

## **Session 11 - Signing**

### **Signing Issues - Making Signs Work**

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#### **Abstract:**

This paper addresses several issues regarding the correct use of signs with background references to the MVA and MUTDC. The issues addressed in this paper are:

- Adherence to Standards
- Sign positioning
- Sign/legend sizing
- Lane Control versus Turn Control signs
- Route Finding signage
- Liability in signing

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## Introduction

The purpose of this paper is to use existing examples as a guide for future designs and upgrading. Many of these examples are on facilities that were designed and constructed some time ago. While they may have been adequate then, based on design standards current at that time, and under much lower traffic volumes than the facilities currently carry, they no longer meet current expectations or safety criteria. They are thus instructive examples of desirable upgrades.

## Adherence to Standards

Traffic signs are the primary means of communicating to drivers' critical information that is not apparent from the roadscape. It is essential that the message conveyed by signs be understandable, unambiguous and consistent. To this end we have Sign Standards that are derived in part from legislation (regulatory signs), and partly based on sound engineering and accepted "Best Practices".

Both Canada and the United States have their respective "Manual of Traffic Control Devices." These manuals provide guidance on nationally accepted standards of signing. In addition to the Manual of Traffic Control Devices for Canada each province has, to varying degrees of detail, their own sign manuals, policies and procedures. Hence, while there is a national overarching umbrella document providing guidance on consistency of traffic control devices, compliance with these national documents is voluntary.

The B.C. Ministry of Transportation manual contains more signs than are contained in the Manual of Traffic Control Devices for Canada. B.C.'s unique geography necessitates a wider variety of signs than other provinces, for example, there is limited applicability of avalanche warning signs in Saskatchewan.

Since we have a multiplicity of jurisdictions in BC we need to take special care to ensure consistency. At the highest level all road authorities must follow the BC Motor Vehicle Act and Regulations. This legislative authority provides a basis for the BC Ministry of Transportation Manual of Standard Traffic Signs and Pavement Markings [1] where it states:

### *1.5 Standardization of Application*

*Similar situations must always be signed in the same manner in order to ensure correct driver response. Therefore, to maintain signing integrity, standards for the application of traffic signs must be upheld. Signs should be used only where they are warranted. Excessive use of signs detracts from their effectiveness.*

The B.C. Motor Vehicle Act and Regulations define specific regulatory signs such as stop signs, speed limits signs etc. The Ministry of Transportation manual defines many more signs, not only regulatory signs (in line with legislation), but also warning signs, construction signs, guide signs, information signs etc. B.C. road authorities other than the Ministry of Transportation are not mandated to follow the Ministry manual however are encouraged to do so.

Common signing issues include:

- Inconsistency of application of standard regulatory and warning signs
- Inconsistency of sign positioning
- Incorrect sign design for the given driving environment

## Sign positioning

Signs, of whatever type, must always be designed and placed so that they are clearly visible and legible, are placed so that they can be read, and understood such that they can be acted upon safely to enable the driver to make and execute the correct maneuvers in a timely and safe manner under the prevailing traffic and roadway conditions. This means that sign and lettering sizes must be adjusted for vehicle speeds, and positioning must recognize the probability of signs being obscured by traffic in adjacent lanes on multi-lane facilities.

The general rule of thumb for determining the time necessary to read a message is that approximately 1 second is required for a road user to read 1 word or 1.5 to 2.0 seconds per phrase. Messages should convey a single theme and not mix categories of messaging, i.e. warning messages should not be mixed with guidance messages. Obviously as more information is added to the sign, the longer the reading time needed to comprehend the message. As the necessary message processing time increases so ultimately does the size of the sign and the distance the sign must be placed prior to the decision point.

To simplify the location of signs most jurisdictions have sign placement tables that correlate the type of sign and posted speed relative to the placement distance in advance of the decision point. These tables are generally available for all categories of signs.

Not only is it important to determine how far in advance of a decision point a sign needs to be it is also necessary to determine whether the sign is shoulder mounted, davit mounted (similar to shoulder mounted but elevated) or mounted overhead of the travelled lanes. These placement options need to be assessed based on road cross section, traffic volumes and traffic composition. The majority of signs are shoulder mounted. The B.C. Ministry of Transportation states that overhead signs should be considered when the posted speed is greater than or equal to 90 km/h and the AADT is greater than or equal to 50,000 vpd. As overhead mounting of signs involves the engineering and installation of substantial structures at many times the cost of shoulder mounted signs, the need for this treatment must be carefully assessed. In lieu of overhead mounting, it may be possible to provide multiple redundant signing on the shoulder and centre median to decrease the probability of drivers missing signs.

The following photographs show examples of signing on the same facility but in opposing directions. Figure 1 shows the freeway standard while Figure 2 shows a expressway standard. When one segment of the roadway was upgraded to remove an at grade intersection the higher standard of guide signing was installed. This difference in guide signing application is not uncommon in transition areas between different classifications of facilities. The key consideration for the road authority in these cases is operationally providing the drivers with the same degree of information with the same degree of processing time.



Figure 1 Freeway Standard



Figure 2 Expressway Standard

## Sign legend sizing

Linked to positioning, but more related to vehicle speed and driver perception (visual acuity), the size and style of lettering has a significant impact on the effectiveness of signs. Recent research has resulted in the development of the new “Clearview” font for highway signs.

The “average” human eye can distinguish objects approximately one minute of arc in size (1” at 95 yards or 10cm at 350m). A standard vision test chart is based on identifying letters 5 min of arc high at 20 ft (6m).

Sign lettering is defined depending on the roadway operating speed and the required perception time required to read the message. The MUTCDC provides guidance for specific sign types and roadway types (as a proxy for operating speed)

As noted above, the general rule of thumb for determining the time necessary to read a message is that approximately 1 second is required for a road user to read 1 word or 1.5 to 2.0 seconds per phrase. As more information is added to the sign, the longer the reading time needed to comprehend the message. We thus need to increase the text size to allow drivers sufficient time to read the message at the prevailing traffic speed.

The distance from which a driver can read a messaging is based on letter height and font. For many years the rule of thumb in the United States was 50 ft (15 m) per inch (25 mm) of letter height. Recent studies with the aging driver population have suggested that a better measure would be 40 ft (12.1 m) per inch of letter height. A 20% increase in letter height has substantial impact on sign size and cost. The additional sign size would also have a domino effect on the support structure such that a sign that may previously have been supported by twin telespar posts may in its larger version need a much more substantial and costly structure. Fortunately, Penn State University developed the new Clearview font. The Federal Highways Administration has approved interim use of this new typeface. It has superior distance legibility over the old familiar Highway Gothic font. Clearview offers a 20% improvement in legibility and recognition with the same size sign as currently used. [2]

Basic character sizes for signs are:

<b>Freeways &amp; Expressways</b>	<b>Upper Case (mm)</b>	<b>Lower Case (mm)</b>
Urban	450	360
Rural	350	280

Signs that use smaller type sizes are not legible sufficiently far away to allow drivers time to read the message and/or react appropriately. For drivers to understand the smaller type messages they would need to lower their travelling speed in order to give themselves sufficient reading time. This slowing down will disrupt the traffic flow and can result in operational problems. In this example the sign is also mounted on the inside of a curve in a cut situation. As a result the sign is also not visible early enough, especially to drivers in the right side lane.



Figure 3 Text Size, 80kph expressway, sign location (inside curve)

Warning signs that rely on graphics rather than text also need careful consideration.

This figure shows two types of warning sign used redundantly. The chevron sign should be used in groups of three to denote a sweeping curve. The signs are also too small for the facility (posted speed is 90kph). This location will be upgraded under a project scheduled for 2005.



Figure 4 Exit gore signs

### Lane Control vs Turn Control signs

As an example of a common problem in BC let us look at two regulatory signs. Unfortunately these signs are commonly misused with potential problems.

Quoting the BC Traffic Sign Manual...



*TURN CONTROL signs may be used at intersections or accesses to mandate (green signs, at left) or prohibit (red signs) the movement(s) of **all traffic on an approach** as specified on the sign.*

*TURN CONTROL signs should not be confused with LANE USE signs which are used are used to regulate the use of specific lanes and are mounted in advance of the intersection.*



*LANE USE signs (black signs at right) are used to indicate to the motorist the use of a specific lane on an approach to an intersection.*

*LANE USE signs regulate the lane assignment on approach to intersections and should be used where the movement is contrary to driver expectation or to the normal rules of the road.*

*LANE USE signs should not be confused with TURN CONTROL signs. Turn control signs are used to control all traffic in all lanes at an intersection.*



It should be clear from this that only one of the green (permissive) Turn Control signs or a combination of red, (prohibition) signs can be used on any one intersection approach as that sign applies to all traffic. If two permissive signs (for example left turn only permitted and through only permitted (both green)) are used, there is a conflict that essentially says no one can move and comply with the signage! The correct signage in this case is to use the Lane Use signs (black) over each lane.

In the first two of the following photographs these signs are being used incorrectly. In the top photo, the red turn prohibition sign (left foreground) is correct, however the green sign (at the end of the right lane) is incorrect, it should be the black Lane Use sign, mounted prior to the end of the lane (side mounted or overhead, where the text sign is).



Figure 5 Incorrect combination/use of Turn Control signs (median and far end of right lane)

The use of turn control signs to indicate lane usage at this signal (bottom left photo) literally means an approaching driver can legally (regulatory sign) not move through the intersection as the signs conflict, one says you can only go straight ahead or turn right, the other one says you can only turn left... Again, the signage should be the black lane control signs, preferably mounted prior to the signal mast arm. The bottom right photo shows the correct sign application, black lane control signs mounted over each lane prior to the intersection. If necessary for further clarity, arrow signal heads should be used.

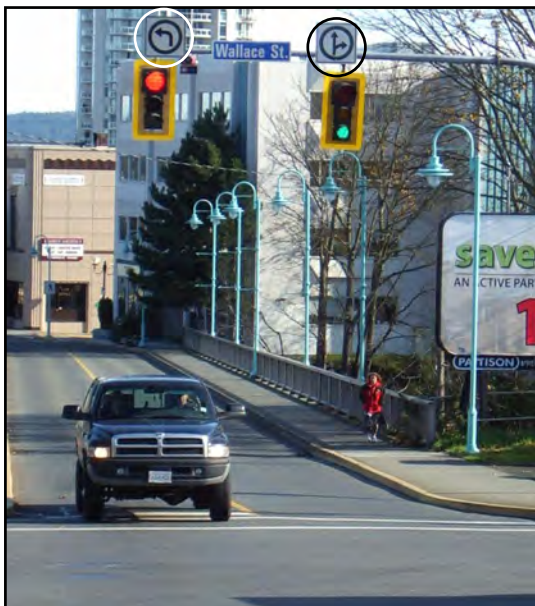


Figure 6 Incorrect use of Lane/Turn Control signs

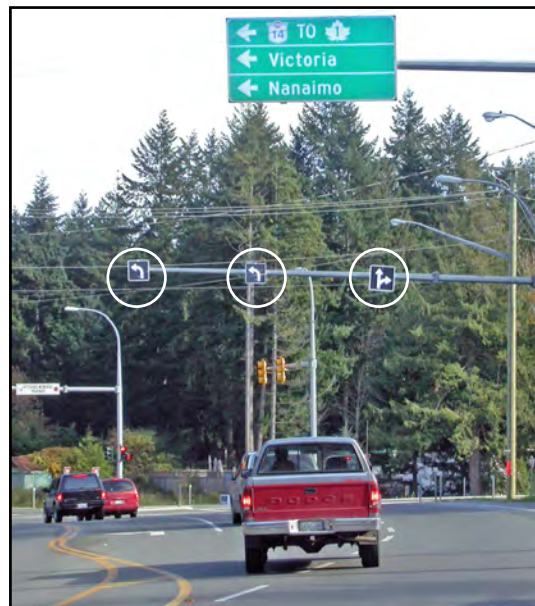


Figure 7 Correct use of Lane Control signs

## Route Finding signage

These signs fall into three categories, direction signs in advance of decision points (intersections/interchanges), Exit marker and confirmation signs at the intersection/interchange, and map style information signs placed off the road.

A major freeway (or expressway) split requires direction signs starting several kilometres prior to the split, conventional exit ramps require these signs starting at approximately 1.5km from the exit point. These signs are usually well placed and legible, however if truck volumes are a high percentage of the flow, then consideration needs to be given to the use of overhead signs or auxiliary signs in the median to ensure that trucks do not block visibility.

Intersections on at grade roads require the same considerations. Consistency of location of street name signs in intersections is important; drivers should not have to search to find them.

Too often we see the first signs placed opposite the beginning of the left turn lane, or, worse, actually at the intersection. “Street Name” tabs on the “Intersection” warning signs may not provide adequate information at an appropriate time. Intersection warning signs are diagrammatic and hence are instantly recognizable. When street name tabs are placed underneath the sign the driver must spend more time reading the sign. Additionally it is preferable to separate warning from guidance information. Providing the messages on separate signs allows each message to be read faster. The challenge in B.C. is that the geography often limits the real estate available to provide this separation of signs.

The use of route shields provides valuable wayfinding direction. The key to success in their use is consistent application and ensuring that they are large enough to be visible. The use of “shield” type route number signs, without additional advance information should be restricted to use after the intersection. To be effective their need to be signs which clearly demonstrate to the driver the link between the route shield and the destination they are seeking. These signs need to be in place in advance of decision points.



Figure 11 Route Sign

Conversely the use of “Finger Signs” provides no information to drivers in a way that they can safely use it. They may however serve a useful purpose in high pedestrian traffic areas.

Off road map type signs also have a valuable role in providing information to travellers who are not familiar with the area. These should be placed in locations where there is adequate off road parking, and where safe access can be provided. This type of signing is most often found in rest areas or in pull-outs.



Figure 8 Route Finding Sign



Figure 9 Too Small, too late (80kph expressway)



Figure 10 Finger Signs

## Liability in signing

The lane/turn control sign example was chosen as an example of one of many instances where the Regulations are not being followed. As these are regulatory signs it is most important that drivers receive the correct message that is consistent and unambiguous. If this does not happen, drivers get used to doing “the wrong thing”, then one day someone will ignore them and become involved in a collision, and liability will conceivably end up with the Road Authority because the signage was incorrect. Just a badly though, where they are used correctly, they will be ignored because drivers have become used to the wrong application of the signs.

In the area of liability when causality is examined, it is typical for the investigation to focus on what the traffic control standard was in effect. This may include checking whether the prescribed signs in the B.C. Motor Vehicle Act and Regulations were in place. When the signs in question are outside of the regulation then the investigation would look at the road authorities written policies around signing and how this application fit into those policies as well as national practices in the Manual of Traffic Control Devices for Canada, the provincial practice and that of other similar road authorities.

Not only would policies and procedures with respect to sign installation be examined, but the maintenance standards for signing, time frames for responding to sign deficiencies and historic documentation identifying what actions had been taken.

The best strategy for limiting exposure to liability in signing is to follow legislation, national standards, provincial standards and road authority practice. In each case it is important to have policy documentation in place outlining the hierarchy of standards that will be followed.

## Summary

If there were only three words allowed to describe the key attributes of signing they might be:

- Standards
- Visibility
- Legibility

Standards are critical because they reinforce consistency, visibility is critical because drivers cannot receive the message if they cannot see the sign, and legibility is critical to allow drivers enough time to read the sign at the prevailing speed.

Care needs to be taken to ensure a facility-wide view of signing, as upgrade projects take place, the adjacent sections need to be reviewed to ensure that the overall standard is consistent with the prevailing traffic speed. Signage also needs review as traffic density increases and vehicles obstruct the view of following drivers.

Managing legal liability is one aspect of signage, but even if the strict letter of the law is followed, situations can occur where operational problems arise if the application is not appropriate to the actual conditions.

## References

[1] *British Columbian Ministry of Transportation Manual of Standard Traffic Signs and Pavement Markings.*  
[http://www.th.gov.bc.ca/publications/eng\\_publications/electrical/MoSTt\\_PM.pdf](http://www.th.gov.bc.ca/publications/eng_publications/electrical/MoSTt_PM.pdf)

[2] *New easy-read road signs based on Pennsylvania State University research – Interim Approval*  
[http://mutcd.fhwa.dot.gov/res-interim\\_approvals.htm](http://mutcd.fhwa.dot.gov/res-interim_approvals.htm)