with the relevant material and performance requirements of AS 4049, and
- (c) Written attestation of the performance of the road marking material on asphalt and/or chip seal surfacing is provided by an Australian State Roading Authority or equivalent agency.

Approval may be granted by the Lead Advisor Pavements for such an approach. The approval will also consider criteria such as, but not limited to, the reputation and track record of the paint manufacturer. A high standard of assurance is needed for approval to be given using this alternative approach. Therefore, all road marking products entered on to the M07 list of approved products based on APAS certification will be classified as having “Normal” (N) durability with Standard “0” visibility. Changes to classifications to Extended “E” or Long “L” durability, and/or “High” visibility may be made based on demonstrated durability and visibility performance on New Zealand road surfacings. Application should be made to the Principal Surfacing Engineer requesting a classification change accompanied by appropriate evidence of performance.

5.7 Renewal of Approvals

Road marking materials that have been listed on the M07 List of Approved Products may apply to the Principal Surfacing Engineer for an extension of approval for a further five-year period, provided:

- (a) The existing approval has at least six months currency before it expires, and
- (b) Updated written evidence of clause 5.4 is provided, and
- (c) Written evidence from road owners is provided that attests to the good durability and performance of the road marking material in the field.

Extension may be granted at the sole discretion of the Lead Advisor Pavements on the basis of this evidence and the recommendation of the Principal Surfacing Engineer.

6 LABORATORY TESTING OF MATERIALS

6.1 General

Road marking products seeking approval shall be tested by a laboratory accredited to ISO/IEC 17025 and comply with the requirements below, as follows:

- (a) Waterborne paint shall comply with the requirements of Table 3;
- (b) Solvent-borne paint shall comply with the requirements of Table 4;
- (c) Thermoplastic road marking materials shall comply with the requirements of Table 5;
- (d) Catalysed systems e.g. Cold Applied Plastic (CAP) shall comply with the requirements of Table 6.

For other principal materials, an appropriate suite of tests and requirements shall be agreed with Waka Kotahi. Clause 6.7 outlines minimum tests and requirements and suggests other properties to be addressed. Clause 6.8 provides tests and requirements for glass beads, applicable to beads which are either mixed into the principal material or surface applied as “drop on” glass beads.

The ingredients of any material shall meet regulatory requirements, in particular the Hazardous Substances and New Organisms Act 1996. Classification and Group Standard(s) shall be provided for all materials.

All materials shall be free of heavy metals and when tested in accordance with NZTA T17, meet the requirements of AS/NZ 2009 Table N1 as specified by CSIRO for the Australian Paint Approval Scheme (APAS).

6.2 Storage properties

Materials shall be unaffected by storage of six months from date of supply. At any time within six months of supply, properties affecting application of the material shall be stable or readily returned to the supplied condition; by for example, simple stirring or recirculation via pumps, and the performance properties of the material shall be unaffected.

The minimum requirements for liquid materials after storage for six months are given in Table 2.

Table 2: Storage Requirements for Liquid Materials

Test Method/Property	Acceptance Requirement
AS 1580.214.1 Consistency	Value shall not have changed more than ± 10 Krebs units from the expected value stated in Clause 6.
AS/NZS 1580.103.1 Examination	No evidence of skin, lumps, gel, or coarse particles.
AS/NZS 1580.211.1 Degree of settling	The settling rating shall be not less than 6.

Notes:

- (a) For solid materials, the manufacturer/supplier shall state the shelf life of their material.
- (b) Further to the above, the manufacturer/supplier may include additional testing to demonstrate material stability.

6.3 Properties of Waterborne Paint

Waterborne paint materials shall comply at all times with the requirements of Table 3 below.

Table 3: Requirements for Waterborne Road Marking Materials

Test Method/Property	Acceptance Requirement
AS 1580.211.1 Condition in the container	As per AS 4049.3 clause 6.1.1 Condition in the container
AS 4049.3 Appendix E Fineness of paint	As per AS 4049.3 clause 6.1.2
AS 1580.214.1 Consistency	Expected value and range accepted in Quality Control testing shall be stated. For example, 90 ± 5 Krebs units or 90 Krebs units $\pm 5\%$ at 25°C. Refer to clause 0 for the maximum permissible range.
AS 1580.401.8 No-pick-up time	The no-pick up time shall be ≤ 15 minutes. If the no-pick-up time is ≤ 7 minutes the material can be classified as "rapid drying" otherwise the material shall be classified as "slow drying".
AS 4049.3 Appendix F Assessment of Early washout resistance	As per AS 4049.3 clause 6.1.6
AS 1580.601.1 Colour	As per AS 4049.3 for a white material. For a yellow material, the colour shall be equal to Y13 (Vivid Yellow) or Y14 (Golden Yellow) or any colour that lies between Y13 and Y14 of AS 2700.
AS 1580.602.2 Specular gloss	As per AS 4049.3 clause 6.1.8 Specular gloss
AS/NZS 1580.202.1 Density	Expected value and range accepted in Quality Control testing shall be stated.
AS/NZS 1580.204.1 Fineness of grind	Expected value and range accepted in Quality Control testing shall be stated.
AS 1580.301.1 Non-volatile content by mass	Expected value and range accepted in Quality Control testing shall be stated.
AS 1580.301.2 Non-volatile content by volume	Expected value and range accepted in Quality Control testing shall be stated.

6.4 Properties of Solvent-Borne Paint

Solvent-borne paint materials shall comply at all times with the requirements of Table 4 below:

Table 4: Requirements for Solvent-Borne Road marking Materials

Test Method/Property	Acceptance Requirement
AS 1580.211.1 Condition in the container	As per AS 4049.1 clause 7.1.1
AS 4049.1 Fineness of paint	As per AS 4049.1 clause 7.1.2
AS 1580.214.1 Consistency	Expected value and range accepted in Quality Control testing shall be stated. For example, 75 ± 5 Krebs units or 75 Krebs units ± 5% at 25°C. Refer to clause 0 for the maximum permissible range.
AS 1580.401.8 No-pick-up time	The no-pick up time shall be ≤ 15 minutes. If the no-pick-up time is ≤ 7 minutes the material can be classified as “rapid drying” otherwise the material shall be classified as “slow drying”.
AS 1580.601.1 Colour	As per AS 4049.1 clause 7.1.6 for a white material. For a yellow material, the colour shall be equal to Y13 (Vivid Yellow) or Y14 (Golden Yellow) or any colour that lies between Y13 and Y14 of AS 2700.
AS 1580.602.2 Specular gloss	As per AS 4049.1 clause 7.1.7
AS 4049.1 Appendix E	As per AS 4049.1 clause 7.1.9 Resistance to bleeding
AS 1580.204.1 Fineness of grind	Expected value and range accepted in Quality Control testing shall be stated
AS/NZS 1580.202.1 Density	Expected value and range accepted in Quality Control testing shall be stated.
AS 1580.301.1 Non-volatile content by mass	Expected value and range accepted in Quality Control testing shall be stated.
AS 1580.301.2 Non-volatile content by volume	Expected value and range accepted in Quality Control testing shall be stated.

6.5 Properties of Thermoplastic Materials

Thermoplastic road marking materials shall comply at all times with the requirements of Table 5 below.

Table 5: Requirements for Thermoplastic Road Marking Materials

Test Method/Property	Acceptance Requirement
AS 1580.601.1 Colour	As per AS 4049.2 clause 6.1 for a white material. For a yellow material, the colour shall be equal to Y13 (Vivid Yellow) or Y14 (Golden Yellow) or any colour that lies between Y13 and Y14 of AS 2700.
AS 4049.2 clause 6.3 Heat stability	As per AS 4049.2.
AS 4049.2 clause 6.4 Softening point	Expected value and range accepted in Quality Control testing shall be stated.
AS 4049.2 clause 6.6 Flow resistance	As per 4049.2.
AS 4049.2 clause 6.7 Density	Expected value and range accepted in Quality Control testing shall be stated.

6.6 Properties of Catalysed Road Marking Systems

The primary materials of a catalysed system (e.g. Cold Applied Plastic) shall be tested and comply at all times with Table 6 below. The table states whether the tests are to be applied to individual components of the catalysed system, for example the resin base and the hardener/catalyst, or the system of the primary materials combined.

Table 6: Requirements for Catalysed Road Marking Materials

Test Method/Property	Acceptance Requirement
AS 1580.211.1 Condition in the container	Tests are applied to the individual primary materials and requirements are as per AS 4049.1 clause 7.1.1 Condition in the container
AS 1580.214.1 Consistency	Expected value and range accepted in Quality Control testing shall be stated. For example, 75 ± 5 Krebs units or 75 Krebs units ± 5% or other recognised viscosity units
AS 1580.601.1 Colour	Requirements apply to the system. As per AS 4049.1 clause 7.1.6 for a white material. For a yellow material, the colour shall be equal to Y13 (Vivid Yellow) or Y14 (Golden Yellow) or any colour that lies between Y13 and Y14 of AS 2700.
AS 1580.602.2 Specular gloss	Test is applied to the system and the requirement is as per AS 4049.1 clause 7.1.7.
AS/NZS 1580.202.1 Density	Tests are applied to the individual primary materials and for each the expected value and range accepted in Quality Control testing shall be stated, for example 1.45 ± 0.05 kg/L at 25°C.
No-pick-up time or dry/cure time AS 1580.401.8 No-pick-up time, ASTM D1640 or agreed test method	State test method to be applied to the system and state results.
AS 1580.301.1 Non-volatile content by mass	Tests are applied to the individual primary materials and for each the expected value and range accepted in Quality Control testing shall be stated.
AS 1580.301.2 Non-volatile content by volume	Tests are applied to the individual primary materials and for each the expected value and range accepted in Quality Control testing shall be stated.

6.7 Other Principal Materials

Other principal materials may be adhesive tapes, or other materials not specified above.

For other principal materials, an appropriate suite of tests and requirements shall be agreed between the Lead Advisor Pavements and the manufacturer/supplier prior to commencement of testing. Depending on the nature of the principal material, other tests may address, but are not limited to, resistance to bleeding, specular gloss, no-pick-up time, adhesion, abrasion resistance, and storage properties. For liquid materials, other tests may address, but are not limited to, condition in the container, consistency, application properties and non-volatile content by mass.

For materials formed of multiple components, some tests may require separate testing of each component, for example storage properties should be addressed for each component.

6.8 Glass Beads

Glass beads shall comply with AS/NZS 2009. Type D-HR beads shall be used in lieu of Type D beads. Heavy metal content of glass beads shall be determined and reported in accordance with Appendix N of AS/NZS 2009. The heavy metal content of glass beads shall not be greater than the values shown in Table N1 for the specifiers CSIRO and APAS.

6.9 Other Materials (surface applied or incorporated)

The heavy metal content of these materials shall be not greater than the values shown in AS/NZS 2009 Table N1 for the specifiers CSIRO and APAS.

7 QUALITY CONTROL AND OTHER REQUIREMENTS

7.1 Quality Control

A supplier or manufacturer shall be responsible for carrying out a quality control program to ensure that each batch of material produced conforms to this specification and the expected values stated for that material.

A quality control program with an appropriate suite of quality control tests and requirements shall be proposed by the manufacturer/supplier and agreed between the Lead Advisor Pavements and the manufacturer or supplier.

For any products on the List of M07 Approved Products, on request the supplier or manufacturer shall make available details of the sampling, quality control tests, and results of the quality control program for their material(s) of that product.

7.2 Packaging and labelling

Materials shall be packaged in sound, clean and dry containers/packaging constructed of a material which is inert to the contents and sufficiently robust to withstand normal conditions of handling and storage without rupture or leakage.

The following information shall be legibly and permanently marked or labelled on to each container/package:

- (a) The name of the supplier/manufacturer
- (b) A description adequately describing the contents, for example "White waterborne road marking paint"
- (c) The product name as listed in the M07 List of Approved Products
- (d) The contents by volume in litres for liquid materials or mass in kilograms for solid materials
- (e) Production or batch number and date of manufacture
- (f) Specific storage and handling information or warnings required by regulatory requirements
- (g) Storage and handling conditions recommended for maintaining material condition.

7.3 Handling and Disposal

Road marking materials may be hazardous or ecotoxic materials. As such their storage, use and general handling shall be in accordance with appropriate regulatory requirements. Disposal of waste, including paint-impacted wash water shall be to an appropriately licensed facility.

8 ON-ROAD PERFORMANCE TESTING OF PRODUCTS

8.1 General

Road marking products submitted for approval shall follow the process of clause 5.5 of this document. When an on-road performance trial is planned and drop-on materials are used in the trial with the road marking product, the supplier and grade of the drop-on material shall be declared to the Principal Surfacing Engineer as part of the application for approval.

Clause 9 of this specification provides guidance for selection of an appropriate on-road site and testing schedule. These shall be agreed with the Lead Advisor Pavements prior to commencement of the on-road performance testing (See clause 5.6).

Clauses and 8.2 and 8.3 outline the testing required at intervals during the field trial.

8.2 Requisites

For approval, a product must pass the requirements in this clause 8.2. Performance on these tests does not influence the Classification provided with the approval.

A product shall be tested in accordance with AS 4049.5 clauses 8.3.3, 8.3.4, and 8.3.7 and results shall comply with the associated parameter requirements given in Table 1 of AS 4049.5, except as noted below.

Table 7: Amendments to AS 4049.5 Requirements

Test/Property	Reporting/Requirements
AS 4049.5 clause 8.3.3 Degree of wear	As per AS 4049.5 Table 1
AS 4049.5 clause 8.3.4 Skid resistance	For products laid at a thickness < 0.9mm, the minimum BPN is 45. For products laid at a thickness ≥ 0.9mm, the minimum BPN is 50.
AS 4049.5 clause 8.3.7 Colour change	Colour change shall be assessed for white and non-white materials. The minimum colour change value is 4. By agreement with the Lead Advisor Pavements, the ISO 105 A03 grey scale may be used.

8.3 Visibility Requirements and Classification

“Visibility” is measured via retroreflectivity (R_L) and the luminance factor under diffuse illumination (Q_d) which shall be determined in accordance with NZTA T16 but see Note below. The retroreflectometer shall be capable of measuring both R_L and Q_d . With agreement from the Lead Advisor, Pavements an alternative may be used.

To be approved, a product must pass the minimum visibility requirements, shown in Table 8 and Table 9 at the required testing milestones. Results are used to determine the classification for the product as set out in Table 1.

Table 8: On-road performance trial visibility criteria for white products (mcd/m²/lux)

Criterion	Retroreflectivity		Luminance	
	Dry R_L	Wet R_L	Dry Q_d	Wet Q_d
Performance for “High Visibility” Classification	150	50	120	120
Performance for “Standard Visibility” Classification	100	35	80	80

Table 9: On-road performance trial visibility criteria requirements for yellow products (mcd/m²/lux)

Criterion	Retroreflectivity		Luminance	
	Dry R_L	Wet R_L	Dry Q_d	Wet Q_d
Performance for “High Visibility” Classification	120	35	80	80
Performance for “Standard Visibility” Classification	75	25	60	60

Note: The method of AS 4049.4 Appendix K, using a type (c) retroreflectometer, may be used as an alternative to NZTA T16.

9 ON-ROAD PERFORMANCE TRIAL

9.1 Preparation and Implementation

The following clauses should be considered during preparation and implementation of the on-road performance trial.

Throughout preparation and implementation of the on-road performance trial, the manufacturer/supplier of the product being trialled shall be responsible for obtaining all permissions and obtaining or following all requirements of the road controlling authority and/or network management contractor. Agreement with the road controlling authority and/or network management may include arrangements for removal/reinstatement of road markings following the trial or early failure of trial lines.

9.2 Trial stages and documentation

9.2.1 Proposal

The proposal (Clause 5.2) shall include information on the intended on-road performance trial location, sample areas, and inspection regime.

The Principal Surfacing Engineer should be informed seven days prior to the intended laying of the product to be trialled and kept informed to the day of application. The Principal Surfacing Engineer, or their representative, may elect to attend the laying of the product for on-road performance trial.

9.2.2 Laying and first inspection

The road markings shall be inspected between 24 hours and 1 week after laying. The inspection shall cover the requirements of 9.2.3.

A report of the on-road performance trial shall be submitted to the Principal Surfacing Engineer within four weeks of laying.

The Laying Report should confirm or update information included in the proposal and provide details of the laying and sample areas. The Laying Report should confirm the product can be practicably used to produce uniform/consistent road markings with clear controlled dimensions with the required properties and at the nominated thickness.

9.2.3 Inspections

The product being trialled shall be inspected at intervals and tested as per Clause 8.2 and 8.3. An "Inspection Report" shall be submitted to the Principal Surfacing Engineer within four weeks of each inspection. Clause 10 contains an Inspection Report template that may be used.

In addition to testing of the sample areas, inspections should observe and record any factors potentially relevant to product performance.

9.3 General Location

The on-road trial site shall be located on a section of public road.

The proposal should outline the location of the on-road trial site, describe the typical annual weather conditions, the annual average daily traffic and percentage heavy vehicles (and percentage very heavy vehicles if relevant), the speed limit, the topography and alignment at least 500 metres preceding and following the on-road trial site.

As a guide to selecting suitable on-road trial sites, preference is for annual average daily traffic in the order of 2,500 to 5,000 vehicles per lane with about 10 percent heavy vehicles and 2 to 3 percent very heavy vehicles (HCV II). A speed limit greater than 80 km/hr is preferred.

The proposal should indicate whether the product being trialled is to be laid as transverse lines or longitudinally. Transverse trial lines should be a set of at least four lines for each product under trial, laid across a traffic lane.

Longitudinal trial lines could be a length of continuous edge line. A centreline or lane lines between multiple lanes of traffic in the same direction could be considered. A continuous edge line adjacent a barrier would

generally be inappropriate as it would have little direct trafficking. Centreline of "no passing" highway segments shall not be used unless the information from the test is required for yellow paint lines.

The proposal should include maps and/or photographs and details sufficient for the Principal Surfacing Engineer to locate the on-road trial site.

It is suggested that the test site should be distant from activities such as quarries which can induce excess dirt, gravel and the like to be tracked over the test area.

9.4 Road surface

Products are approved separately for either chip seal road surfaces or asphalt road surfaces (such as open graded porous asphalt (OGPA), dense asphalt or stone mastic asphalt). The trial site should be selected accordingly.

The proposal shall outline the road surface type, age and confirmation from the Road Controlling Authority that the road surface will not be resurfaced within the intended on-road trial duration.

The road surface of the on-road trial site should be stable and have been in place for at least six months.

The proposal should indicate whether the product being trialled is to be laid direct onto the "bare" road surface, upon existing road markings or some other "base" road marking laid for the purpose of providing an "underlying road marking". If the product being trialled is to be laid upon an underlying road marking, the material(s), age and condition of the underlying road marking should be recorded and the compatibility of the underlying road marking should be confirmed.

9.5 Sample areas

At each inspection, testing as per Clause 8.2 and 8.3 shall be undertaken within each sample area. Additional sample areas may also be tested and reported.

For transverse trial lines, the left hand wheel path of each line will constitute a sample area.

For longitudinal trial lines, at a minimum, four 5m long sample areas shall be located where trafficking of the lines is expected, for example the edge line on the inside of a corner. The proposal should include the rationale for selection of the sample areas, for example site observations of vehicle paths through corners. The sample areas should be spaced in the order of 400m to 600m apart, depending on the site.

The proposal should include maps and/or diagrams and/or photographs and details sufficient for the Principal Surfacing Engineer to independently locate the sample areas where measurements are made.

9.6 Laying

9.6.1 General

As far as practicable laying of the product being trialled shall replicate the manner in which the product would normally be laid. On request the Principal Surfacing Engineer may grant permission for an alternative application method more suited to a trial especially where transverse markings are to be laid. Laying of the on-road performance trial road markings shall comply with all the relevant requirements of NZTA P22 and NZTA T08 or NZTA T12.

Where drop-on materials are used (such as glass beads) the supplier and grade of the materials, and the application rate shall be declared and submitted with the testing documentation.

Conditions during laying of the product being trialled shall be recorded.

9.6.2 Test plates

In addition to any other test plates required, during laying two test plates shall be prepared for the purpose of provision to the Principal Surfacing Engineer. For products which would normally be laid with drop-on materials included, one test plate shall be prepared without those drop-on materials and the other test plate shall be prepared with the product as it would normally be laid including any drop-on materials. For products which would normally be laid without drop-on materials included, both test plates shall be prepared with the product as it would normally be laid.

Test plates shall have nominal surface dimensions 200mm x 150mm x 1.5mm prepared from electro-coated steel plate.

Test plates shall be taken at least 600mm away from the start or end of the line being laid to ensure the sample is representative. The test plate shall be placed on the road surface central to the line to be laid and covered.

For products where a test plate is prepared without any drop-on materials, the dry film thickness of the product shall be determined using a non-destructive thickness gauge. The thickness gauge shall have an accuracy of $\pm 3\%$ in the range of thickness 0.5mm to 13.0mm when calibrated at zero and either end of the range.

When the line on the test plate is sufficiently cool and hard, dry film thickness measurements shall be made (often oven drying of a paint film is necessary to speed the dry time). Measurements shall be taken in three longitudinal zones parallel to the direction the line was laid, one longitudinal zone in the centre of the line and one longitudinal zone approximately 15mm to 20mm in from both edges of the line. Ten measurements shall be taken in each longitudinal zone in a random pattern within the zone. The average for each zone shall be reported and the average of the 30 measurements shall also be included in reporting of the laying.

9.7 Inspection programme

The proposal should outline the programme for inspections. There shall be one inspection between one and seven days after laying then further inspections approximately evenly spaced through the total trial duration. Table 10 includes a guide to selecting a suitable number of inspections during the trial.

The proposal should include a rationale for the total trial duration selected.

The total trial duration should be selected based on whether the product being trialled is to be laid as transverse lines or longitudinally, traffic volumes/composition at the trial site, and whether the product is intended for classification as normal, extended, or long-life. Note the minimum trial duration should be about nine months to achieve 1.5 million vehicle passes for transverse lines to demonstrate stability of properties in the environment.

The following table is provided as a guide to selecting suitable total trial duration.

Table 10: Trial duration guidance

Product durability	Trial laid as:		Number of inspections
	Transverse lines	Longitudinally	
Normal	1.5 million vehicle passes	12 to 15 months	Laying + 3
Extended	2.5 million vehicle passes	24 to 27 months	Laying + 4
Long-life	5.0 million vehicle passes	4.5 to 5 years	Laying + 6

9.8 Special provisions

At the discretion of the Lead Advisor Pavements, when trialling long-life products, it may be possible for provisional approval to be granted prior to completion of the total trial duration.

For example: a suggested approach is to lay both the product being trialled for long-life classification and a product already on the List of M07 Approved Products with a long-life classification at the same time at the trial site, then inspect both products after 9-12 months in service life. Results from the product approved with long-life classification can be used to extrapolate performance expected. A report of the results and extrapolation procedure can be used to apply to be included on the List of M07 Approved Products with a provisional long-life classification. Inspections of the on-road performance trial for both products would continue and the results from the total trial duration submitted to the Principal Surfacing Engineer. From those results, the product would either be given full approval and a new expiry date given or the trial product's long-life classification would be removed.

Similarly, the Lead Advisor Pavements may request for a sample of control product to be laid and measured as part of the on-road performance trial. The data will be used to develop greater understanding of factors affecting road marking in-service life and may also be used for monitoring or comparing on-road performance trials but will not be used as a "benchmark".

10 ROAD TRIAL: LAYING REPORTING GUIDE

Product and on-road performance trial site		
Manufacturer/Supplier contact		
Product (including colour)		
Location of trial site		
Laying		
Date of laying		
Site preparation prior to laying (underlying lines, sweeping/cleaning...)		
Method of laying (self-propelled machine, trowel screed...)		
Direction of laying (north/southbound, from/to centreline...)		
Laying operators and roles		
Conditions during laying		
	Range recommended by manufacturer	During laying
Road surface temperature (°C)		
Ambient air temperature (°C)		
Relative humidity (%)		
Wind speed (m/s)		
Time before trafficking (minutes)		
Test plates provided		
	Test plate 1	Test plate 2
Description		
Location test plate taken from		
Dry film thickness (if applicable)	Average zone 1	
	Average zone 2	
	Average zone 3	
	Plate average	

11 ROAD TRIAL: INSPECTION REPORTING GUIDE

Note this guide is set up assuming four sample areas for the product being trialed. The template should be altered or replicated if a larger number of sample areas is used.

Product and on-road performance trial site				
Manufacturer/Supplier contact				
Product (including colour)				
Location of trial site				
Inspection				
Date of inspection				
"Age" of road markings since laying				
Estimated vehicle passes				
Inspection operators and roles				
Comments				
Properties				
Note: Photograph of each sample location to be included with Inspection Report				
Sample area	1	2	3	4
Degree of wear	Percentage of area remaining intact			
Skid resistance	Temperature-corrected BPN			
Test 1				
Test 2				
Average				
Colour change	Colour change value using (select) ISO 105 A02 or ISO 105 A03			
Sample area	1	2	3	4
Dry R _L	mcd/m ² /lux			
Reading 1				
Reading 2				
Reading 3				
Reading 4				
Reading 5				
Average				
Wet R _L	mcd/m ² /lux			
Reading 1				
Reading 2				
Reading 3				
Reading 4				
Reading 5				
Average				
Dry Q _d	mcd/m ² /lux			
Reading 1				
Reading 2				
Reading 3				
Reading 4				
Reading 5				
Average				
Wet Q _d	mcd/m ² /lux			
Reading 1				
Reading 2				
Reading 3				
Reading 4				
Reading 5				
Average				
The inspection has been completed in accordance with prescribed procedures.				
Name and signature			Date	