

NZTA P03: 2025

Specification for First Coat Sealing

1 Scope

This specification is for the construction of a first coat seal over a granular basecourse. It describes the materials, design criteria and construction process for the first coat seal.

The Principal is responsible for:

- (a) Determination of the binder composition.
- (b) The treatment selection.
- (c) The design of the chip seal.

2 Referenced Documents

2.1 Waka Kotahi NZ Transport Agency

- (a) NZTA B02 Specification for Construction of Unbound Granular Pavement Layers
- (b) NZTA B05 Specification for In-Situ Stabilisation of Modified Pavement Layers
- (c) NZTA B07 Specification for the Manufacture and Construction of Plant Mixed Modified Pavement Layers
- (d) NZTA M02 Specification for Bitumen Emulsion
- (e) NZTA M06 Specification for Sealing Chip
- (f) NZTA P18 Specification for the Design of Chip Seals
- (g) NZTA T09 Procedure for the Estimation of the Kerosene Content
- (h) NZTA T30 Colour Indicator Test for the Presence of Adhesion Agent in Bituminous Binders
- (i) NZTA Z01 Minimum Standard for Quality Management Plans
- (j) NZTA Z08 Minimum Requirements for Inspection, Sampling and Testing

2.2 Standards New Zealand

- (a) NZS ISO/IEC 17025 General Requirements for the Competence of Testing and Calibration Laboratories
- (b) NZS 4407 Methods for Sampling and Testing Aggregates
- (c) AS/NZS ISO 9001 Quality Systems – Requirements

2.3 Civil Contractors New Zealand

- (a) CCNZ BPG02 Requirements for Bitumen Sprayers
- (b) Industry Guidance for Basecourse Preparation for Road Construction

2.4 ASTM International

- (a) ASTM D140 Standard Practice for Sampling Asphalt Materials
- (b) ASTM D2170 Standard test Method for Kinematic Viscosity of Asphalts

3 Quality

3.1 General

The chip sealing Contractor 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 this Specification shall be undertaken by a laboratory accredited to NZS ISO/IEC 17025.

3.2 Hold Points

The Contractor shall accommodate the following submissions and hold points (as defined in NZTA Z08) and provide advance notice to the Principal as in Table 1 below:

Table 1: Submissions and Hold Points

Number	Type	Clause	Action	Advance Notice (days)	Duration (days)
1	Submission	5.2	Provision of chip test reports	-	-
2	Mandatory	7.5	Approval of basecourse finishing	2	-
3	Records	8.3	Provision of QC/QA Documents	-	28
4	Records	9.1	Provision of quality records	-	28

4 Definitions

Refer to NZTA P18 specification for definitions of terms used in this specification.

5 Design

5.1 Materials and Treatment Selection

The Principal will determine the base binder grade and flux oil content and provide this to the Contractor as part of the contract documents or no less than three months prior to the planned chip seal construction date.

The cutter oil content of the binder shall be nominated by the Principal based on the guidance in NZTA P18 specification.

The Principal will determine the treatment for the job. Treatment options include:

- (a) A single coat seal.
- (b) A racked-in seal.
- (c) A two-coat seal.

5.2 Aggregate

Sealing chip shall be supplied from a stockpile constructed at or adjacent to the work site, unless prior agreement has been reached with the Principal to supply direct from a chip manufacturer. Where the chip is supplied directly from the chip manufacturer, it shall be from a separate discrete stockpile that has been tested in accordance with the requirements of this specification.

The Contractor shall arrange for samples of the sealing chip to be drawn from the site stockpile using the sampling method of NZS 4407 clause 2.4.6.2 and be tested. The samples shall comply with Table 3 or Table 4 of NZTA M06 specification depending on the chip Grade as appropriate.

Testing frequency shall be as in Table 2 below:

Table 2: Chip Aggregate Stockpile Sampling Frequency

Stockpile Size (m ³)	Minimum Number of Samples
<100	1
100 – 500	2
>500	3

The Contractor shall submit the laboratory test reports to the Principal so that the binder application rates can be determined.

5.3 Design Process

The Principal will determine the seal design using the process set out in NZTA P18 specification and provide this as the binder application rate R to the Contractor no more than two weeks after receipt of the test reports for the samples drawn from the chip aggregate site stockpiles.

5.4 Reseal

A reseal as a second coat seal shall be applied no later than 24 months after the construction of the first coat seal.

Note: It is essential to give a first coat seal enough trafficking before a second coat is applied.

Heavily trafficked sites, (>2500 Equivalent Light Vehicles per lane per day, see P18) must receive a second coat seal no later than 12 months after construction of the first coat seal.

The Principal will determine the second coat treatment which is intended to further enhance waterproofness and strengthen the first coat seal.

Note: Usually second coat reseals are applied after at least six months of warm weather trafficking, in order to give the new pavement time to “settle down” and for the seal to compact. The selection of the type of second coat seal should ideally be determined at the time of the first coat seal treatment selection.

6 Plant and Equipment

All plant items shall be in good mechanical condition and in particular no fault that could present a hazard shall be permitted. Oil, water or fuel leaks will render a plant item unacceptable.

Bitumen distributors shall possess a current Certificate of Compliance with CCNZ BPG02 *Requirements for Bitumen Sprayers*. A copy of the Certificate of Compliance shall be carried in the distributor.

The bitumen distributor shall be equipped (for instance by using an “end nozzle”) such that a sharp cutoff on the outside edges of the seal is constructed without the binder application rate tapering off.

Note: Where adjacent spray runs with a longitudinal joint are constructed then a normal taper shall be constructed to allow full depth (triple) overlap of the subsequent binder application.

Chip spreading equipment shall be capable of spreading the aggregate evenly, at a controlled rate, over a width of at least 2.4m and shall be fitted with a positive means of adjusting the width of spread. Control of spread width shall be adjustable only from the side of the spreader. The design of the spreading equipment and the operating speed of the spreading vehicle shall ensure that the sealing chip is dropped in such a way that it does not tumble on impact with the sprayed surface.

Rollers shall be self-propelled and have a minimum weight when operating of not less than seven tonnes, spread over at least seven smooth pneumatic tyred, wheels. Any roller exceeding 13 tonnes shall be deemed, for the purpose of this specification, to weigh 13 tonnes. The tyres shall be inflated to not less than 600kPa and adequate means of checking tyre pressures on site shall be provided by the Contractor. A steel wheeled roller may be acceptable for not more than the first two passes required for the initial rolling.

Vibrating pneumatic tyred rollers have been found to be very effective in developing the chip mosaic and are recommended for use.

7 Construction

7.1 Timing

Sealing in accordance with this specification shall be carried out between 1 September and 31 March. All binder spraying shall be completed at least 90 minutes before the official time of sunset and all plant shall be clear of the sealed area by sunset.

7.2 Weather Conditions

The shade air temperature within the area being sealed shall not be less than 10°C. Where the shade air temperature is less than 20°C prior to commencement of work the shade air temperature shall be rising.

The Contractor shall obtain weather forecasts and is liable for any consequent maintenance or repairs arising from weather events. A reputable weather forecasting agency shall be agreed with the Principal.

There shall be no rain, frost or snow forecast for the job site for a minimum of 48 hours after completion of the chip seal.

7.3 Pattern of Sealing Operations

All the extents of the seal including the longitudinal edges shall comply with the design of the pavement and shall include all widenings and entrances. The extents shall be clearly defined and marked prior to commencement of sealing.

A spray plan shall be developed by the Contractor and provided to the Principal for approval on request.

Where a longitudinal joint occurs, a strip of the first sprayed area shall be left unchipped to allow effective jointing with the next pass of the distributor and the next spray run shall overlap to the extent recommended in the Certificate of Compliance of the distributor.

No traffic, including construction traffic shall be permitted to cross the unchipped bitumen including longitudinal edges.

No lap shall be left uncompleted at the end of any day's sealing. Laps within traffic lanes, or within 600mm of them, shall be completed within 30 minutes of the first side being sprayed. No normal road traffic shall be allowed to cross uncovered binder.

7.4 Protection of Road Furniture

Before any binder is sprayed, the Contractor shall offset mark out the position of all service covers and railway crossing rails in the road surface and bridge expansion joints, so that they can readily be located afterwards, and shall cover them adequately to protect them from spray. Once spraying and chip spreading is completed the covers shall be cleaned off.

Kerb and channel, marker, sign posts, median and side barriers and other road furniture adjacent to surfaces to be sealed, shall be adequately protected against over-sprayed binder and from roller or other damage.

Any blemish or damage so caused shall be made good at the Contractor's expense and to the satisfaction of the Principal.

Where new granular basecourse construction abuts kerb and channel, the seal width shall be extended so that between 10mm and 20mm of seal extends on to the concrete channel.

7.5 Basecourse Surface

Basecourse preparation shall fully comply with NZTA B02, B05 or B07 specification as appropriate and should be in accordance with CCNZ *Industry Guidance for Basecourse Preparation for Road Construction*. The finished surface shall exhibit a tightly interlocked stone mosaic surface. The surface of the road at the time of sealing shall be clean, reasonably dry and free of ice or frost.

The Contractor shall sweep the finished basecourse surface immediately prior to construction of the first coat chip seal. The presence of any appreciable layer of fines, including crusher dust, on the surface shall render the surface unacceptable for sealing.

If the finished basecourse surface is not "tight" and sweeping dislodges aggregate then sealing shall not proceed. Locationally and date/time referenced photographs shall be taken by the Contractor of the swept basecourse immediately prior to sealing and included in the quality records.

Where sealing abuts existing surfacings the basecourse shall be finished at a reduced height equivalent to the thickness of the chip seal so that the height of the new seal is identical to the existing surfacing.

Chip sealing shall not commence until the basecourse preparation and sweeping has been completed to the satisfaction of the Principal.

This shall constitute a hold point. Sealing shall not commence until the Principal releases the hold point. The Contractor shall provide at least 48 hours notice to the Principal of expected completion of basecourse preparation so that site inspections can be scheduled.

7.6 Application of the Binder

All binders shall be supplied with a blend certificate certifying binder composition to enable traceability of the binder to the job site. The blend certificate shall state the dosage and volume of all binder components.

The binder shall be applied with a bitumen distributor, certified compliant with CCNZ BPG02.

When the road surface has been cleaned and brought to the required standard, the binder shall be sprayed at the specified rate over the prepared surface. The quantity of binder sprayed in any spray run, excluding hand-sprayed areas, shall not vary from the target volume by more than $\pm 5\%$. Should greater variation occur more than twice during spray operations in a single day then works shall cease and the bitumen distributor be repaired and recalibrated.

Apply the binder at the binder application rate (being CSR_{hot} or ESR_{hot} as appropriate), as follows:

- (a) For single coat seals apply the full design application rate in one pass before applying the sealing chip cover aggregate. See P03 Notes for photographs.
- (b) For raked-in seals apply the full design application rate in one pass before applying the sealing chip cover aggregate. The coarse aggregate shall be applied first leaving wide "windows" allowing sufficient space for the second chip application using the finer chip, to contact and bond with the binder. See P03 Notes for photographs
- (c) For two-coat seals, the binder is sprayed in two applications, totalling R . The first binder application, 50% - 60% of the design application rate is sprayed, followed by application of the coarse chip aggregate. The coarse aggregate shall be applied leaving some windows to allow the fine aggregate to lodge in the surface voids. The seal is rolled to lay the coarse chips on to their greatest dimension and embed them into the binder.

The second binder application, being the remaining binder is sprayed, followed by the application of the fine chip aggregate and rolling.

Where instrumentation measuring binder delivery is fitted to the distributor, the instrumentation may be used to measure the binder used in a single spray run, for the sole purpose of checking application rate. The Contractor shall use a calibrated dipstick to measure the binder volume in the tank before spraying is commenced, and after the last spray run, or prior to its refilling. Written evidence of the binder application, including reconciliation of dipstick and instrumental records of binder usage shall be provided to the Principal as part of the quality documentation.

The road shall be reasonably dry before the binder is applied, and no spraying shall be carried out when the air temperature measured within the confines of the job site is below 10°C in the shade. At locations which have been noted as heavily shaded, the Principal may direct that sealing operations be performed during a limited period of the day.

Note: It is acceptable for basecourse surfaces to be dampened with a light application of water if bitumen emulsion is used as the binder.

In order to ensure that the required application rate is obtained at the commencement of each spray run and that a sharp and even joint is obtained at the finish of each spray run, non-porous paper or fabric shall be placed across the pavement where each run of the spray starts and finishes. Spraying shall start and stop within the paper strips. The Contractor shall take adequate measures to secure the paper against lifting by wind or traffic. Soil shall not be used for that purpose.

Immediately prior to any distributor run, the binder shall be circulated through the spray bar for at least 20 minutes until the bar is fully heated. This must be done over paper to prevent ground contamination from any droppings from the spray bar.

The bitumen distributor shall start moving in advance of the area to be sprayed so as to be travelling at the correct speed when the spray bar reaches the paper strip. Spraying shall start and stop within the paper strips.

During application the sprayed binder shall be monitored to identify issues such as but not limited to blocked nozzles, incorrect overlaps, streaking, missing end nozzle. Where such issues are identified, they shall be rectified prior to the further application of binder.

7.7 Application of the Chip Aggregate

7.7.1 Chip Supply

The Contractor shall arrange for the supply of the sealing chip and its stockpiling on site.

The chip used to seal any section shall be drawn from the stockpile appropriate to that section. Where the Contractor wishes to use chips of the same Grade from an alternative tested and approved stockpile, any such proposal will be accompanied by amendment or confirmation of the required binder application rate and may require that such alternate chip be not mixed with that from another stockpile.

The Contractor may elect either to seal the chip stockpile site before stockpiling or to place the aggregate directly on the ground. In the latter case a continuous layer of chip shall be left on the bottom of the stockpile area sufficient to prevent contamination of the chip by the ground.

If the chip is observed to be contaminated with material from the stockpile base, spreading of the contaminated load shall cease immediately and the load discarded.

7.7.2 Chip Application

Before commencing any distributor "run", sufficient loaded trucks shall be at the site to provide the full chip cover for the area of road surface to be sprayed. For single coat seals the spread rate of the chips shall be such that when fully rolled and trafficked it will be one stone thick, closely packed shoulder to shoulder, with the individual stones with their long axis (average greatest dimension, AGD) horizontal.

For raked-in or two coat seals, the coarse aggregate application shall be sparse with wide "windows" to allow the finer chip to lodge between the coarse aggregate particles and contact the binder.

The Contractor shall be responsible for obtaining the appropriate chip spread rate which can be tested for "take" of chips as described in clause 9.2 at the end of the protection period.

The spreading of the chip aggregate shall commence promptly after the spraying of the binder. All binder sprayed shall be covered with chips across the full sprayed width, apart from necessary longitudinal laps. The width and length of spray and chip application availability shall be matched to ensure that all binder sprayed shall be covered with chip within ten minutes of application. If this requirement is not complied with then work shall cease until the process is corrected.

Chips which are sufficiently dry to adhere to the binder without applied pressure within five minutes of being spread over the binder shall be considered satisfactory.

Personnel with hand brooms should be stationed to ensure that the area of binder is evenly covered by sealing chip. The Contractor may also use sheeting and drag brooming to evenly distribute the chip.

7.7.3 Transverse Joints

Where a two-coat seal abuts an existing surfacing with a transverse joint it shall be tapered off to minimise any roughness at the surfacing interface. This is normally done by halting the application of the second coat chip no more than 1m prior to the interface.

7.8 Rolling

The total rolling requirement, applied by pneumatic tyred rollers as defined in clause 6 shall be related to the amount of binder sprayed as follows:

$$T = \frac{V_t}{450 \times S \times n}$$

Where: T = Total roller requirement (hours)

V_t = Total volume of binder sprayed (litres) measured at spraying temperature.

S = Average overall rolling speed (km/h) employed in uninterrupted rolling for an average speed of up to 8km/h.

For average overall speeds of 8km/h or greater $S = 8$ km/h:

n = number of rollers employed in uninterrupted rolling.

Rolling time may be reduced by 20% if Vibrating Pneumatic Tyred Rollers are used.

Initial rolling in association with hand brooming shall be completed within 30 minutes of the application of chip. The maximum binder volume, to be sprayed before pausing to allow the initial rolling to be completed within 30 minutes, shall be related to the total number and average rolling speed of rollers employed in the initial rolling as follows:

$$V_m = 450 \times S \times n$$

Where: V_m = Maximum binder volume (litres) measured at spraying temperature.

This volume may be sprayed in a single run or as successive adjacent runs.

Initial rolling shall be applied to the first (coarse) chip application of raked-in and two coat seals such that the coarse chips are oriented on to their greatest dimension and embedded on the binder.

An approved self-propelled, smooth steel wheeled, non-vibrating roller, with rolling wheels not less than 0.5m in width, applying loads of not less than 2700kg, nor more than 4500kg per metre of total drum width may be used for not more than the first two passes required for the initial rolling. These two passes shall be deemed to equate to $\frac{2}{3}$ of the initial rolling specified.

Use of the steel roller shall be discontinued if chip breakdown is observed.

During the initial rolling other plant shall not be permitted to impede the rollers by parking on the new seal. The entire sealed surface must be rolled, with greater emphasis being placed on areas outside normal traffic wheel tracks.

Finish rolling, comprising the balance of the total rolling requirement, shall be completed on the day of sealing before removal of the rollers from the site.

Records shall be maintained of target and completed roller hours and provided to the Principal as part of the quality documentation.

7.9 Construction Monitoring

The Principal or their delegate may monitor the construction of the chip seal. Any construction quality issues identified will be immediately reported to the Contractor on site and work halted until the identified issues have been rectified.

7.10 Dry Lock

When specifically required, the Contractor shall apply a fine chip, such as NZTA M06 Grade 6 chip, lock coat to the specified sections of new sealcoat, or as directed by the Principal. This lock coat shall be applied after the completion of the rolling as defined in clause 7.8, and within the period thereafter specified by the Principal, but generally within 24 hours of that completion of rolling.

The lock coat includes the supply and spreading of the Grade 6 chip uniformly at an application rate of 260m²/m³, plus or minus 10%, over the entire area of the specified sections of seal coat.

7.11 Trafficking

On completion of rolling the job site may be opened to slow speed traffic. Traffic control shall be such that the trafficking is distributed across the full width of the job site to further enhance chip embedment and formation of an interlocked chip mosaic.

Speed restrictions and active traffic control shall be maintained for at least 48 hours after completion of the sealing operation. Records shall be kept of the active traffic control and provided to the Principal as part of the quality documentation.

7.12 No Fouling of Sealed Surface

The Contractor shall not foul the sealed surface with soil, water, oil, fuel or other droppings. The movement of plant and traffic onto the new seal and into and out of stockpile areas shall be controlled to prevent the carrying of material onto the seal by vehicles tyres.

7.13 Intersecting Public Roads and Private Ways

All unsealed intersecting public roads to the boundary of the road reserve being sealed and private ways to the kerb line or surface water channel line shall be sealed in accordance with this specification.

7.14 Removal of Surplus and Waste Material

Paper or fabric placed across the pavement for the distributor runs, and string lines used to define the edges of the sealing, shall be uplifted immediately after the chip is spread. All excess construction materials and waste shall be removed from the site when the chip sealing operation is finished for the day. All surplus chips in stockpiles on the road reserve shall be removed before the end of the contract period.

7.15 Removal of Surplus Chips

Surplus chips shall be removed from the sealed surface prior to the removal of the temporary speed restriction signs. The removal of the surplus chips shall be carried out by light rotary brooming together with hand brooming where necessary. Suction may be used to uplift surplus chips after brooming. Every precaution shall be taken to ensure that chips which are in contact with the binder are not removed. Not more than 50 grams weight of loose chips shall be left on any two-metre square area of the surface.

8 Binder Sampling and Testing

8.1 Sampling of Cutback Bitumen Binders

A sample of cutback bitumen shall be drawn from the first delivery and last top-up for the site with a minimum sampling rate of one sample per job site. The Contractor shall be responsible for obtaining and storing the binder samples.

For maintenance patching operations one sample per tanker load is required.

The Contractor shall provide parallel samples to the Principal on request.

The binder sample shall be taken using the method of ASTM D140 or recognised equivalent except that sample volume shall be nominally 1 litre.

One sample in 20 shall be tested with a minimum of one test per site. The testing shall be no more than 10 working days after construction of the seal and include:

- (a) Kinematic viscosity testing using the method of ASTM D2170 or recognised equivalent, and calculation of the kerosene content using the method of NZTA T09.
- (b) Presence of adhesion agent using the method of NZTA T30.

The test results for the cutback bitumen shall comply with the following requirements:

- (c) The estimated kerosene content shall fall within the design kerosene content $\pm 2\text{pph v/v}$.
- (d) If detected, the adhesion agent shall be reported as "detected".

Remaining untested samples shall be stored by the contractor for at least 12 months after completion of the chip sealing operations. Storage conditions shall be such that the samples are identifiable, referenced to the job site spray runs, kept dry and free from degradation.

After this period and providing that there are no quality issues on site relating to the binder performance, the untested samples may be discarded.

8.2 Sampling of Emulsified Binders

The Contractor shall provide bitumen emulsion test reports from the manufacturing facility to the Principal demonstrating compliance with NZTA M02 specification.

Samples shall be taken at each establishment and held in storage by the Contractor for at least 12 months after completion of the chip sealing operations. These samples are for the purposes of determining binder quality only.

8.3 Reporting

All information regarding materials and construction quality shall be provided to the Principal within 28 days of the completion of the chip sealing works.

9 Construction Quality

9.1 Records

An accurate record of the location and sequence of construction shall be maintained by the Contractor and included in the quality records. They shall be provided to the Principal on request no more than 28 days after completion of the works. The records shall include but not be limited to:

- (a) The location and dimensions of each spray run using the Principal's location referencing system.
- (b) The actual residual binder application rate R for each spray run.
- (c) The actual chip application rate.
- (d) Site shade air temperatures and weather conditions during construction.
- (e) Photographic records of the finished basecourse construction.
- (f) Binder composition, blend certificate and test results.
- (g) Binder temperature at time of application.
- (h) Chip source and test results.
- (i) Registration number of the binder distributor.
- (j) Physical dips of distributor tank contents at start of the day and before and after top-ups.
- (k) Rollers used and rolling time achieved.

9.2 Protection of the New Seal Coat

The Contractor shall take all necessary measures to protect each section of new seal coat from the completion of the rolling until the removal of the temporary speed restrictions. The standard of protection shall be such that the area covered by chips in close contact shall not be less than 98% of the total area being considered. If testing for the "take" of chips is carried out by the Principal, the minimum area to be considered shall be a square of 300mm sides.

9.3 Repairs

Any bald areas exceeding 0.5m² shall be repaired within five days from the day of occurrence or reporting.

Loss of chip exceeding 5% in any square metre of the total sealed area shall be repaired within one month from the date of observance or reporting.

The standard of any remedial works shall be such that the repaired surface shall have an equal standard of safety, durability, waterproofness and smoothness to that of an undamaged new surface and it shall be visually similar to the adjacent surface. For the safety of the public, necessary repairs shall be carried out promptly.

The Contractor shall make no repairs without the prior approval of the Principal for the methods to be used.

The Contractor should be aware that, in some circumstances, at least the following repair methods may be necessary:

- (a) Reinstatement of chip by rolling in.
- (b) Overlay by one or more seal coats.
- (c) Overlay by asphaltic mix or granular material.

10 Contract Document Development Guidance Notes

The following additional liability applies:

The Contractor shall be responsible for the quality and performance of the chip seal until 48 hours after opening to normal trafficking. Where repairs to the chip seal are required then the liability is extended until 48 hours after completion of the repairs and their acceptance by the Principal.