

## A4.2 GENERAL INFORMATION

### A4.2.1 Driver Needs and Route Hierarchy

Guide and information signs are a major element of the traffic control system. Guide signs provide the information that the driver requires to reach the intended destination, which is the reason why the driver is on the road. Guide and information signs should be consistent along different travel routes across Alberta, Canada and to a certain extent North America.

Sign uniformity provides quick recognition by all drivers of a sign by its shape, colour and size. The message on the sign must be easy to read, clear to not cause confusion, and easily understood by the driver. The driver must also be given adequate time to react and respond to the sign as required.

Consistent, standard signs, placed by the road authority having jurisdiction not only command attention, but also command the respect of the road user in general. Inconsistent, non-standard signs may confuse the driver, and although erected with the best of intentions, may not command the same level of attention and respect.

Drivers using guide and information signs can be placed into one of three broad groups:

- The “stranger” who is a driver traveling the roadway for the first time and is totally unfamiliar with the route and area.
- The “local stranger” who may be attempting to reach some location for the first time, or may be repeating a trip that is made only occasionally. This driver is broadly familiar with the area, but not with the route or specific site of the destination.
- The “local-local” who is repeating a trip made regularly on a road and in an area that is familiar.

Of these three groups, the “stranger” and the “local-stranger” categories are those most dependent upon guide and information signs to direct them to their destination.

#### A4.2.1.1 Primary Travel Routes

Primary travel routes are an integral part of the overall highway system and form the framework for the highway system. In Alberta, these include one and two digit highways, and the ring roads in Edmonton and Calgary. Highway routes connect the majority of communities (destinations) within the province and form the main travel routes for long distance trips.

#### A4.2.1.2 Secondary Travel Routes

Secondary travel routes are routes which form a sub-system of the overall highway system. Secondary travel routes include three digit highways (former secondary highways) which interconnect with the primary travel routes. These routes typically consist of short trips or provide local access between primary travel routes, particularly in rural areas.

#### A4.2.1.3 Local Travel Routes

Local travel routes are routes comprised of roads other than provincial highways, which connect to the highway system. These routes are important to ensure continuity in guidance is maintained as travelers exit or enter onto the highway system.

### A4.2.2 Classification of Guide and Information Signs

In Alberta, various types of routes are signed using five separate sub-classes of guide signs:

- **Class IA – Destination Guide Signs** - Guide signs indicate road user orientation by identifying destinations, directions, distances and locations. These signs are identified with an IA prefix.
- **Class IB – Highway Route Markers and Street Identification Signs** - Highway Route Markers and Street

Identification Signs indicate numbers, names or other destinations of streets or highways. These signs are identified with an IB prefix.

- **Class IC – Off-Road Facility Signs** - Off-Road Facility Signs indicate the availability of and direction to off-road services, facilities and visitor attractions. These signs are identified with an IC prefix and include specific sign programs such as Tourist Oriented Directional Signs (TODS) and Logo (gas, food, lodging) Signs.
- **Class ID – Miscellaneous Information Signs** - Miscellaneous Information Signs indicate information which is not otherwise provided in any of the foregoing subclasses of signs, but are important to highway travelers. These signs are identified with an ID prefix.
- **Class IF – Freeway Guide Signs** - Freeway Guide Signs are important signs found in freeway systems that provide direction and guidance to upcoming interchange exits and destinations. The placement of these signs are critical to ensure enough time is given for proper lane changes and maneuvering safely to the exits.

More details on the colour and design of these signs are found in Section A4.3.2.

Sign tabs often supplement the primary signs and are usually smaller in size. Sign tabs consist of two types:

- **Supplementary Sign Tabs** - Supplementary sign tabs indicate additional related information which supplements the message conveyed by the primary sign. These tabs form part of the sign message.
- **Educational Sign Tabs** - Educational sign tabs indicate in legend form the same message represented by a symbol on a primary sign. Educational tabs may be used to convey the

meaning of symbols during an introductory period. After the introductory period has expired, any new sign installations shall exclude the educational tab.

### A4.2.3 Human Factors

Human factors should be a primary consideration in the design and application of all traffic control devices, but especially with guide and information signs. The driving task involves many different types of motorist vehicle interactions and one of these is the recognition of signs and responding to them.

Additional information about human factors may be found in the TAC's publication "*Supplemental Guide for Guide and Information Signage in Canada, 2003*".

#### A4.2.3.1 Driver Response

How the driver responds to a particular sign will depend upon the driver's ability in detecting, understanding and reacting to that sign. The time taken to respond to signs involves many factors, including:

- *Target detection* – from a guide signing context, this involves making guide signs easily recognizable so that they can be seen amongst other sign clutter.
- *Target identification* – this involves making the information easily and quickly recognizable to the driver.
- *Driver decision* – once the sign has been detected and identified, the driver needs to decide whether or not to react to it.
- *Driver reaction* – driver reactions can vary from nothing, if the guide sign is not relevant to the driver, to making a lane change or turning at an intersection, onto another roadway.
- *Response of the vehicle* – different vehicles respond in different ways depending upon the type of vehicle.

The sign designer needs to consider the above driver responses when designing and placing signs along the highway. One way of achieving this is to ensure signs are easily detectable by making them of standard colour and shape. Signs should also be legible with limited information so they may be glanced at rather than read in detail. Drivers must be able to read them quickly while traveling at high speeds or when faced with other visual or operational demands in their driving task.

#### **A4.2.3.2 Positive Guidance**

Consistency in design is good practice, as it assists a driver to respond to conditions, situations, events and information in a consistent manner. It is therefore important that, whenever possible, signs are kept identical, or at least very similar, on travel routes throughout North America, within Canada and each province.

Information should be presented clearly so that a driver can:

- Detect a sign in an environment that may be cluttered.
- Recognize the sign information.
- Decide upon an appropriate response
- Complete the maneuver safely.

There are four principles of positive guidance:

**Primacy** – information should be placed in order of importance to the driver. The most important information should not necessarily be placed first. Temporary conditions, regulatory and warning signs must take precedence over guide and information signs, as driver safety is more important than navigational needs.

The most critical signs should first be placed in their optimal locations, and others are fit in after in order of priority (i.e., Tourism signs relating to a freeway section typically appear first to the driver, upstream of exit direction signs). Less important signs may need to be placed at less optimum positions or

eliminated altogether due to limited space for signs along the road.

A hierarchy of the order that guide signs shall be displayed from most critical to least critical is identified as:

- a) Directional Guide Signs (either on freeway or highway)
- b) Emergency Services Signs (directions to Hospital/Police)
- c) Transportation Service Signs (directions to Airports, Bus Depots, Rail Stations)
- d) Motorist Services Signs
- e) Attractions and Points of Interest Signs
- f) Miscellaneous Information Signs.

**Spreading** – when information cannot be placed on one sign or at one location, it should be spread out to reduce the opportunity for the driver to become overloaded.

**Coding** – colour and shape coding of traffic signs allow representation of different types of information that are clear to the driver. An example is using a blue background to represent tourism or motorist services.

**Repetition** – providing information more than once, but ensuring the additional messages do not clutter the driver's view.

#### **A4.2.3.3 Driver Capabilities and Requirements**

The driver's ability to physically detect, read, understand, make a decision and react to a sign message is based primarily on the placement of the sign and the message conveyed.

**Visual Search** – drivers tend to look ahead in order to be prepared for unexpected obstructions in their driving path. For example, in advance of curves, drivers are preoccupied looking at the road for physical directional guidance, so signs should not be placed at or on the approach to curves.

Drivers tend to move their eyes from side to side and up and down in order to detect these obstructions. Driver eye movements are less extensive under heavy traffic conditions suggesting that sign design and placement should be given special attention in urban situations.

**Driver Detection, Reading and Response Requirements** – Drivers require the necessary time to perceive, understand and safely respond to a sign message. This is known as Perception Response Time (PRT).

The detection process begins when an object enters the driver's field of view. At this point in time the object is “seen” but not registered in the brain. The next phase is the recognition of the sign so that the driver can make a decision about what to do.

**Driving Maneuver** – Once drivers know what actions to take, they must make the appropriate maneuver which may include a number of lane changes, weaving, turns or other vehicle driving actions.

The total time required to complete the above actions is found by:

Total time needed = **Reading Time + Reaction Time + Maneuver Time**

Where:

*Reading Time* - Time required to read a sign with a given message

*Reaction Time* - Time required to make a decision and initiate a maneuver, if one is required

*Maneuver Time* - Time to complete any required maneuvers before reaching the route choice point.

The distance traveled on the route is a function of the vehicle speed on the highway and the time required to interpret the message and make the maneuver. Tables 2.1 thru 2.4 provide the distance required to complete certain tasks when driving at various speeds.

**Design Example** – As an example, a driver’s sight distance requirement is calculated for a sign with one symbol and three words, 100 km/h speed limit, medium complex environment, requires one lane change on a freeway, and the exit is on a ramp traveling the same speed as the highway.

Total Distance Required = Reading Distance of 90 m (Table 2.1) + Reaction Distance of 35 m (Table 2.2) + Lane Change Distance of 200 m (Table 2.3) + Deceleration Distance of 0 m (Table 2.4) = 325 m.

Based on the practice of using 25 mm text height for every 12 m of viewing distance, the required text height would need to be  $325 \text{ m} \times 25 \text{ mm} / 12 \text{ m} = 675 \text{ mm}$  (26”) in size to be viewed at a distance of 325 m. As a sign of this size is not deemed practical, the alternative is to place an advance sign having smaller text at a location upstream of the exit or turn.

An advance sign having 405 mm (16”) text height has a viewing distance of:  
 $405 \text{ mm text} \times 12 \text{ m} / 25 \text{ mm text} = 194 \text{ m}$ , and should therefore be placed at least:  
 $325 \text{ m} - 194 \text{ m} = 131 \text{ m}$  upstream of the exit.

More detail can be found in TAC’s “*Supplementary Guide for Guide and Information Signage in Canada*”.

**Typical Sign Placement** – In most cases the guidelines set out in this “*Alberta Highway Guide and Information Sign Manual*” provide set distances for signs in typical situations, such as placing advance signs one kilometre in advance of an interchange exit. This practice of using typical sign layouts allows consistency and uniformity in sign placement, meets driver expectations, and exceeds the minimum distance requirements.

However, there are often situations where sign space on the roadside is restricted, or where close interchange spacing occurs. Under these constraints, the designer must

consider the basic requirements for sign placement as outlined in this section to meet driver needs.

#### A4.2.3.4 Older Drivers

Older drivers typically are defined as those 65 years and older. The older driver population has greatly increased over the past decades and will continue to increase in the future.

Compared to younger drivers, older drivers typically will have more difficulty seeing, reading and understanding guide signs. The following are some difficulties that older drivers may experience while on the road:

- Poor visual acuity.
- Under poor lighting, legibility losses with age are greater.
- On a partially reflectorized sign when the lighting is beyond the optimum legibility, loss is more prevalent in older drivers.
- If the brightness of signs is very high at night, the problem of irradiation for older drivers is increased.
- Distractions due to irrelevant input increases sign detection time.
- Messages that are unclear (i.e. some symbols) take older drivers longer to understand.
- With age an increase in decision making time occurs.
- Less efficient scanning behaviour and eye movements.
- Diminished visual field size.
- Difficulty in selective attention.
- Slower decision making.
- Minor memory deficits (i.e. forgetting where to turn or what was on the traffic sign).

Sign modifications that may help to improve older drivers' visibility and improve sign acuity include:

- Increasing illumination on roads.
- Providing high contrast between the background and message on a sign.
- Constructing brighter and larger signs.

In areas where a larger amount of the drivers are older drivers, longer detection, reading, reaction and maneuver time requirements should be considered. If symbols are to be used on signs they should be simple and tested for their comprehension and legibility before they are implemented. Limiting the number of signs on a roadway is also important because sign clutter may cause the driver to become overloaded. These improvements will not only help older drivers but all drivers.

In 2000, AASHTO's *Manual of Uniform Traffic Control Devices – Millennium Edition* modified the letter height from 15 m viewing distance for every 25 mm of text height to 12 m viewing distance for every 25 mm of text height. This change was initiated to account for the increasing number of older drivers traveling our highways. TAC's *Supplemental Guide for Guide and Information Signs* also adopted these guidelines for legibility distance requirements.

#### A4.2.3.5 Use of Human Factors

Typical signage layouts and designs are used throughout this manual, which exceed the minimum requirements when considering human factor requirements. Sign designers should use these typical signage layouts and designs whenever possible, for consistent sign design and placement.

However, when it is not possible to conform to these typical layouts, the sign designs and positioning should be determined using basic principles based on human factors, as outlined in this section.

The sign designer requires an understanding of human factors and the navigating limitations placed on various types of drivers in different driving environments. The design can then address signage needs through clear messages, appropriate letter height and proper sign placement to safely guide motorists to their destination.

**Table 2.1 – Reading Distance (m)**

No. of Words*	Speed (km/hr)							
	40	50	60	70	80	90	100	110
2	11	14	17	19	22	25	28	31
3	17	21	25	29	33	38	42	46
4	22	28	33	39	44	50	56	61
5	36	45	54	63	72	81	90	99
6	42	52	63	73	83	94	104	115
7	47	59	71	83	94	106	118	130
8	53	66	79	92	106	119	132	145
9	67	83	100	117	133	150	167	183
10	72	90	108	126	144	163	181	199
11	78	97	117	136	156	175	194	214
12	83	104	125	146	167	188	208	229
13	97	122	146	170	194	219	243	267
14	103	128	154	180	206	231	257	283
15	108	135	163	190	217	244	271	298

Notes:

- \* 1 symbol is equivalent to 2 words
- Reading Time: 0.5 s per critical word or 1.0 s per critical symbol
- Minimum Reading Time: 1 s
- Glance Time: 0.75 s after every group of 4 words or equivalent

**Table 2.2 – Reaction Distance (m)**

Complexity of Environment *	Speed (km/hr)							
	40	50	60	70	80	90	100	110
Low	11	14	17	19	22	25	28	31
Medium	14	17	21	24	28	31	35	38
High	28	35	42	49	56	63	69	76

Notes:

- \* Reaction Times: 1.0 s for low complexity, 1.25 s for medium complexity, 2.5 s for high complexity

**Table 2.3 – Lane Change Distance (m)**

Road Type *	Speed (km/hr)							
	40	50	60	70	80	90	100	110
Non-Freeway	62	78	93	109	124	140	156	171
Freeway	80	100	120	140	160	180	200	220

Notes:

- \* Gap Search Times: 1.8 s for non-freeway, 2.7 s for freeway.
- Lane Change Time: 3.8 s for non-freeway, 4.5 s for freeway to account for heavier truck traffic

Table 2.4 – Speed Reduction Distance\* (m)

Initial Speed (km/h)	Final Speed (km/h)										
	100	90	80	70	60	50	40	30	20	10	0
110	33	63	90	114	134	152	166	177	185	189	191
100		30	57	80	101	118	133	144	152	156	158
90			27	51	71	88	103	114	122	126	128
80				24	44	62	76	87	95	99	101
70					21	38	52	63	71	76	77
60						17	32	43	51	55	57
50							14	25	33	38	39
40								11	19	24	25

Notes:

- \* Deceleration speed: 8.8 km/(hr\*s)

Note: Tables 2.1 to 2.4 are from TAC's "Supplementary Guide for Guide and Information Signage in Canada".

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