

Maintenance and renewal treatments for state highways



Maintenance of the physical road on the state highway network comprises of both proactive and reactive treatments. These range from short-term repairs to more intensive treatments that take longer to complete, but last a longer period of time before further maintenance is required.

Reactive treatments (maintenance)

- Pothole repairs** – these are the quickest of repairs, however the lifetime of a repair is also limited. The recent introduction of improved materials (such as BRP patches) and new machinery (for example, Jetmasters) has created laster longer repair types for this issue.

- > Potholes are created when water enters the road surface, enabling it to sit within the pavement layers. Vehicles driving over the road then create hydraulic pressure on the water, causing movement, which impacts the pavement material. Eventually the water and hydraulic pressure creates an opening in the road surface, also known as a pothole.
- > Potholes are more prevalent in winter, when roads are less able to dry out in between periods of wet weather.

- Mill and fills** – small patches of asphalt resurfacing, generally completed in winter to resolve troublesome sections of road (that is, where there are multiple potholes, ruts or other issues such as heaving or shoving). The road surface is removed (milled) and replaced (filled) with asphalt. This can be undertaken on either chipseal or asphalt surfaces, but is much less efficient/cost-effective and the treatment will not last as long as it would if replaced during summer.



A section of SH1 Desert Road showing fatigue, cracking and rutting



Chipsealing a rebuilt section of road.

Proactive treatments (renewals)

▪ **Pre-seal repair** – prior to chipsealing, any pavement faults need to be repaired to ensure the chipseal is applied to a solid base, ensuring it will last as long as possible. Selected areas of pavement are removed and replaced, or existing material stabilised with lime or cement, increasing strength and rigidity.

- > Pre-seal repairs tend to take place 3-12 months ahead of the chipseal surface being applied.
- > When not specifically related to resealing, these patches are known as 'digouts' or 'stabilisation patches'.

▪ **Chipseal** – bitumen or emulsion is applied to the existing road surface, before stones (chip) are applied on the top. As the bitumen/emulsion cools it hardens, setting the stones into place. Not all stones will adhere to the surface, and for a period of time these will shed off the surface. Within 48 hours of sealing, the road is swept and re-marked, though some stone loss will take place after this time.

- > Chipsealing is the most common renewal treatment on the state highway network as it is cost-effective, and suitable for the flexible pavements used across the majority of the state highway network.
- > Like thin asphaltic concrete, chipseal is the waterproof layer for the road, which prevents the structural (pavement) layers from getting damaged (similar to paint protecting the wood on a house). Ideal asset management strategies will see resealing take place prior to surface failures, protecting the road surface and deferring greater costs associated with needing to rebuild roads.
- > Ground condition and temperature are extremely important for successful chipseal application. This work almost exclusively takes place between October and March.

▪ **Thin asphaltic concrete resurfacing** – removal and replacement of the asphalt surface layer on a road (sometimes referred to as the 'wearing course'). While there is greater flexibility compared to chipseal, ground condition and temperature are still important. A lot of this work takes place at night to reduce disruption.

- > When these treatments take place, isolated sections of problematic pavement layer may be replaced – this is known as 'deep lifting'.
- > There are various types of asphalt, from AC14 and AC20 (with the number referring to the nominal size of stone used) through to stone mastic asphalt (SMA) and open graded porous asphalt (OGPA), which tend to be used on higher volume sections of road.

▪ **Heavy maintenance** – this treatment is used when a stretch of road doesn't need a complete rebuild. However, significant sections of it need pavement repairs. These sections will be removed, with new material brought in, graded, compacted and potentially stabilised, before a (typically) chipseal surface is applied.

▪ **Rebuilding (rehabilitation)** – this refers to the replacement of all road layers for a section of road. There are various types of rebuild:

- > **Granular** – this is where the pavement layers are comprised of stones (aggregate) of various size. These are placed on the road, graded, compacted and potentially stabilised with either lime or cement. Granular pavements can be either unbound (not stabilised) or bound (stabilised). A chipseal or asphalt surface is then applied.
 - Where a chipseal surface is applied, this will be followed up by a second coat seal 6-12 months later. This allows the road to settle and prevents flushing from occurring due to excessive bitumen/emulsion content between seal layers.



Bitumen emulsion in use on a section of SH1 Tīrau to Waiouru.

- > Structural asphaltic concrete – this is where all road layers are made of asphalt, a structural asphalt rebuild replaces all layers.
- > Foam bitumen stabilisation (FBS) – this rebuild technique involves recycling existing material and injecting it with foamed bitumen (bitumen mixed with water at high velocity). New aggregate may also be used depending on the requirements for the section of road.
- > These treatments are typically finished with chipseal. However, in some cases (such as throughout the SH1 Tīrau to Waiouru project) asphalt may be used for the surface layer.
 - FBS tends to be much quicker to construct than other rebuild treatments, however capability across the industry to undertake this work is limited.

Bitumen vs emulsion

Currently there's mixed use of bitumen and emulsion products across the state highway network in relation to chipping.

Bitumen is the by-product of petroleum refining. At high temperatures it becomes highly viscous (that is, runny), but hardens at lower temperatures. It makes an excellent binding agent, however it needs to be heated to 170 degrees for successful application. This presents a significant health and safety risk (bitumen burns) for road workers and anyone else standing adjacent to a worksite, as well as environmental risks should the bitumen run into waterways.

Emulsion is bitumen mixed with water and an emulsifier. The benefit of emulsion is that it can be applied at much lower temperatures (around 80 degrees), greatly reducing the risk to road workers and the environment.

In June 2021, NZTA announced a progressive change to remove the use of bitumen within chipping operations, and all contracts from 1 July 2024 have mandated the use of bitumen emulsion for sealing operations.

Integrated delivery contracts procured next year will require suppliers to use bitumen emulsion.



Granular road rebuilding underway on SH6.

Temporary traffic management

Every worksite on the state highway network is supported by temporary traffic management. Traffic management helps provide road users a clear understanding of where works are taking place, and where they are required to drive to keep themselves and the road workers safe.

From September 2025, all contractors looking to work on the state highway network are required to use a risk-based approach to developing the relevant Traffic Management Plan (TMP), which outlines the temporary traffic management required for their site.

This approach ensures the right amount of traffic management will be in place for each worksite, supporting efficient use of resources and a positive travelling experience for road users.

What this looks like

Traditional traffic management set-ups include:

Shoulder closure – when works are taking place on the side of the road, the 'shoulder' of the road will have cones placed along it to highlight the presence of road workers within close proximity of the road.

Stop/go – typically used on two lane roads, where one lane is being worked on, while the other is used to move traffic past the worksite. Vehicle movements are alternated from either end of the site to allow every to pass the site with delays minimised.

Lane closures – these can be used on roads with multiple lanes in each direction, this sees one or more lanes closed, and remaining lanes used to allow traffic to continue past the worksite. They can also be used to close one direction of travel, with a detour route used to ensure road users can reach their destination.

Road closures – when works have a significant impact on the road corridor, for example where there may not be room for vehicles to safely travel past the site, the best decision can be to close the road.

Detour routes will be used to support road users, unless there are no alternative options.

every worksite. These tend to be 30–50km/h when work is taking place.

Aftercare refers to temporary traffic management that is in place when road workers are not. This can either be between shifts or immediately after works are complete, but where temporary speed limits remain. This ensures road users are kept safe from any potential hazards when road workers are not on site to manage any risks. Picking up aftercare temporary traffic management in a timely manner is a focus for NZTA and suppliers

An example of traffic management remaining after works is complete is the period immediately after chipsealing, where the road is kept under a temporary speed limit. This process is known as trafficking the seal. New chipseal is only lightly rolled before the road is re-opened, with road users completing compaction when they drive over the new seal. The road will have cones along each shoulder and no road marking for around 48 hours after sealing takes place.

As NZTA and the industry adapts to changes in temporary traffic management, we're seeing an increased desire for road closures as a way to keep road workers safe while also increasing productivity and quality. These will be implemented where suitable, and NZTA will work with suppliers to ensure these are well communicated to road users in advance.



Lane closure in place on SH15.