



*Transportation Association of Canada*

*Guidelines for  
Transit Lane Conspicuity  
through Surface Treatment*

*May 2010*

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ISBN 978-1-55187-299-4

Cover photos: City of Ottawa

# TAC REPORT DOCUMENTATION FORM

<b>Title and Subtitle</b> <b>Guidelines for Transit Lane Conspicuity Through Surface Treatment</b>		
<b>Report Date</b>  May 2010	<b>Coordinating Agency and Address</b>  Transportation Association of Canada 2323 St. Laurent Boulevard Ottawa, ON K1G 4J8	<b>ITRD No.</b>
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<b>Abstract</b>  The Guidelines for Transit Lane Conspicuity Through Surface Treatment facilitate the implementation of coloured transit lanes. Transit lane violation has a negative impact on both transit travel times and the image of the transit facility. By making transit lanes more obvious to the eye and mind (e.g. more conspicuous), lane violation can be significantly decreased or eliminated. The Guidelines recommend using red colour for the coloured surface treatment of transit lanes.  The guidelines were developed based on the following four principles: 1. The use of strict conditions for implementation instead of widespread implementation; 2. Focus on restricted areas vs. conflicting areas; 3. Potential for partial and full-length application; and 4. Compatibility with other transit lane design elements.  The guidelines for the surface treatment of transit lanes do not constitute standards. Surface treatment is an optional tool to make transit lanes more conspicuous when required. Agencies designing transit lanes should follow existing guidelines or standards for transit lane markings and signage.		<b>Keywords</b>  Traffic Control Public Transport Traffic Lane Surfacing Colour Guidance Specifications Construction Maintenance Education Publicity
<b>Supplementary Information</b>  This report will be available in French from the TAC bookstore; please visit <a href="http://www.tac-atc.ca">www.tac-atc.ca</a>  A background document titled "Transit Lane Conspicuity Through Surface Treatments: Knowledge Base" was prepared as part of this project and is available through the Transportation Association of Canada (TAC) library catalogue.		



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## ACKNOWLEDGEMENTS

The Guidelines for Transit Lane Conspicuity Through Surface Treatment project was made possible by funding provided by numerous agencies. TAC gratefully acknowledges the following sponsors for their generous contributions to this effort:

City of Calgary

Halifax Regional Municipality

Metrolinx/GO Transit

Ville de Montréal

City of Ottawa

Ministère des Transports du Québec

Société de transport de Montréal

TransLink (South Coast British Columbia Transportation Authority)

Toronto Transit Commission

Transport Canada

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## EXECUTIVE SUMMARY

### Background to the Guidelines

The Guidelines for Transit Lane Conspicuity through Surface Treatment (Guidelines) have been prepared to facilitate the implementation of coloured transit lanes. Transit lane violation has a negative impact on both transit travel times and the image of the transit facility. By making transit lanes more obvious to the eye and mind (e.g. more conspicuous), lane violation can be significantly decreased or eliminated.

A number of Canadian municipalities have been experimenting with coloured transit lanes but widespread application has been hampered by the lack of implementation guidelines. It is expected that the availability of national guidelines for the use of coloured transit lanes would facilitate implementation, and colouring transit lanes would become another tool to make the operation of transit lanes more effective.

There are a number of surface treatment methods for making transit lanes more conspicuous. These methods include the application of colour, raising transit lanes relative to adjacent mixed flow lanes, the application of different surface materials, texture or pattern, and the use of pavement text. The review of the experience of applying different surface treatments suggests that the development of guidelines for coloured transit lanes would be most useful and feasible.

The guidelines presented in this document are based on a comprehensive research of surface treatments of transit lanes in North America, Europe, Middle East, Australia, and New Zealand. A background document titled “Transit Lane Conspicuity Through Surface Treatments: Knowledge Base” was prepared as part of this project and is available through the Transportation Association of Canada (TAC) library catalogue.

### Purpose of the Guidelines

The objective of the national guidelines is to facilitate the design and application of coloured surface treatment of transit lanes.

The guidelines for the surface treatment of transit lanes do not constitute standards. Surface treatment is an optional tool to make transit lanes more conspicuous when required. Agencies designing transit lanes should follow existing guidelines or standards for transit lane markings and signage.

### Contents of the Guidelines

The following summary provides a brief description of the eleven sections of the Guidelines document.

## **Section 1 – Introduction**

This section provides a definition of terms and acronyms used in the document and the review of existing applications of five different surface treatment methods. The need for guidelines for each method is analysed and the development of guidelines is recommended only for coloured surface treatment.

## **Section 2 – Application Principles of Coloured Lanes**

This section describes the four principles that guided the development of the Guidelines.

1<sup>st</sup> Principle: Strict conditions for implementation instead of widespread implementation

2<sup>nd</sup> Principle: Focus on restricted areas vs. conflicting areas

3<sup>rd</sup> Principle: Potential for partial application

4<sup>th</sup> Principle: Compatibility with other transit lane design elements

## **Section 3 – Colour Selection**

The recommended colour for transit lane surface treatment is provided and the meaning of the colour is specified.

## **Section 4 – Coloured Surface Treatment Application Schemes**

Three potential application schemes and their recommended applications are described. The three schemes include the Partial Treatment, Block Treatment, and the Continuous Treatment.

## **Section 5 - Design Elements**

Specific design details for coloured lane applications are provided including the design of the start and end of the treatment, relevant details for the Partial Treatment, and some possibilities for the treatment of transit queue jumps.

## **Section 6 – Implementation Criteria and Decision Process**

The main reasons and the decision process for applying surface treatment are provided.

## **Section 7 – Selection of Coloured Surface Treatment Technology**

Coloured surface treatment technologies can be grouped into two categories, the installation of Coloured Pavement Materials and the application of Coloured Surface Coating. The main considerations for selecting the most appropriate technology are described.

## **Section 8 - Maintenance of Coloured Surface Treatment**

The relevant maintenance issues for both the Coloured Pavement Material and Coloured Surface Coating technologies are specified.

## **Section 9 - Surface Treatment Material Characteristics Guidelines**

The relevant material specifications including the safety and durability requirements are described in this section.

## **Section 10 – Public Education and Marketing**

The intuitive message of red lanes is generally clear: ‘do not use this lane’. However, there could be a desire or need to develop a targeted education and/or marketing program to increase the acceptance and understanding of surface treatment.

## **Section 11 – Bibliography**

The list and details of the background material used in the development of these Guidelines is provided in this section.

## 1. INTRODUCTION

### 1.1 Background

Different transit lane surface treatments have been used in different parts of the world to make transit lanes more obvious (conspicuous) to the eye and mind of motorists. These treatments include red and green coloured lanes, raised lanes, the application of different surface material, texture or pattern, and the use of pavement text.

In Canadian cities, due to the lack of national guidelines, various surface treatments have been implemented mostly as pilot projects. It is expected that the availability of national guidelines will facilitate more widespread utilization of surface treatments to make transit operation more efficient.

### 1.2 Definition of Terms and Acronyms

Items	Definition
conspicuous	obvious to the eye and mind; visible and understandable
coloured lane	traffic lane with a colour different than adjacent lanes
lane violation	the use of a traffic lane by ineligible vehicles
transit queue jump	a traffic engineering measures which allows transit vehicles to by-pass vehicular congestion/queues
pavement from different material	a traffic lane made from material different from the material used for adjacent lanes
pavement with different texture/pattern	a traffic lane that has different texture or pattern than the adjacent lanes
pavement text	text applied to the pavement indicating the intended use of the particular lane
partial treatment	surface treatment that is applied to a lane only at specific locations
block treatment	surface treatment that is applied to a lane along an entire city block
continuous treatment	surface treatment that is applied continuously with gaps only at major intersections
coloured pavement material	a coloured surface treatment technology where the entire top aggregate layer (a few centimetres) has the specific colour
coloured surface coating	a coloured surface treatment technology where only a thin top layer (a few millimetres) is coloured
permanent application	an application which is expected to last as long as the pavement
introductory or temporary application	an application which is expected to last shorter than the pavement

### 1.3 Review of Existing Applications of Surface Treatments

A comprehensive research of surface treatments of transit lanes in North America, Europe, Middle East, Australia, and New Zealand was carried out. The objective of this review is to summarize the experience with various surface treatments in different jurisdictions. The full background document “Transit Lane Conspicuity Through Surface Treatments: Knowledge Base” is available through the Transportation Association of Canada library.

**Surface treatment methods:** Five different surface treatments of transit lanes were examined including coloured lanes, raised lanes, the application of pavement from different materials, the use of different texture/pattern, and the application of pavement text. The most frequent treatments are the application of pavement text and coloured lanes. The red colour had been traditionally associated with a restriction, thus most jurisdictions that have implemented coloured lanes have used the red colour. The other colour that has seen implementation is green.

**Reasons for implementation:** Coloured lanes, raised lanes, and pavement text are almost exclusively used to discourage the use of the lane by non-transit vehicles. Lanes used by Light Rail Transit (LRT) vehicles and/or buses are occasionally made from different pavement materials (e.g. concrete, cobble stone). However, the main objective of using these materials is related to structural/construction aspects (e.g. concrete) and streetscaping (e.g. cobble stones). The use of surface texture/pattern to mark transit lanes is normally a marketing/branding effort and is not widespread due to its relatively high implementation cost and lengthy and complex installation process.

Coloured lanes have been implemented in the last decade in a number of cities all over the world. Most implementations were carried out in countries with warmer climate than Canada’s. For example, in Scandinavia, which has somewhat similar climate, no coloured lanes have been implemented. In Canada and the USA, coloured transit lanes were tried in Vancouver, Winnipeg, Windsor, Ottawa and New York City. Coloured surface coating was applied in all cities noted above except in Winnipeg, where coloured concrete was used.

The reported effectiveness of the coloured surface treatment has been very positive in Vancouver, Winnipeg, Ottawa and New York City. However, surface treatment has been discontinued in most of these cities. The reasons for discontinuing the coloured treatment include the lack of application guidelines, lack of appropriate colouring materials and contractors, inadequate friction of some surface coatings, and the relatively short life time of the applied colouring materials. Currently, Winnipeg and New York are the only cities with an active implementation program.

Raised lanes are also used to distinguish transit lanes from the adjacent mixed flow lanes. For example, in Laval, Quebec, the bus lane on a bridge is raised and in Toronto the streetcar lanes on St. Clair Avenue are raised. Raised lanes influence driver behaviour somewhat differently than coloured lanes. Raised lanes provide a certain level of physical barrier, while coloured lanes influence driver behaviour by making the transit lane look different.

Different pavement materials, such as concrete, cobble stone and interlocking bricks also have been used for transit lanes. The main objective of using different materials is to either increase the structural strength of the pavement (e.g. concrete) or to enhance streetscaping. The use of specific pavement materials has not been limited to the exclusive use for transit lanes.

Pavement text has been used in many countries to mark bus lanes and discourage lane violation. The word “BUS” is often used and has the same meaning in many languages. In Canada, only British Columbia and Quebec use this type of marking.

**Effectiveness:** Although surface treatment may impact driver behaviour from the legal perspective, surface treatment is not enforceable. Any surface treatment must be accompanied by appropriate pavement markings and signage which make the lane use restriction enforceable.

Raised lanes impact driver behaviour differently than other surface treatments. Raised lanes not only make the transit lane more visible, they also provide a physical barrier especially if they are separated by a barrier curb. The other surface treatments influence driver behaviour by making the lane look different. However, making a lane look different is not sufficient to reduce violation. Motorists must associate the different visual experience with transit only use. This association may be inherent (in case of the red colour treatment) or learned (in case of any other surface treatment).

Isolating the effects of surface treatment on the transit lane violation is problematic. Some quantitative and qualitative information on the effectiveness of surface treatment exists for coloured lanes but no quantitative information was found on the effectiveness of other surface treatments.

There are examples where the application of coloured lanes accompanied by other design and operational measures practically eliminated lane violation. However, there are also examples where the coloured lane only reduced lane violation.

Factors influencing the effectiveness of coloured lanes include:

- time of operation (full time – 24 hours/7 days per week restriction increases effectiveness, while part time operation weakens the mental association between the coloured lane and the transit use restriction)
- allowed encroachments (less allowed encroachments tends to increase the effectiveness)

**Guidelines:** In Canada no national, provincial, or municipal guidelines exist for the surface treatment of transit lanes. Countries that have developed guidelines for the application of coloured lanes include the United Kingdom, Australia, and New Zealand.

Existing guidelines differ in terms of the level of jurisdiction for which they were developed and the level of detail.

In terms of the jurisdiction, guidelines were developed at the national level in New Zealand, state and municipal levels in Australia, and national and municipal/county levels in the United Kingdom.

In terms of details, existing guidelines may include the purpose of implementation, the selected colour, design characteristics (dimensions) and technical details (skid resistance, durability and others).

Not surprisingly, the most uniformity in application can be expected when guidelines are developed at the national level, especially if they are developed proactively before widespread implementation.

## 1.4 The Need for Guidelines

This section summarises findings about the coloured lanes, raised lanes, lanes of different pavement material, lanes with different pavement texture/pattern, and lanes with pavement text surface treatments. It also specifies why guidelines for the surface treatment of transit lanes are needed and why the development of Canadian national guidelines is recommended only for coloured lanes.

The reasons for developing national guidelines are the following:

- achieve uniform implementation;
- maximize the effectiveness of the surface treatment of transit lanes; and
- facilitate the implementation of surface treatment where applicable/beneficial.

### Coloured Lanes

It is recommended that national guidelines be developed only for the application of coloured lanes in Canada.

New Zealand is a good example of the usefulness of having national guidelines since they specify that, if surface treatment for special purpose lanes is needed anywhere in the country, the treatment will be in the form of green coloured surface. On the other hand, the lack of national guidelines in the United Kingdom resulted in the adoption of two different colouring schemes in various cities (red in London, green in Edinburgh).



**Exhibit 1.1: Red Bus Lane**

(Source: City of Ottawa)

## Raised Lanes

Raised lanes are inherently conspicuous, they often have poles for power supply when used by Light Rail Transit (LRT), they are separated from adjacent lanes by mountable curbs, and they are often made from different pavement material. However, the literature search and surveys did not identify any specific implementation guidelines for raised lanes.

The relatively few potential applications of raised lanes do not warrant the development of national guidelines. At the same time, various technical / design details would make the development of guidelines quite challenging and likely ineffective.

## Lanes from Different Pavement Material

The literature search and surveys did not identify any specific implementation guidelines for the application of different pavement materials. Different pavement materials are already in use for various purposes including streetscaping and traffic calming. Many of these applications are not associated with transit use. The effectiveness of guidelines would be compromised with the large number of existing applications of different pavement materials implemented for various purposes.

## Lanes with different Pavement Texture/Pattern



**Exhibit 1.2: Pavement  
Texture/Pattern**

(Source: Integrated Paving Concepts)

The literature search and surveys did not identify any specific implementation guidelines for the utilizations of pavement texture/pattern for transit lanes. Furthermore, the use of pavement texture/pattern has been relatively limited to a few specific locations such as bus bays and pedestrian areas or crossings. The application of pavement texture to a longer lane with transit use has not been identified. Developing guidelines for the use of a specific method which has had a very limited application might be premature. Furthermore, if pavement texture/pattern is used for marketing/branding purposes within a specific jurisdiction, the same design cannot become a uniform national application.

## Lanes with Pavement Text

In Canada, only British Columbia and Quebec use pavement text to mark bus lanes. This approach is relatively inexpensive, conspicuous, and well understood by the public, thus it should be further investigated and potentially applied in other provinces.

## 2. APPLICATION PRINCIPLES FOR COLOURED LANES

The development of guidelines was based on the following four principles:

1. The use of strict conditions for implementation instead of widespread implementation;
2. Focus on restricted areas vs. conflicting areas;
3. Potential for partial and full-length application; and
4. Compatibility with other transit lane design elements.

### **1<sup>st</sup> Principle: Strict conditions for implementation instead of widespread implementation**

Coloured surface treatment should be applied to transit lanes that are used at all times exclusively by transit vehicles. Exceptions should be kept to minimum. This restrictive use will ensure the maximum effectiveness of the surface treatment method.

### **2<sup>nd</sup> Principle: Focusing on restricted areas vs. conflicting areas**

The coloured surface treatment should be applied mostly to areas that are restricted to transit use only and not to areas that allow the use of the lane by other vehicles. Note this approach is fundamentally different from the use of colored pavement marking in bicycle lanes to demarcate a conflict zone, which is currently in use by some American jurisdictions but is not an approved TAC guideline. Coloured bicycle lanes indicate to motorists that cyclists are also using the roadway and motorists should pay more attention to the vulnerable road users. Sending this message is most important at conflicting points, where motorized vehicles cross the bicycle lane (Exhibit 2.1). **In the case of transit lanes, the coloured surface treatment should indicate the areas where motorists are not allowed to use the lane.**

For information concerning TAC guidelines for the use of bicycle pavement markings in conflict zones, see the *Bikeway Traffic Control Guidelines for Canada, 2<sup>nd</sup> Edition*.

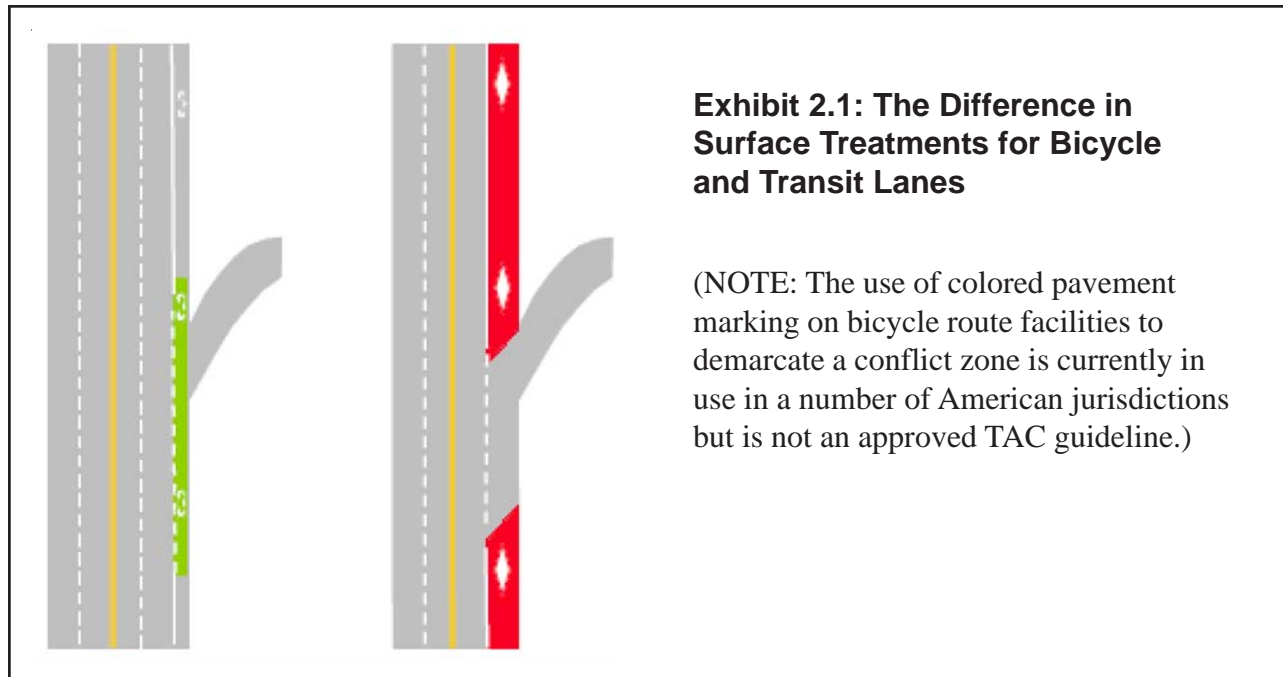
### **3<sup>rd</sup> Principle: Potential for partial application**

To minimize application costs, the application of coloured surface treatment could be applied at critical sections of a continuous transit lane. These critical sections include the beginning, the end, and some of the intermittent areas of transit lanes.

### **4<sup>th</sup> Principle: Compatibility with other transit lane design elements**

Surface treatment is an approach to make transit lanes more conspicuous. Existing signage and pavement markings are required to indicate the presence of transit lanes. The application of surface treatment is optional, but if implemented, it should complement signage and pavement markings and should not require any changes to the existing pavement marking and signage standards.





### 3. COLOUR SELECTION

The red colour should be used for the coloured surface treatment of transit lanes. The primary reasons for the selection is the traditional association between the colour red and “prohibition”. The intended message of the red lane to motorists is: “Do not use this lane.”

Coloured surface treatment does not substitute any of the currently required pavement markings or signage. Coloured surface treatment is an additional and optional tool to increase the conspicuity of transit lanes.

### 4. COLOURED SURFACE TREATMENT APPLICATION SCHEMES

There are three alternative schemes for the application of surface treatment (Exhibit 4.1):

**Partial Treatment** (Alternative A): The surface treatment is provided at the beginning and end of the transit lane or block, and at critical intermediate points.

Partial treatment is suitable for both short and long blocks. This alternative could be an effective and cost-efficient approach in areas where the temptation to use the transit lane by ineligible vehicles is low to moderate.

**Block Treatment** (Alternative B): The surface treatment is provided along city blocks, thus it is discontinued at every side street.

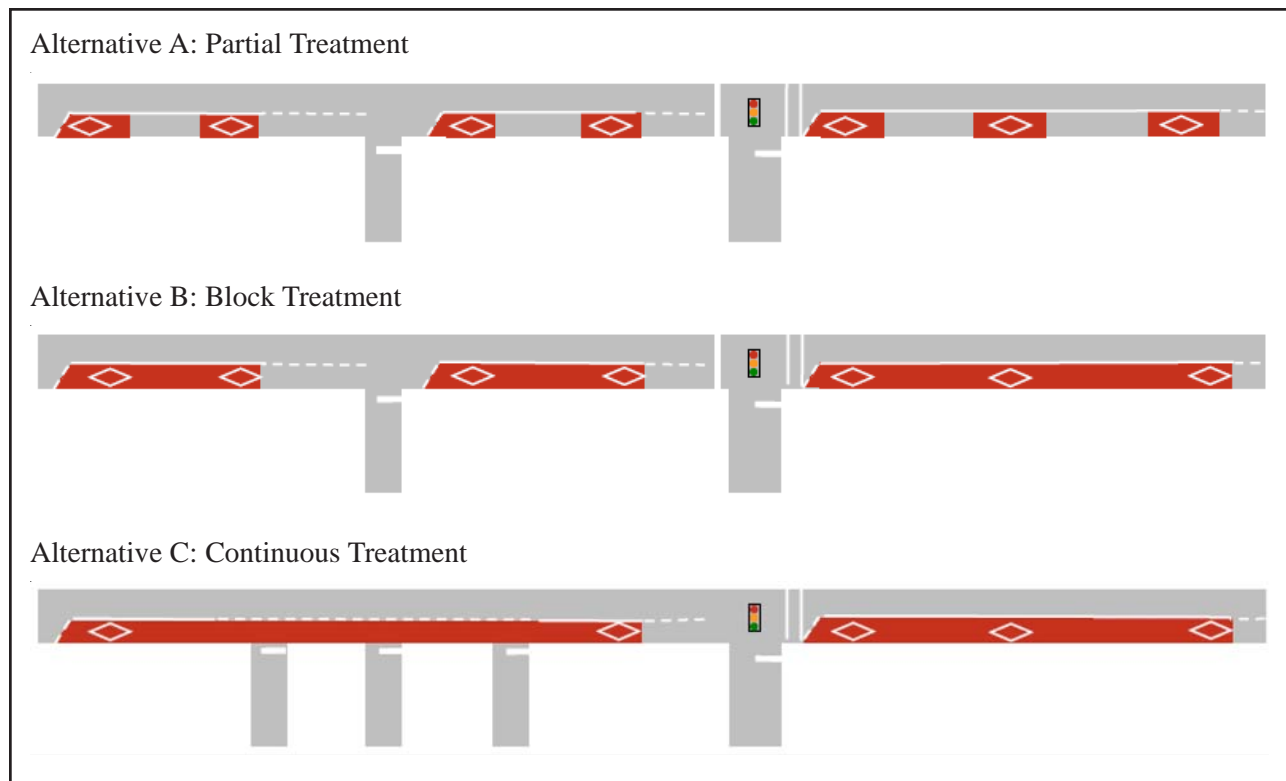
The Block Treatment is most suitable when a continuous reminder of the presence of the transit lane is required. This alternative is likely to be more effective than the Partial Treatment on roadways where the temptation to use the transit lane by ineligible vehicles is high.

**Continuous Treatment** (Alternative C): The surface treatment is provided across minor and unsignalized intersections, but it should be discontinued at major and signalized intersections.

This treatment is inconsistent with the 2<sup>nd</sup> principle (Focus on restricted areas vs. conflicting areas) and it is recommended to be used only in special circumstances when minor side streets are placed relatively frequently (less than 150 m) and the implementation of Block Treatment or Partial Treatments is not practical nor economical due to the frequent discontinuities.

**Road sections where frequent transit lane encroachments are allowed**

The 2<sup>nd</sup> principle that suggests coloured lanes should be used only on sections where lane use is restricted to transit vehicles should be the general guideline. Thus, along road sections with frequent driveway accesses, Partial Treatment or no treatment is recommended. To maintain the inherent message of restriction of red coloured lanes, Continuous Treatment or Block Treatment is not recommended at sections where non-transit vehicles legally and frequently encroach into the transit lane.



**Exhibit 4.1: Alternative Methods for the Application of Coloured Surface Treatment**

## 5. DESIGN ELEMENTS

### 5.1 Surface Treatment Starts and Ends

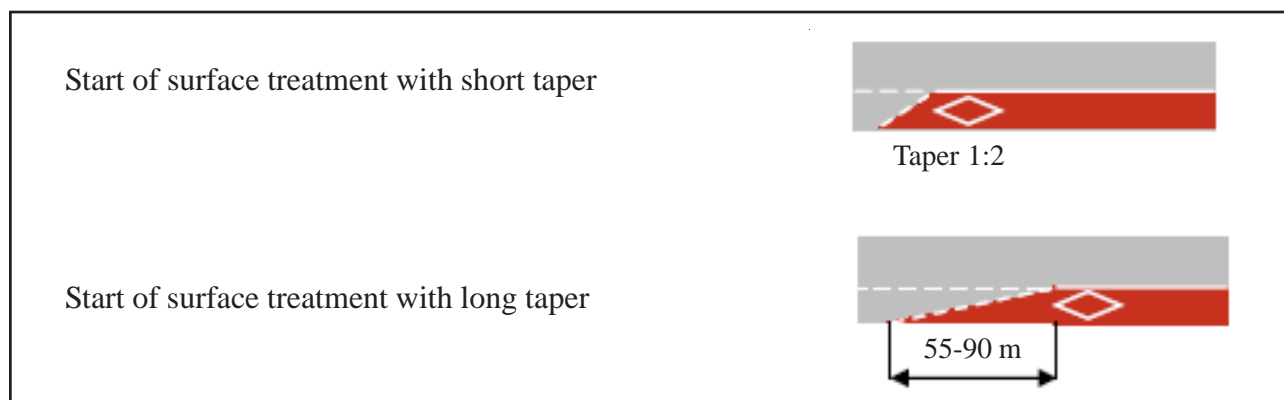
The recommended practice for starting a surface treatment is a short taper (1:2) which corresponds to the existing guidance in the *Manual of Uniform Traffic Control Devices* (MUTCDC) for marking the start of a transit lane. Although the guideline for the taper is 1:2, somewhat longer tapers (e.g. 1:3 to 1:4) have proved to be more visible. The tapered start should be repeated whenever the surface treatment is discontinued at an intersection and re-started at the far-side of the intersection.



**Exhibit 5.1: Long Taper Start**

(Source: City of Ottawa)

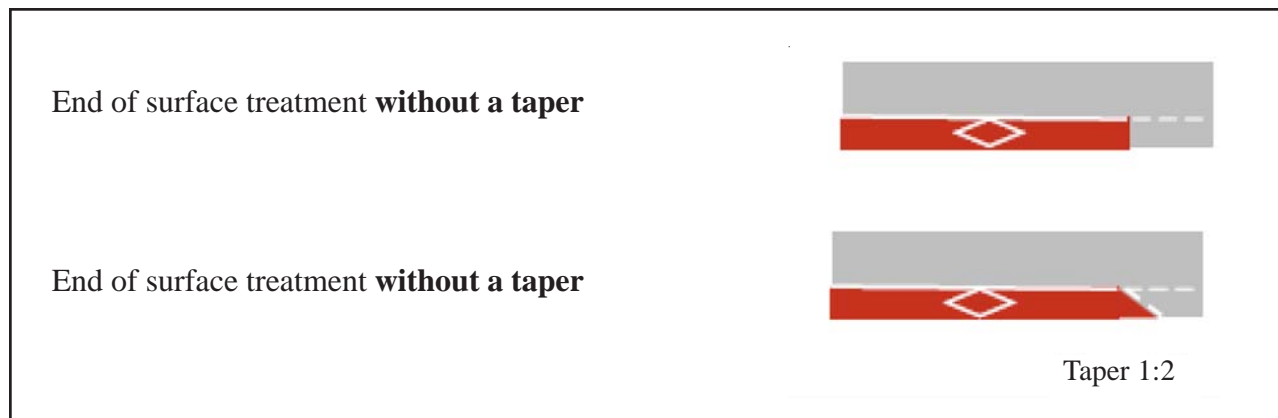
The MUTCDC describes only the design of short tapers. However, based on practical experience, the use of a long taper may be very effective in guiding non-transit vehicles out of the transit lane. If a particular jurisdiction uses long tapers, the surface treatment should complement the taper design. Exhibit 5.2 shows the application of a long taper (55m -90 m) for illustration purposes. Locations with sufficient space and higher posted speeds would normally have longer tapers and locations with shorter available length and/or lower speeds would have shorter tapers. The long taper is used only for the first start; subsequent starts are marked with short tapers.



**Exhibit 5.2: Surface Treatment Starts with Short and Long Tapers**

The recommended practice for ending the surface treatment is a simple discontinuation of the surface treatment without a taper. This corresponds to existing MUTCDC guidance for pavement markings (top illustration in Exhibit 5.3).

Some jurisdictions mark the end of the transit lane with a short taper. If a tapered ending is used, the surface treatment should complement the pavement marking (bottom illustration in Exhibit 5.3).



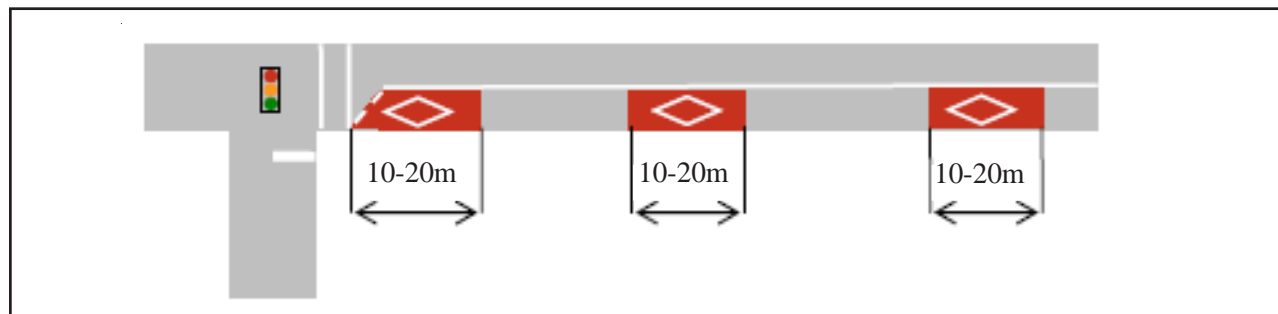
**Exhibit 5.3: Surface Treatment End Without and With a Taper**

## 5.2 Design of Partial Treatment

The start of the first patch within the block is designed by following the MUTCDC guidance for transit lane pavement marking (short taper). If a pavement marking with long taper is used to start the transit lane, the surface treatment should follow the long taper. Subsequent patches within the block start without a taper (Exhibit 5.4).

The last patch within the block may end with or without a taper depending on the pavement marking. All other patches within the block should end without a taper (Exhibit 5.4).

It is recommended that the length of the red patches is between 10 and 20 meters. Higher posted speed limit and/or longer blocks should have longer patches, while lower operating speeds and/or shorter blocks should have shorter patches.



**Exhibit 5.4: Design of Partial Surface Treatment**

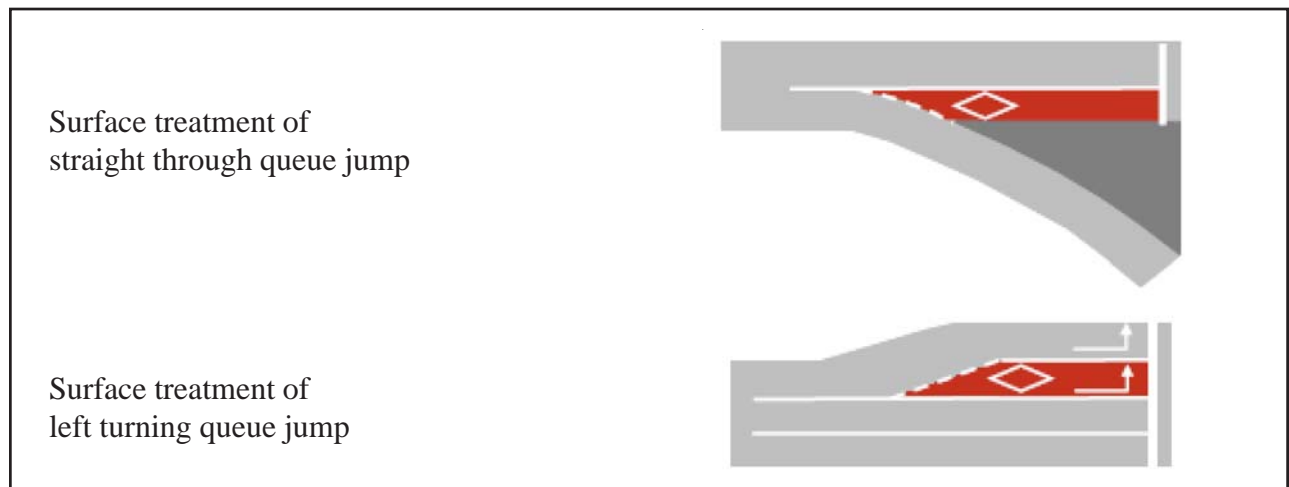
### 5.3 Design of Surface Treatment for Transit Queue Jump Lanes

Queue jump lanes are normally shorter sections of transit lanes and the application of the surface treatment along the entire length of the queue jump lane is recommended. The start of the taper is defined by the existing pavement markings (Exhibit 5.6). These examples of pavement markings are only illustrations and not recommended guidelines.



**Exhibit 5.5: Transit Queue Jump with Coloured Lane**

(Source: City of Ottawa)



**Exhibit 5.6: Surface Treatment of Bus Queue Jump Lanes**

## 6. IMPLEMENTATION CRITERIA AND DECISION PROCESS

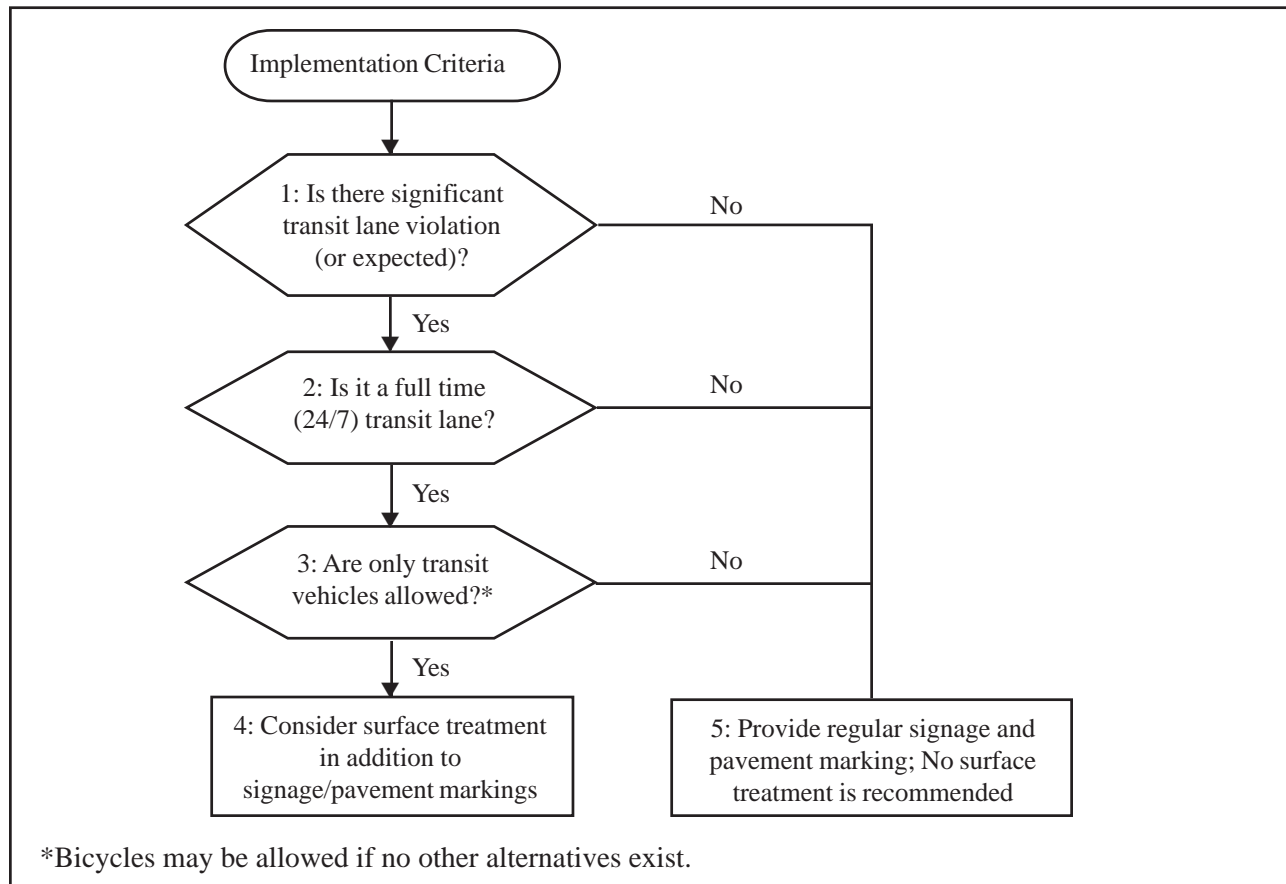
From the legal perspective, the operation of a transit lane is specified by using traditional signage. Transit lane pavement markings provide guidance to motorists and the coloured surface treatment, if implemented, reinforces these markings.

The main reasons for applying coloured transit lanes could be the following:

- there is significant transit lane violation (existing transit lanes);
- significant lane violation is expected (future transit lanes);
- the coloured lane would decrease confusion at more complex lane configurations;
- the coloured lane would alleviate operational problems; and
- marketing/educational/branding objective.

The surface treatment should be applied to only those transit lanes that are reserved for the exclusive use by transit vehicles at all times (24/7). Surface treatment could be applied to shared bus and bicycle lanes in circumstances when the safest position for cyclists is in the transit lane.

The recommended decision process is shown in Exhibit 6.1.



**Exhibit 6.1: Decision Process for Implementing Coloured Surface Treatment**

## 7. SELECTION OF COLOURED SURFACE TREATMENT TECHNOLOGY

Coloured surface treatment technologies can be grouped into two broad categories:

- Surface treatment with Coloured Pavement Material; and
- Surface treatment with Coloured Surface Coating.

### Surface Treatment with Coloured Pavement Material

The use of Coloured Pavement Material (as opposed to Coloured Surface Coating) should be considered when the following conditions are met:

- permanent application of the coloured surface treatment is required;
- frequent pavement cuts for utility maintenance projects are not anticipated;
- the coloured pavement material can provide the required shade of colour;
- lane construction or reconstruction is required; and
- additional life cycle cost of coloured pavement material is less than the cost of coloured surface coating.



**Exhibit 7.1: Surface Treatment with Coloured Pavement Material**

(Source: City of Winnipeg)

### Surface Treatment with Coloured Surface Coating

The use of Coloured Surface Coating (as opposed to Coloured Pavement Material) should be considered when the following conditions are met:

- existing lanes, no reconstruction is planned;
- frequent pavement cuts for utility maintenance activities are anticipated; and
- permanent application of the coloured surface treatment is not required.

The decision process for selecting the surface treatment technology is presented in Exhibit 7.2.

In terms of the duration of the application of coloured surface treatment there are two alternative approaches.

**Permanent application** is recommended when long-term surface treatment is required. This approach is more suitable to locations where the possibility of lane violation is continuously high due to congestion and intensive traffic activities which are more typical to downtown areas. For permanent applications, Coloured Pavement Materials should be considered because of their superior colour retention characteristics.

**Introductory or temporary application** is recommended when the surface treatment is applied to highlight changes in lane designation. This approach is suitable when general flow lanes are converted to transit-only lanes or queue jumps, and other design elements such as pavement markings, signage, and Transit Signal Display installation are sufficient to keep non-transit vehicles out of the lane after the introductory period. The introductory period could last from six months to a few years (normally less than three years) after which maintaining the coloured surface treatment is not required. The application of Coloured Surface Coating should be considered for these introductory applications.

The frequency of pavement cuts for utility maintenance has a significant impact on the selection of the coloured surface treatment technology. Older downtown areas, with aging utilities located under the roads are subject to more frequent pavement cuts. The reinstatement of Coloured Surface Coating is significantly cheaper and faster than the reinstatement of Coloured Pavement Material.

The colour selection for Coloured Surface Coating is generally much wider than the selection for Coloured Pavement Materials. Thus, Coloured Pavement Materials could be applied only when pavement material of the required colour is available.

The application of Coloured Pavement Material requires new lane construction or reconstruction. If the lanes are created by new construction, using Coloured Pavement Material should be considered. Coloured Pavement Material should be also considered when the lanes are reconstructed after major utility or pavement rehabilitation. In all other cases, the life-cycle cost of the two technologies should be considered in the selection process.



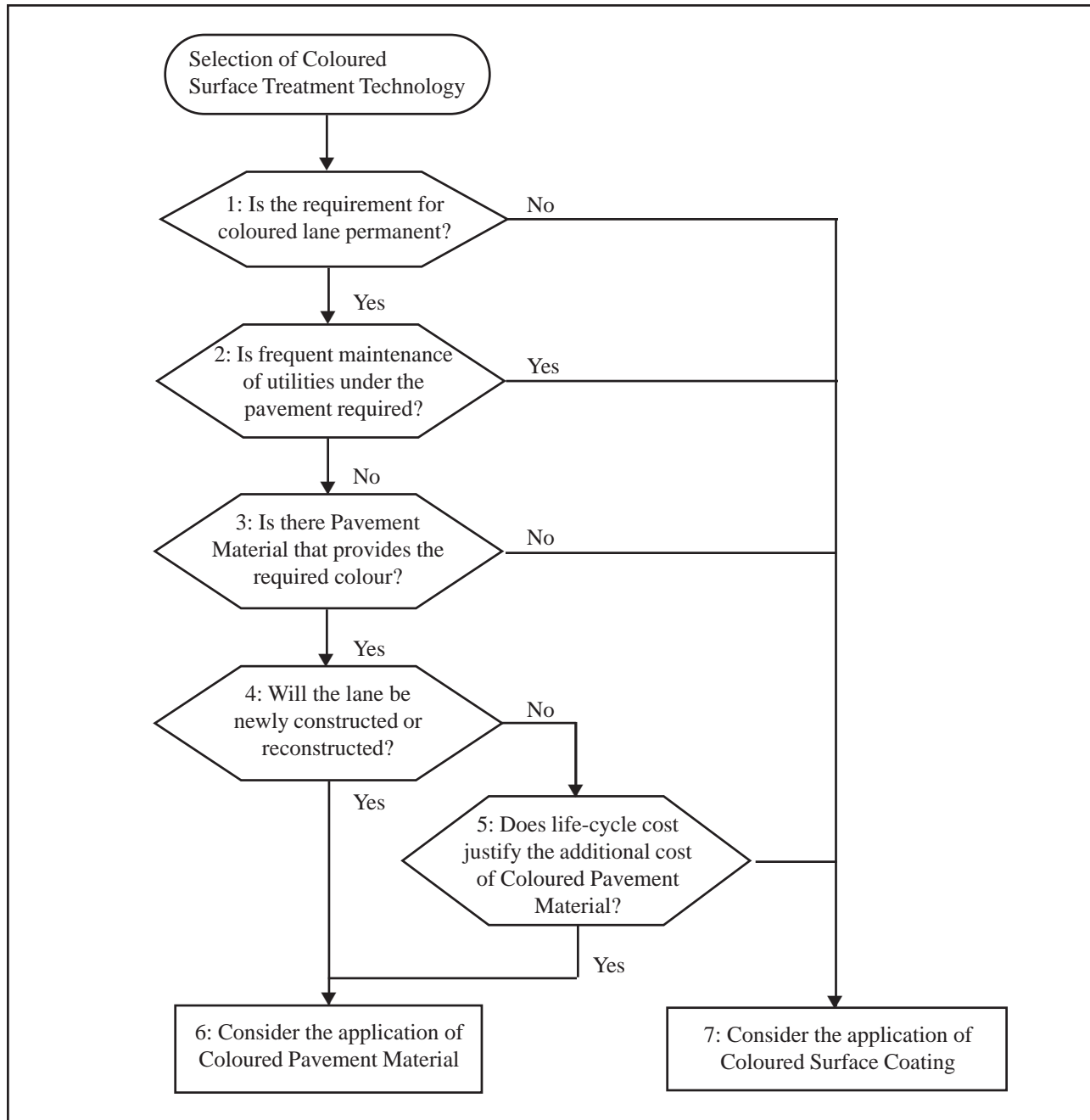
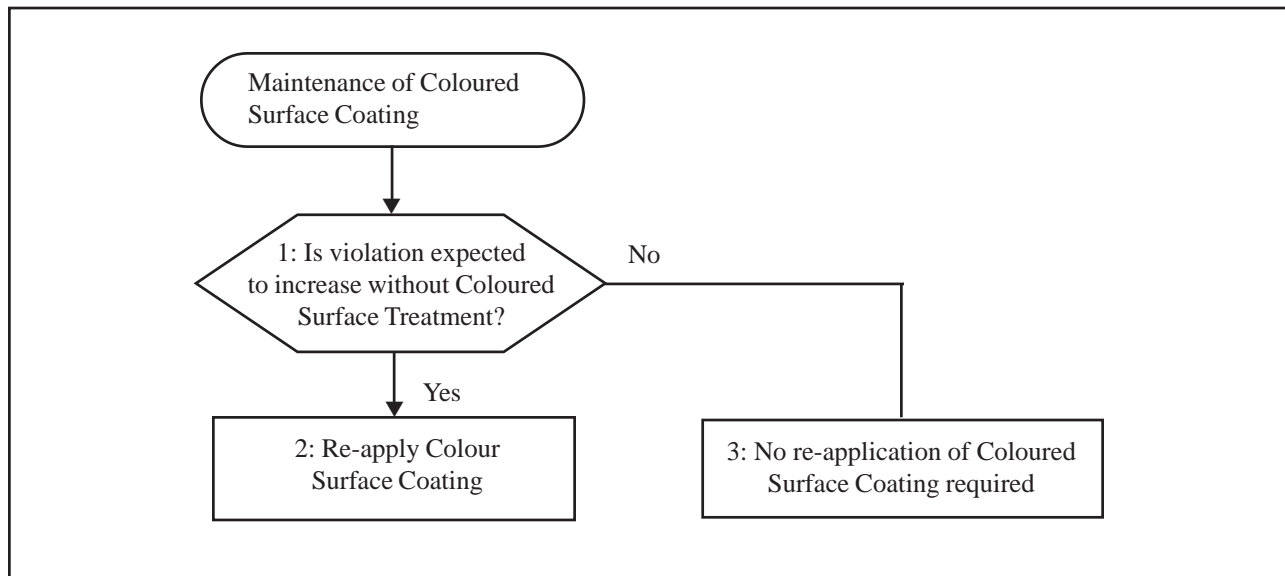


Exhibit 7.2: Decision Process for the Selection of Colour Application Technology

## 8. MAINTENANCE OF COLOURED SURFACE TREATMENT

Surface Treatment with Coloured Pavement Material has the same lifetime as the pavement. The maintenance of Coloured Pavement Material is mostly limited to the reinstatement of coloured pavement after local construction activities. As indicated in Section 7, the application of Coloured Pavement Material technology is not recommended when construction activities are relatively frequent.

The maintenance of Coloured Surface Coating includes the reinstatement after local construction activities and may include periodic re-application of the Coloured Surface Coating. The application of coloured lanes by using Coloured Surface Coating could be considered as a temporary measure which would be discontinued when violation of the transit lane has been reduced to the target value. At some locations, it may be sufficient to apply the colour only once. At other locations, there could be a need for a longer period to educate motorists of the lane use restriction. The decision process for the periodic maintenance for Coloured Surface Coating is presented in Exhibit 8.1.



**Exhibit 8.1: Decision Process for Periodic Maintenance of Coloured Surface Coating**

When appropriate, the reinstatement of coloured surface can be included in maintenance and construction contracts.

## 9. SURFACE TREATMENT MATERIAL CHARACTERISTICS GUIDELINES

The coloured surface treatment should satisfy minimum safety and durability requirements.

### **Safety requirement**

The skid resistance of the colour treated surface during its entire life cycle should comply with the existing standards of non-treated traffic lane surfaces.

### **Durability requirement (Coloured Surface Coating)**

The required lifetime of coloured surface treatment should be based on an economic consideration.

## 10. PUBLIC EDUCATION AND MARKETING

The red colour treatment of transit lanes generally conveys the intended message of restricted use. The decision about the need for special public education and/or marketing should be made by the appropriate authority in each individual jurisdiction.

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