



COLOURED SURFACING PRINCIPLES

Best practice guidance note

WAKA KOTAHI NZ TRANSPORT AGENCY

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More information

Waka Kotahi NZ Transport Agency
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If you have further queries, call our contact centre on 0800 699 000 or write to us:

Waka Kotahi NZ Transport Agency
Private Bag 6995
Wellington 6141

This document is available on Waka Kotahi NZ Transport Agency's website at www.nzta.govt.nz

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Introduction

The choice of why, where and when to use coloured surfacing is a tricky subject. Whilst there is no definitive way to use colour there are certainly several inappropriate uses of colour that will ultimately undermine where colour genuinely has added impact.

Coloured surfacing is generally an additional feature added to the standard features of a design. In itself the colour has no meaning (barring what is set out in the Traffic Control Devices Rule (TCD Rule)). Consequently, expecting road users to intuitively understand the purpose of the colour, or the form in which the colour is laid (stripes, patches, lines etc) can place too high an expectation on the effectiveness of coloured surfacing. The use of colour will generally be more effective with consistent application and appropriate signs and markings. The use of colour supports TCDs, it does not replace them. The use of colour is also part of a hierarchy of interventions. It is not a default to be included in all designs from the outset.

Any Road Controlling Authority (RCA) should develop a policy regarding the clear and consistent use of colour. The policy should reflect the content of this guide and include a hierarchical approach to ensure colour is used in a targeted and consistent manner. This policy needs to reflect the TCD Rule and any policy does not relieve the RCA of their obligations under the TCD Rule.

Legislative context

The Land Transport Rule: Traffic Control Devices 2004 specifies requirements for the design, construction, installation, operation and maintenance of traffic control devices. It also sets out the functions and responsibilities of road controlling authorities in providing traffic control devices to give effect to their decisions on the control of traffic. TCD Rule enables the use of a contrasting surface texture or colour as set out in section 5.3(b) (method of marking). The Rule then goes on to define the use of certain colours and their uses in relation to road marking (white and yellow) or coloured surfacing (blue).

Other provisions for the use of colour are provided for in the TCD Rule in the sections relating to pedestrian crossings (section 8.2) and special vehicle lanes (section 11.2).

In the case of pedestrian crossings, a colour contrast must be provided between the road surface and the white pedestrian crossing markings. This colour contrast should be provided when it is not naturally created by the road surface.

In the case of special vehicle lanes (eg a cycle lane, a bus lane etc) RCA may provide a surface treatment in the special vehicle lane that provides a contrasting colour or texture to that of adjacent lanes used by other vehicles. This can be provided at locations along the length of the lane or along the full length of the lane.

In this instance the use of colour is to 'discourage use of a special vehicle lane by other vehicles, or to draw attention to the likely presence of vehicles entitled to the use of the lane.'

The only other provision for the use of colour is the section in the TCD Rule that makes provision for 'Roadway Art' (section 5.6).

The meaning of colour

It is worth noting that:

- Coloured surfacing has no 'legal' meaning in itself.
- The use of coloured surfacing supports and reinforces markings and signs. It also highlights certain risk environments or/and vulnerable road users.
- Coloured surfacing does not need to be used in every layout or design.
- When designing and implementing a design stand back and consider whether the use of colour is necessary, what the purpose of using it is and how to use colour in a targeted, pragmatic and self-explaining manner.

As noted earlier the use of colour should always form 'supporting' infrastructure rather than the primary infrastructure. There is no substitute for good initial design nor using the available signs and markings. Coloured surfacing should never be used instead of providing the appropriate markings or signs. Coloured surfacing treatments should only be considered after other options for warning road users via standard markings and signs have been investigated and included in the design.

From a Human Factors perspective there are many advantages of adding colour as an additional way to communicate information. This is also known as providing 'redundancy in the system' whereby colour is used to reinforce a message that may also be on a sign or road markings. Providing this redundancy will result in the following benefits:

1. Redundancy provides flexibility for different users to capitalise on the format they process fastest and find most salient (this allows for individual differences such as may occur if someone has difficulty reading or is colour blind).
2. Redundancy allows people who may miss one cue, to be directed to take a closer look at what message might be being conveyed to them eg, use of red or orange is generally used to convey that a time-critical action is required, say for example as might occur on a stop sign. In addition, pavement colour can be used to make a large global shape that will attract attention to the area of interest to highlight likely conflict areas and to be able to quickly delineate between two areas that might have different rules or require different behaviours eg, cycle and bus lanes.

The overuse of coloured surfacing can undermine its value and impact where it is most useful. Therefore, RCAs are encouraged to use coloured surfacing pragmatically and in a targeted manner.

The principles of using colour

The general principle that has developed over time is that green and red have implied meanings and uses.

Green has become associated with special vehicle lanes. Primarily, green is used for cycle lanes and other cycling facilities, but the colour green is not exclusive to cycling. Red surfacing has become generally associated with higher risk locations and speed limit threshold changes, such as that shown in Figure 1.



Figure 1 Coloured surfacing at a speed limit threshold (Photo: Ann-Marie Head)

An RCA should consider who the intended audience for the coloured surfacing is. The presence of a high-risk location would ideally be advertised to all users by using red colouring. If the intent is to raise awareness of presence of users of a special vehicle lane or encourage some modes to stay out of a lane then green would be appropriate. Here the intended audience isn't the user of the special vehicle lane but all those users that are excluded from that portion of the roadway.

When trying to influence a behaviour, for example 'take more care', then red is the more appropriate colour choice, whilst route continuity might be created using green.

The choice of colour will be different depending on the target audience and the purpose. Table 1 sets out what colour should be used if an RCA decides to apply a coloured surfacing treatment.

Table 1 Application of coloured surfacing for different purposes

	Facility / location	Primary target users	Purpose of the colour	Most appropriate colour (if used by the RCA)
1	Bus lane (includes Bus only lane)	Vehicles excluded from the bus lane	Discourage use of the bus lane by other vehicles, or to draw attention to the likely presence of vehicles entitled to use the bus lane.	Green
2	Transit lane	Vehicles excluded from the transit lane	Discourage use of the transit lane by other vehicles, or to draw attention to the likely presence of vehicles entitled to use the transit lane.	Green
3	Cycle lane	Vehicles excluded from the cycle lane Cyclists	Primarily to discourage use of the cycle lane by other vehicles, or to draw attention to the likely presence of cyclists entitled to use the cycle lane, though there may be situations where the target audience are cyclists and green is also useful to emphasis route continuity.	Green
4	Segregated shared path	All path users	Establishing where it would be better and safer to have segregation, cycle marking supported by green indicating 'cyclists'.	Green
5	Segregated shared path	All path users	To raise awareness of a potential conflict point where segregation is not feasible.	Red
6	Separated cycle lane	Cyclists	Primarily route continuity though there maybe situations where the target audience are those road users to be discouraged from using the cycle path.	Green
7	Advanced stop box	Motorists	Discourage vehicle stopping in the Advanced stop box, or to draw attention to the likely presence of cyclist in the Advanced stop box.	Green
8	Sharrow marking in a general traffic lane	Motorists and cyclists	Shared road use. There may be situations where the target audience are cyclists and green may be	Green underneath the Sharrow marking

Facility / location	Primary target users	Purpose of the colour	Most appropriate colour (if used by the RCA)	
		useful to emphasis correct road positioning for cyclists.		
9	Shared path area adjacent to a bus stop	Pedestrians as they get off the bus and wheeled shared path users	To raise awareness of a potential conflict point.	Red
10	Within an area marked with a bus stop box marking	All users	To raise awareness of a public transport facility and related parking stopping restrictions.	If a colour is felt useful, Green
11	General traffic lane and shoulders	All users	To raise awareness of a potential conflict points and to discourage driving into the shoulders.	Red
12	Driveway crossings	Motorists	Raising awareness of a crossing point and users of a facility crossing the driveway.	Green can be useful under the driveway crossing marking but red would apply at high-risk pedestrian footpath locations and potentially could be used for roadway or driveway traffic
13	Approach to a crossing from a shared path or cycle path	Cyclists	Raising awareness of a crossing point and influencing cyclists to look and slow down.	If a colour is felt useful, Red
14	Approach to a zebra crossing from the roadway	Motorists	To raise awareness of a potential conflict, point on the crossing.	If a colour is felt useful, Red (do not use colour at the crossing)
15	Approach to a signal crossing from the roadway	Motorists	To raise awareness of a potential conflict, point on the crossing.	If a colour is felt useful, Red (do not use colour at the crossing)
16	Cycle crossing area across a roadway	Crossing users	Provide route continuity and advertise the facility (however be aware of the risk that colour may be interpreted as 'priority'.)	Potential no colour, though green for cycle crossings can be useful.
17	Speed limit threshold treatment	All users	Provide visual support for the change in speed limit at a	If a colour is felt useful, Red

Facility / location	Primary target users	Purpose of the colour	Most appropriate colour (if used by the RCA)	
		significant location (eg, entering a rural township).		
18	General traffic lane	All users	Create road sharing behaviour.	None (but see Sharrow)
19	Mobility parking space	All users	To raise awareness of a mobility parking space and related parking stopping restrictions.	Blue
20	General traffic lane and roadway art	All users	Influence motorist behaviour, build community pride and identity and make a street feel safer and more inviting.	Multi-coloured
21	Local area traffic management and calming	All users	Influence motorist behaviour, build community pride and identity and make a street feel safer and more inviting.	Terracotta
22	Courtesy crossing	All users	To raise awareness of the location of the 'crossing' and to encourage greater care on the part of all users.	Use a textured surface rather than relying on colour alone.

Readers will note that the colouring of a 'crossing' (items 14 and 15) is suggested as being uncoloured. This relates to the intended audience and the desired effect. It also is reflective of more recent guidance on these facilities developed in 2021.

At zebra crossings visually impaired road users have reported that red and pink colouring between the white bars does not provide adequate contrast. Red coloured surfacing is permitted under the Land Transport Rule (TCD) provided it is not part of or is visually integrated into the zebra crossing road marking. Good practice has been revised and it is not recommended to apply red coloured surfacing beneath zebra crossing bar markings. Recommended practice is now to apply red coloured surfacing on the vehicle approaches to zebra crossings between the crossing marking and the stop line as shown in Figure 2.

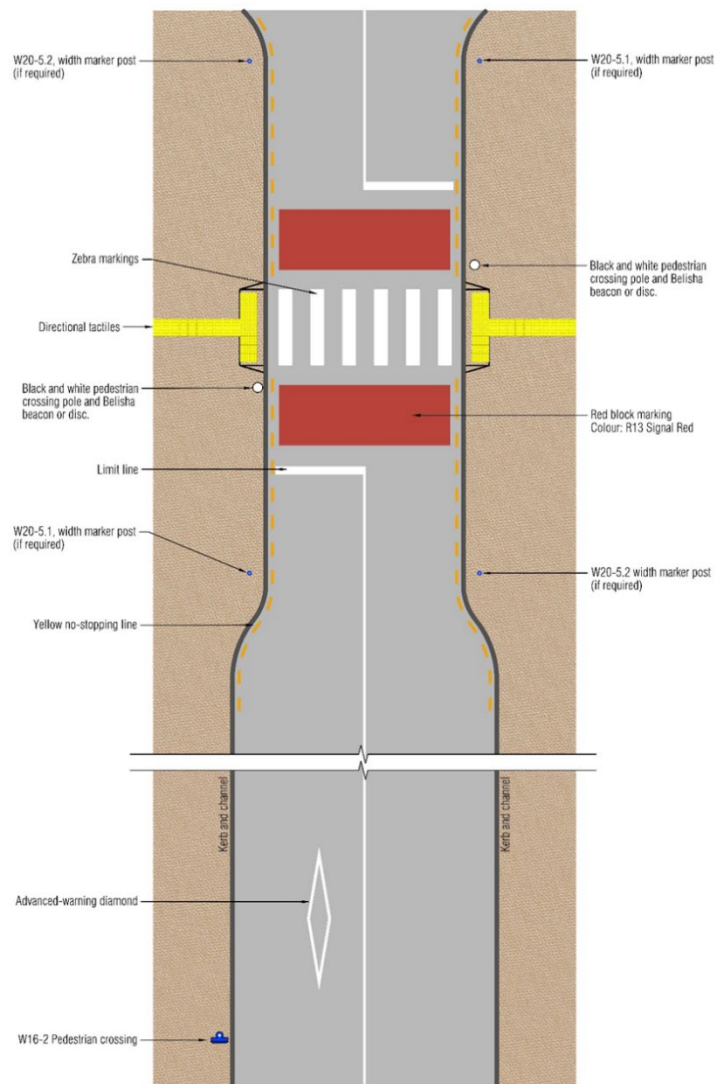


Figure 2 Typical layout for zebra crossing with red surfacing treatment

This layout reflects the desire to inform motorists of the presence of the crossing given the colour is located to 'face' motorists.

At a cycle crossing current practice is that the roadway element of the crossing should use coloured surfacing. However, RCAs need to be aware that this can, on occasion, give users of the crossing a false impression of 'priority' over road traffic. Anecdotal research in New Zealand has suggested that applying 'green' to side road crossings has resulted in more risk for crossing cyclists based on a misperception of priority. The misconception may occur at crossings too. The risk can be mitigated through the provision of a feature such as a raised safety platform.

RCAs should bear this in mind when considering the detailed layout of the crossing and the use of colour. It should be noted that the green surfacing has no legal significance, and it is the give-way signs and markings that create the give way relationship between road and crossing users.

The application of red on the roadway in advance of the cycle crossing (item 13 in Table 1) would still be very valid. RCAs may also wish to consider adding red to the path on the approach to the crossing. This raises awareness in the mind of cyclists to check for pedestrians and that traffic is stopping on the approach to the crossing. It also follows the philosophy now set out in the Cycling Network Guidance and the TCD Manual.



Figure 3 Application of green surfacing on a cycle crossing (Photo: Ann-Marie Head)

Whilst this note has the most applicability in the urban setting it is worth noting that the use of coloured surfacing near rural at grade stock crossings (or along herding routes) can present problems. It is advisable not to use coloured surfacing in situations where stock droving is likely. Stock will refuse to cross banded colours across lanes or the road. Where colour is being considered at gateways/thresholds then this should be avoided if stock is likely to be present on road at any time.

Example layouts

Most of the details of the layouts for coloured surfacing can be found in the 'Cycling Network Guidance' and 'Pedestrian Network Guidance' websites (as well as in parts 4 and 5 of the Traffic Control Devices Manual). The intention is not to repeat these in detail in this document.

It is worth exploring a couple of aspects of layout though, especially relating to special vehicle lanes and features such as sharrows and hook turns.

Green coloured surfacing should be used at locations where motorists may be unaware of the likely presence of users of the special vehicle lane, or where motorists are likely to encroach into a special vehicle lane.

When an RCA commences on the journey to creating a network of special vehicle lanes they may need to mark the entire width and length of the lanes in order to generate appropriate road user behaviour. However, over time as behaviours evolve new facilities may not need the 'full' treatment. Additionally, at reseals previously fully coloured lanes can be down tuned to focus the use of colour to critical locations (eg intersections, crossing points across side streets, highlighting the start and end of a facility etc).

A more targeted use of colour in this manner also reduces initial installation costs and maintenance / reseal costs as indicated in Figures 4 to 6.

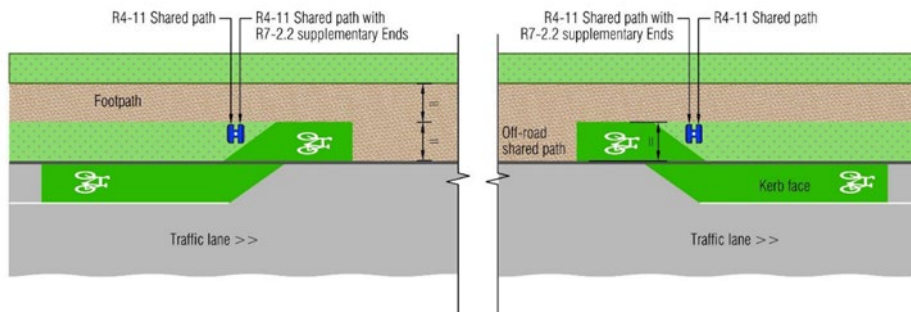


Figure 4 Examples of coloured surfacing used only at the transition point of a cycle facility (Source: TCD Manual Part 5, Figure 8-14)

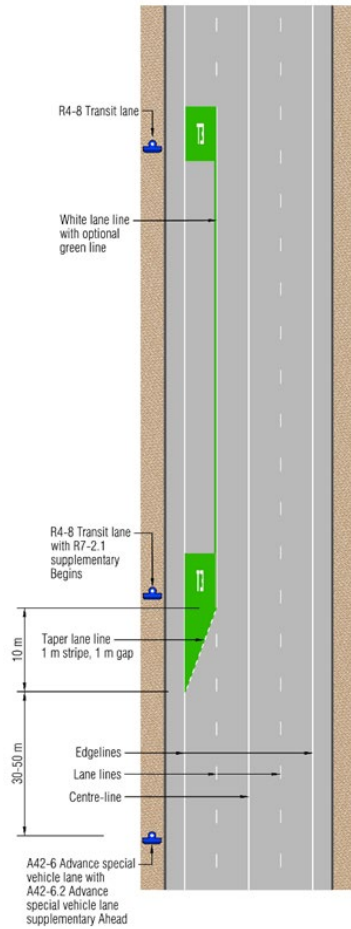


Figure 5 Examples of the use of colour at the start and end of a transit lane (Source: TCD Manual Part 5, Figure 17-11)

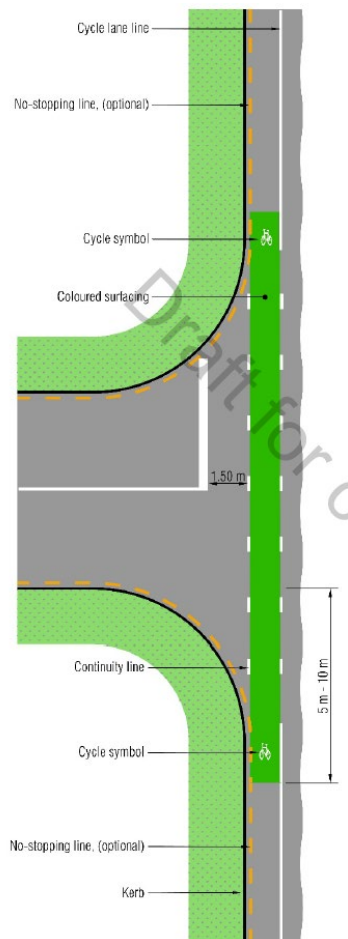


Figure 6 Examples of the use of colour for a cycle lane crossing a side road intersection (Source: TCD Manual Part 4)

In other circumstances the use of colour to enhance the entire width of the marking is very useful and should not be changed, for example Sharrow markings, driveway markings and Hook Turn boxes where the use of colour genuinely highlights the presence of a user in a general traffic lane or intersection. Examples are provided in Figures 7 and 8.

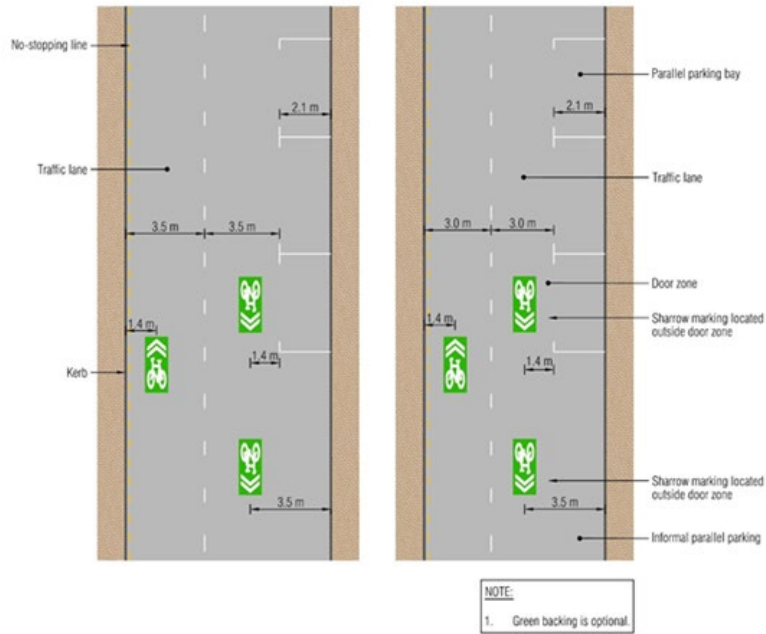


Figure 7 Examples of the use of colour associated with sharrow markings (Source: TCD Manual Part 5, Figure 8-10)

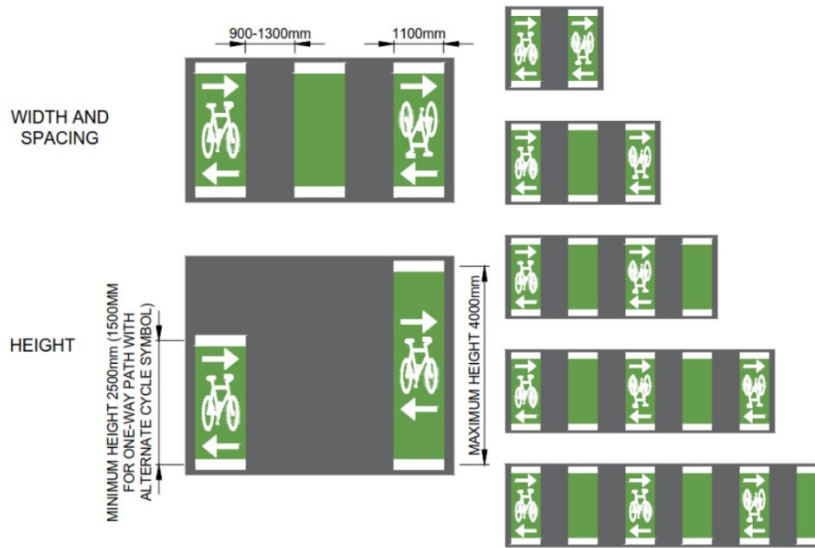


Figure 8 Examples of the use of colour associated with driveway crossing markings (Source: High-use driveway treatment for cycle paths and shared paths guidance note)

Colour specifications and material types

Colour specifications, site preparation, surfacing material performance, surfacing installation etc can be found in 'NZTA P33:2017 P33 specification for coloured surfacings'.

Table 2 itemises the current material colours and pigment names.

Table 2 Coloured surfacing specifications

Colour	Reference number and name
Red	Preferred colour and best practice R13 Signal Red <i>Acceptable alternative</i> R54 Raspberry
Green	Preferred colour and best practice G26 Apple Green <i>Acceptable alternative</i> G13 Emerald Green G36 Kikuyu
Blue	B24 Harbour Blue
Yellow	Preferred colour and best practice Y14 Golden Yellow <i>Acceptable alternative</i> Y13 Vivid Yellow
Terracotta	R52 Terracotta

When installing coloured surfacing (primarily green) it is important that there is sufficient contrast between the facility markings and the roadway for all road users. There are four typical material types used in New Zealand;

- Spread and Sprinkle (epoxy and Polyurethane)
- MMA (Methyl Methacrylate similar to high friction anti-skid surfacing)
- Thermoplastic and
- Paint

For 'spread and sprinkle' the material is a combination of a 'two-pack' resin base and an aggregate applied to the base. The resin base is nominally 1.5mm thick. The base can be pigmented, however most of the surface colour comes from the aggregate. The final material will give good skidding resistance but can trap dirt which, over time will dull the colour. The wearing surface is primarily the aggregate.

MMA is made up of a resin material that has aggregate embedded within it. The colour is carried mainly in the resin, and it is the resin material that is the main wearing media. The surfacing stays clean and bright.

Thermoplastic is created when plastic binder, pigments and aggregate are mixed together and heated to 200+ degrees Celsius. The colour comes from the pigment type used, colour choices are limited, and the

colour has a duller finish. The material is normally hand laid onto the road surface at about 5mm thick. It can be driven / ridden on as soon as it has dried. However, hand laying can create ridges and joints which means the surface isn't perfectly smooth.

Paint tends to be acrylic. The acrylic contains a fine aggregate (normally crushed glass). The material is normally hand laid and once the water evaporates the acrylic is ready for use. The colour is contained in the paint itself. The acrylic is the wear surface, and life will depend on the applied thickness, but this is NOT a long-life product.

The typical life and failure for the different material types is described in Table 3.

Table 3 Typical life of material types used for coloured surfacing

Material type	Typical life	Typical failure
'spread and sprinkle'	10+ years.	Comes away from the road surface in clumps and slabs or wears away.
MMA	10+ years, the oldest NZ site is currently 6 years old.	Generally, it wears away though it can come away from the road surface in slabs or patches.
Thermoplastic	5 to 10 years.	Wears over time and can fail along joint lines resulting in bald patches.
Paint	1 to 3 years.	Wears through.

Historically 'slurry seal' has been used, this is a mixture of pigmented bitumen and chip. However, this surfacing type is prone to be brittle, which makes them unsuitable for cracked or highly flexible surfaces.

The reader should make themselves familiar with section 14.3 (Performance Limits) and especially section 14.3.2 (Surface Friction) of 'NZTA P33:2017 P33 specification for coloured surfacings'. The surface friction characteristics of the coloured surfacing needs special attention to protect two wheeled vehicle riders. Surface friction of any new material should not present a hazard to road users and should match the surrounding roadway performance.

Installation and maintenance

This section does not cover the issue of installation and maintenance in an exhaustive manner. The items raised below should be considered when installing any coloured surfacing.

As noted earlier the cost of installing coloured surfacing can be significant, especially when a lane or facility is treated with the full width application of colour over a long length. A more targeted use of colour can reduce initial installation costs and later maintenance / reseal costs.

Even when the initial installation utilises full width colour this does not have to be retained at reseal. Equally the initial costs of some material types might reflect a high level of performance that could reduce the need to renew and replace later in the life cycle.

For installation, the surface on which the material is being applied needs to be in a good condition, rigid (not flexible) and of a suitable type. Surfaces may need to be prepared by cleaning, water blasting or water cutting before applying a coloured surface.

The weather needs to be good with suitable surface and air temperatures. The road needs to be dry, and a good weather forecast in place.

Ensure you have a suitable warranty in place (5 years+) and potentially a maintenance related contract. Things to consider or be aware of are outlined below:

- Consider the durability of the proposed product relative to the trafficking. (For example, paint (acrylic) marking systems are probably only suitable for off road situations such as cycleways and walkways).
- Consider the stability of the colour. Red is probably the least stable colour and fades quickly.
- Consider the suitability of a colour marking system and the substrate. Concrete surfaces may need preparation - see the [NZ Road Marking Federation guide](#). Also note that it is possible to colour concrete thereby negating the need to apply coloured surfacing onto concrete.
- Due to the rigid nature of thermoplastic, it is regarded as unsuitable for marking on paving stones and bricks.
- Consideration should be given for skid and slip resistance. Un-beaded paint marking systems may require surface applied aggregate to meet acceptable slip standards for pedestrians and cyclists.

Maintaining a coloured surfacing can be expensive relative to the available funds supporting maintenance and renewals. RCAs should consider the long-term maintenance regime for any coloured surfacing that is installed, and the full life cost associated with any material that is selected for use.

Many of the matters that should be considered for installation also apply for subsequent maintenance. However, with maintenance there is an additional matter of compatibility.

Consideration of any potential compatibility issues between maintenance application and the original colour marking system is required. Mixing different material types can create issues, for example applying thermoplastic over cold applied plastic or waterborne material (acrylic) is likely to fail as these form a barrier preventing the heated product from bonding with the pavement surface.

It may be appropriate to trial and monitor if there are concerns about compatibility.