

MANUAL

for setting speed limits

ON MUNICIPAL ROAD NETWORKS

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TABLE OF CONTENTS

IN APPRECIATION		7
EXPLANATORY NOTE CONCERNING MODIFICATIONS		8
INTRODUCTION		9
CHAPTER 1	LEGAL FRAMEWORK OF SPEED LIMITS AND EXCEPTIONS	11
1.1	SPEED LIMITS	11
1.2	SPEED REGULATION	12
1.3	APPROVAL OF REQUESTS FOR CHANGES TO SPEED LIMITS	13
CHAPTER 2	OBJECTIVE AND PRINCIPLES OF SETTING SPEED LIMITS	15
2.1	THE OBJECTIVE: TO IMPROVE THE SAFETY OF USERS OF PUBLIC ROADS	15
2.2	THE THREE MAJOR PRINCIPLES	15
2.2.1	CREDIBILITY OF SIGNAGE	15
2.2.2	HARMONISATION OF EXPECTED DRIVER BEHAVIOUR	16
2.2.3	INTERMUNICIPAL STANDARDISATION OF SPEED LIMITS	16
CHAPTER 3	ROLE AND IMPORTANCE OF SPEED LIMITS	17
3.1	USEFULNESS OF SPEED LIMITS	17
3.2	RELATIONSHIP BETWEEN SPEED AND ACCIDENTS	17
3.2.1	ACCIDENT FREQUENCY	18
3.2.2	ACCIDENT SEVERITY	18
3.3	RELATIONSHIP BETWEEN POSTED AND OPERATING SPEEDS	18

3.4	ELEMENTS CONSIDERED BY DRIVERS IN CHOOSING THEIR SPEED	19
3.4.1	ROADWAY CHARACTERISTICS	19
3.4.2	ROADSIDE CHARACTERISTICS	19
3.4.3	BEHAVIOUR OF OTHER DRIVERS AND OTHER TYPES OF USERS	20
3.4.4	POLICE PRESENCE	20
3.4.5	SIGNAGE	20
3.4.6	PERCEIVED LEEWAY	20

CHAPTER 4	METHOD OF SETTING SPEED LIMITS ON MUNICIPAL ROAD NETWORKS	23
4.1	BUILT-UP AREAS AND UNBUILT AREAS	23
4.2	SETTING SPEED LIMITS	23
4.3	NOTES ON THE USE OF TABLES A, B, C, D AND E	25
4.3.1	EXPLANATION OF CRITERIA IN TABLES A, B AND C	25
4.3.1.1	NUMBER OF TRAFFIC LANES	25
4.3.1.2	WIDTH OF THE PAVED SURFACE	25
4.3.1.2.1	PARKING IN BUILT-UP AREAS	26
4.3.1.3	LONGITUDINAL SIGHT DISTANCE (Lsd)	26
4.3.1.4	LENGTH OF THE HOMOGENEOUS ZONE (Lhz)	27
4.3.1.5	AVERAGE ANNUAL DAILY TRAFFIC FLOW (AADT)	27
4.3.1.6	ROADWAY HIERARCHY	27
4.3.1.7	NUMBER OF ACCESS POINTS PER KILOMETRE (Nap/km)	28
4.3.1.8	LATERAL SIGHT CLEARANCE (Lsc)	29
4.3.2	EXPLANATION OF CRITERIA IN TABLES D AND E	29
4.3.2.1	OPERATING SPEED	29
4.3.2.2	WIDTH OF THE PAVED SURFACE	29
4.3.2.3	ROADWAY HIERARCHY	30
4.3.2.4	NUMBER OF ACCESS POINTS PER KILOMETRE (Nap/km)	30
4.3.2.5	LATERAL SIGHT CLEARANCE (Lsc)	30
4.3.3	ADDITIONAL INFORMATION ON TABLES A, B, C, D AND E	30
4.3.3.1	INFLUENCE OF PEDESTRIANS	30
4.3.3.2	SPEED ZONE DIFFERENTIATION	31

4.3.3.3	ROLE AND FUNCTION OF TABLES A, B, C, D AND E	31
4.4	LENGTH OF SPEED ZONES	31
4.5	SPEED LIMIT SIGNAGE	32
4.5.1	END OF THE MODIFIED SPEED ZONE	32
4.6	SCHOOL ZONES AND PLAYGROUNDS	32
CHAPTER 5	MEASURES TO REDUCE EXCESSIVE SPEED	33
5.1	RE-EVALUATING STREET LAYOUT	33
5.2	SIGNAGE	34
5.2.1	ABUSIVE USE OF 'STOP' SIGNS	34
5.2.2	TRAFFIC SIGNALS	34
5.3	PUBLIC AWARENESS CAMPAIGNS	34
5.4	PLANNING AND CONTROL	34
5.4.1	REGIONAL DEVELOPMENT PLAN AND CITY MASTER PLAN	35
5.4.2	PLANNING BYLAWS	35
5.4.3	HIGHWAY SAFETY CODE	35
5.4.4	POLICE FORCES	36
5.5	ENFORCEMENT	36
CONCLUSION		37

TABLES AND ANNEXES 39

EXPLANATION OF CRITERIA IN TABLE A FOR ROADS WITH NO MORE THAN TWO TRAFFIC LANES	40
TABLE A	41
EXPLANATION OF CRITERIA IN TABLE B FOR ROADS WITH NO MORE THAN TWO TRAFFIC LANES	42
TABLE B	43
EXPLANATION OF CRITERIA IN TABLE C FOR ROADS WITH NO MORE THAN TWO TRAFFIC LANES	44
TABLE C	45
EXPLANATION OF CRITERIA IN TABLES D AND E FOR FOUR-LANE ROADS (CONTIGUOUS AND DIVIDED)	46
TABLE D	47
TABLE E	48
ANNEX I	
THE HIGHWAY SAFETY CODE: SELECTED PROVISIONS	49
ANNEX II	
SUMMARY TABLE; EVOLUTION OF THE NUMBER OF VICTIMS ACCORDING TO THE SEVERITY OF INJURIES AND THE TYPE OF USERS 1995-2000	51
ANNEX III	
THE FUNCTIONS OF STREETS IN BUILT-UP AREAS	52
ANNEX IV	
OTHER RECOGNIZED METHODS FOR THE MODIFICATION OF SPEED LIMITS ON MUNICIPAL ROAD NETWORKS	52
ANNEX V	
PROCEDURE FOR SETTING SPEED LIMITS ON THE QDOT'S HIGHWAY NETWORK	53
ANNEX VI	
SIMPLIFIED METHOD OF CALCULATING TRAFFIC FLOW	68
ANNEX VII	
SELECTED METRIC VALUES	68

IN APPRECIATION

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Our special thanks to Mr. Paul Mackey, director of the firm Safestreet Inc, who provided a large part of the expertise related to the municipal context.

EXPLANATORY NOTE CONCERNING CHANGES

The third edition of the *Manual for setting speed limits on municipal road networks* includes the following changes from the previous editions:

- the last amendments to the Highway Safety Code (R.S.Q, c. C-24.2) in particular sections 327, 328, 329, 626, 627, 628 et 628.1 discussed in Chapter 1 and Annex I;
- the addition of two tables for the setting of speed limits, Tables D and E, respectively for contiguous and divided four-lane roads and the explanation of the criteria listed in Tables D and E. The documents are presented in the section entitled Tables and Annexes;
- the insertion, in Chapter 4, of the explanation of the criteria listed in the tables for contiguous and divided four-lane roads, (D and E);
- the complete updating of the text, quotations and footnotes as well as tables and annexes.

What speed limit should be posted on this road section or in that district? On the one hand, elected municipal representatives are often asked by residents to lower speed limits for safety reasons and on the other hand, some motorists are requesting higher speed limits. Speed is a controversial subject. The *Manual for setting speed limits on municipal road networks* is born of the need for a tool to facilitate such decision-making. For its part, the ministère des Transports du Québec has also wanted to manage more systematically speeds on the highway network it maintains by publishing the *Modèle de détermination de limite de vitesse* in February 1994.

This Manual relates to one-, two-, or four-lane roads. In Québec, three-lane roads or roads with more than four lanes are considered special cases and are quite rare. They deserve complete and rigorous analysis beyond the scope of this Manual.

In 1993, the Québec Government transferred to municipalities the management and maintenance of local road networks that were up to then the responsibility of the ministère des Transports. The transfer revived the debate about setting speed limits on municipal networks and highlighted the need for a uniform procedure for changing speed limits on the municipal networks in municipalities as well as in the ministère des Transports.

On December 5, 1994, at a meeting of the Comité permanent de liaison transport-municipalités (ministère des Transports du Québec (MTQ), the Union des municipalités du Québec (UMQ), the Union des municipalités régionales de comté et des municipalités locales du Québec (UMRCQ), now the Fédération québécoise des municipalités (FQM), and the ministère des Affaires municipales (MAM), now the ministère des Affaires municipales et de la Métropole (MAMM), the participants agreed on the necessity of publishing a manual for setting speed limits on municipal road networks. The ministère des Transports du Québec established a task force on the procedure for setting speed limits on municipal road networks, consisting of members of the Union des municipalités du Québec, of the Association des directeurs de police et pompiers du Québec, now the Association des directeurs de police du Québec, of the Association des ingénieurs

municipaux du Québec, of a representative of the ministère des Affaires municipales, of experts from the ministère des Transports and of the Director of the firm Safestreet.

A preliminary version of the manual, applicable to public roads with no more than two traffic lanes was drafted in October 1995. The proposed procedure was the subject of consultations with the regional directorates of the ministère des Transports throughout 1996. Comments were collected and analysed and a second task force wrote the final version of the Manual. To date, there have been two editions of this Manual for roads with no more than two traffic lanes, one published in January 1998 and one in April 1999. The ministère des Transports established a third task force in 1998 to develop a procedure for setting speed limits on four-lane roads. The results of their work have been integrated into this Manual.

The adoption by municipalities and by the ministère des Transports of a uniform method for setting speed limits on municipal road networks will help simplify and speed up the processing of requests for changes.

The Manual is focused on five areas and is divided in as many chapters:

- the legal framework of speed limits and exceptions;
- the objective and principles of setting speed limits;
- the role and importance of speed limits;
- the method of setting speed limits on municipal networks;
- measures to reduce excessive speed.

1.1 SPEED LIMITS

Speed limits are set in section 328 of the Highway Safety Code (R.S.Q., c. C-24.2) :

“Except on roads where the opposite is indicated by signs or signals and without restricting the scope of section 327, no person may drive a road vehicle at a speed :

- 1° of less than 60 km/h or more than 100 km/h on autoroutes, unless a special permit authorising the use of an outsized vehicle requires that the vehicle be driven at a lower rate of speed;
- 2° in excess of 90 km/h on public highways surfaced with concrete, asphalt or a similar material;
- 3° in excess of 70 km/h on gravel highways;

- 4° in excess of 50 km/h in a built-up area, except on limited-access highways;
- 5° in excess of the maximum rate of speed authorised, according to the circumstances and the time of day, such as periods of school activity, as specified by the illuminated or non-illuminated, variable or non-variable message sign or signal that applies to that portion of the public highway.

Subparagraph 3 of the first paragraph applies on highways under the administration of or maintained by the Ministère des Ressources naturelles. The Minister, on the recommendation of the Minister of Natural Resources, may by ordinance increase the speed limit to 90 km/h on all or any part of such highways.

On access roads leading to a built-up area, subparagraph 4 of the first paragraph applies when the driver reaches the sign or signal indicating the 50 km/h speed limit.”



1.2 SPEED REGULATION

The Highway Safety Code contains a number of sections relating specifically to speed limits.

Sections 298, 299, 300, 327, 328, 329, 330, 331, 626, 627, 628 et 628.1 have been reproduced in Annex I.

Section 626 is of particular interest to municipal road networks and stipulates:

“A municipality may by by-law or, where the law so authorizes, by ordinance

- 1° determine classes of non-motorised vehicles that are subject to registration and determine the amount of the registration fee exigible according to such classes;
- 2° require every resident of its territory who owns a non-motorized vehicle subject to registration that he registers such vehicle;
- 3° provide for the issue of a certificate evidencing the registration of a non-motorised vehicle and require the holder to carry the certificate when using the vehicle;
- 4° **prescribe the minimum and maximum speed limits for road vehicles in its territory, which may be different for different locations except on public highways maintained by the Minister of Transport or on which the Minister of Transport has erected traffic signs in accordance with section 329;**
- 5° prohibit all vehicular traffic, with or without exception, on the roads it indicates and, where appropriate, for the period it fixes, provided that the prohibition is indicated by traffic signs or traffic officers;
- 6° locate taxi stands and stops for buses and minibuses;
- 7° establish safety zones for pedestrians, and require and regulate their use;
- 8° establish rules regulating the direction of traffic, the meeting of oncoming vehicles and the passing of road

vehicles on public highways maintained by it provided that such rules are compatible with the provisions of this Code relating to those matters;

- 9° establish rules regulating the movement of convoys on public highways maintained by it;
- 10° **regulate the speed of road vehicles in parks or cemeteries under its control or prohibit the use of road vehicles in the lanes of parks or cemeteries provided that the speed limit or prohibition is clearly indicated by means of signs conspicuously placed at the entrance to the park or cemetery and along the lanes;**
- 11° prohibit or restrict the movement of all or certain road vehicles in the vicinity of schools, facilities maintained by an institution operating a hospital centre or a residential and long-term care centre contemplated in the *Act respecting health services and social services* (R.S.Q., ch. S-4.2) and hospital centres contemplated in the *Act respecting health services and social services for Cree Native persons* (R.S.Q. ch. S-5);
- 12° take the necessary measures to prevent or relieve traffic congestion;
- 13° determine the annual amount it may require for the erection of commercial tourist information signs on a public highway maintained by it;
- 14° permit, on the conditions and for the periods of time it fixes, off-highway vehicles or certain types of off-highway vehicles to be operated on all or part of a public highway it maintains.”

Also of interest for municipal road networks is section 627 which provides as follows:

“Notwithstanding any contrary or inconsistent provision of a general law or special Act, every by-law, resolution or, where the law so authorizes, every ordinance passed or issued by a municipality relating to the means or systems of vehicular transport under the jurisdiction of the Commission des transports du Québec, vehicle construction, heavy vehicle traffic, **rate of speed**, the traffic of vehicles carrying dangerous substances, the operation of off-highway vehicles on a public highway and the use of vehicles elsewhere than on public highways must, in order to have effect, be approved by the Minister of Transport.

This section does not apply to transportation by taxi within the meaning of the *Act respecting transportation by taxi* (R.S.Q. ch. T-11.1)”

1.3 APPROVAL OF REQUESTS FOR CHANGES TO SPEED LIMITS

Following a reorganisation of the ministère des Transports in 1994, the directors of regional directorates are now mainly responsible for the examination of municipal requests for changes to speed limits and, if appropriate, for the approval of requests in the name of the Minister in accordance with the power delegated under the Regulation authorising a public servant to sign certain contracts or written documents of the ministère des Transports (Decree 701-94 dated May 11, 1994, amended by Decree 1524-96 and Decree 38-2002).

In addition, since February 2001, the Highway Safety Code authorises the Minister of Transport to sign an agreement with any municipality, under certain conditions, to exempt it from the obligation to obtain the minister’s permission to change speed limits on its road network.

The municipal road network is now affected *ad libitum* by section 628.1:

“The Minister may, for the period the Minister determines, enter into an agreement with any municipality to exempt it from the requirement to submit to the Minister, as the case may be, a bylaw, resolution or ordinance made pursuant to section 627 regarding speed. The agreement must specify which public highways are maintained by the municipality and establish the conditions and procedures for establishing a speed limit other than that provided for in this Code. In addition, the agreement must specify the conditions for the consultation of other municipalities concerned.

This section shall not operate to prohibit the Minister from disallowing any by-law, resolution or ordinance respecting speed, made under an agreement referred to in this section, if such by-law, resolution or ordinance may endanger the safety or impair the mobility of persons or goods. The Minister may remove, where expedient, any sign or signal the Minister considers inappropriate where the municipality does not remove it within the time indicated by the Minister.”

The Manual covers speed limits posted on white signs (prescriptive signs). These signs indicate the maximum speed at which a motorist can drive on a section of public road. The Manual does not deal with recommended speeds on curves (yellow signs) nor with signs prescribed for work zones (fluorescent orange signs).

2.1 THE OBJECTIVE: TO IMPROVE THE SAFETY OF USERS OF PUBLIC ROADS

In built-up areas, the primary objective of speed limits must be safety. It is important to choose the optimal speed, taking into account all users of public roads. A limit set too low can be as harmful to safety as a limit set too high.

The American approach to setting speed limits emphasises the motorist and vehicular traffic. Indeed the majority of the fatalities and of the injured in road accidents are vehicle drivers and passengers. In the past, this approach has had a substantial influence on Québec practice.

The preferred approach in Europe today also includes accident reduction objectives but pays particular attention to the living environment, to sharing the roadway and to the coexistence of various users of the road¹. This European approach is now gaining favour in Québec. Indeed, the aim of a speed limit should be the proper fit between driver behaviour and the environment they drive through. In driving through an inhabited area, be it city, town or hamlet, drivers must respect the local population and cannot drive in the same manner as in an uninhabited area. In a built-up area, some users (drivers, cyclists, pedestrians) move at speeds much lower than vehicle characteristics allow. In a built-up area, to optimise safety, it is necessary to try to reduce the differences in speed in a reasonable and differentiated way.

The preferred approach in Québec since 1994 has been that “a speed limit must represent, under certain conditions, a reasonable point of equilibrium between mobility and safety”.

Excessive speed may result in two types of insecurity: an objective insecurity measured by reports of accidents due to excessive speed and a subjective insecurity linked to speed as it is perceived by the population. Both types of insecurity are important.

2.2 THE THREE MAJOR PRINCIPLES

2.2.1 CREDIBILITY OF SIGNAGE

In setting a speed limit in a built-up area, the environment and driver behaviour must obviously be taken into account. Signage has to be realistic in order to rally the support of the majority of drivers. Signage that is incongruent with the layout of the public road will encourage drivers to ignore it.

In addition, signage not congruent and consequently not complied with undermines the credibility of signage in general. In fact, if drivers consider a speed limit to be inappropriate or unrealistic on one street, they are likely to doubt the validity of an identical yet fully justifiable speed limit in a neighbouring street. Therefore, the credibility of speed limit signage should be ensured everywhere.

2.2.2 HARMONISATION OF EXPECTED DRIVER BEHAVIOUR

Drivers must be able to understand quickly and clearly which behaviour is expected of them. The speed limit sign must provide them with the information they need. Indeed, drivers develop a set of automatic responses and behaviours for specific situations. This type of pre-programmed response allows them to drive with a high level of safety. If drivers had to think about all the aspects of a situation each time they faced a problem, the accident rate would

1. EUROPEAN CONFERENCE OF MINISTERS OF TRANSPORT, *Speed Moderation*, Paris, 1996, 86 pages.

2. MINISTÈRE DES TRANSPORTS DU QUÉBEC, *Modèle de détermination de limite de vitesse*, collection « Études et recherches en transports », February 1994, p. 9.

climb substantially. The phenomenon of automatic responses must be taken into account so that drivers are encouraged to adopt similar behaviours in similar road environments.

2.2.3 INTERMUNICIPAL STANDARDISATION OF SPEED LIMITS

It can be tempting for a municipality to apply its own policy and post speed limits different from those of its neighbours as proof of its concern for either mobility or safety. Municipalities must however remember that those who drive through their territory don't all live there. In addition, some roads have an intermunicipal function. Therefore similar municipal speed limit standards should be an aim. This does not necessarily imply having an identical speed limit everywhere. However, if a change in a speed limit is justified in one municipality, it is likely justifiable in a similar case in another municipality.

3.1 USEFULNESS OF SPEED LIMITS

Before setting speed limits, it is appropriate to question their usefulness. A work published in the United States indicates that the first objective in setting a speed limit is to determine a safe and reasonable limit for a section of road or a zone³.

“Speed regulations and speed limits are aimed at complementing driver judgement by setting speeds that are reasonable and appropriate given traffic, weather and driving conditions. Speed limits are imposed to encourage a relative reduction in speed and a better traffic flow, and to reduce accidents⁴.”

The ministère des Transports’ report *Modèle de détermination de limite de vitesse* describes a speed limit as follows:

“A speed limit must reflect, under certain conditions, a reasonable point of equilibrium between mobility and safety. A “point” because it is one value which is in fact a maximum that must be posted. “Equilibrium” refers to the management of the conflict between mobility and safety. “Reasonable” implies that the point of equilibrium is set on the basis of an analysis of several factors rather than left to the discretion of an individual.

...it is essential to follow certain conditions that could be considered ideal:

- a driver in full command of all his/her faculties;
- a vehicle in running order;
- good visibility;
- a dry surface;
- fluid traffic flow⁵.”

3.2 RELATIONSHIP BETWEEN SPEED AND ACCIDENTS

The Québec safety record has been improving for several years (see Annex II for full statistics from 1995 to 2000). Since 1973, deaths have gone down 65% while the number of driving permit holders and the number of vehicles have doubled. Several factors have contributed to the improvement, notably public awareness campaigns to change user behaviour, remedial work on some elements of the driving environment as well as the amendment of laws, regulations, policies and standards. These are the fruit of partnerships with police departments, municipalities, transport industry associations and the health network.

Despite the spectacular improvement of the last 25 years, trauma resulting from highway accidents still constitute a serious public health problem. Recent data show that 23% of trauma related fatalities are the result of a road accident. Such trauma remain the principal cause of death among young people below the age of 25. Thus the social costs related to road accidents are high. In fact, the total cost of such damages added up to more than 2 billion dollars in 1994.

Excessive speed is considered a priority issue in the *Politique de sécurité dans les transports 2001-2005 — Volet routier*, jointly developed by the ministère des Transports and the Société de l’assurance automobile du Québec in 2001:

“The main solutions being explored reflect the multidimensional character of the speed management problem. Legislative, engineering, enforcement and educational actions are required. It is also important to coordinate these actions: before considering enforcement measures, credibility of the actual speed limits must be ensured. To show they are necessary, enforcement measures must also be publicised⁶.”

3. Quoted in MINISTÈRE DES TRANSPORTS DU QUÉBEC, *Modèle de détermination de limite de vitesse*, collection “Études et recherches en transports”, February 1994, p. 9.

4. *Ibid.*, p. 9.

5. *Ibid.*, pp. 9 and 10.

3.2.1 ACCIDENT FREQUENCY

According to supplementary reports drawn up by police officers for accidents resulting in bodily injuries between 1995 and 1999, speed was a first or second accident cause in:

- 38.3 % of fatal accidents;
- 33.3 % of serious accidents;
- 29.2 % of minor accidents⁷.

Speed increases the distance covered during a driver's perception, reaction and braking time. In other words, the maneuvering time available to avoid the accident decreases. In addition, vehicle adherence to the road is reduced especially in turns.

Differences in vehicle speed can also lead to accidents. The faster vehicles can crash into slower vehicles or attempt dangerous passing manoeuvres. These phenomena can worsen when a speed limit is set at too low a level compared to the speed allowed by the geometric characteristics of the road.

For the individual driver, accidents are happily a relatively rare event. It is therefore difficult for him/her to measure the risk of accidents due to speed. Setting a speed limit must therefore be based on technically verified criteria.

3.2.2 ACCIDENT SEVERITY

Speed dramatically worsens accidents. The faster the speed of the vehicle in a collision, the higher the risk of injury. The worse the injuries, the higher the probability of death. Injuries and fatalities result from the transfer of energy at the time of the collision. And the energy of the shock increases as a function of the square of the speed.

The situation is particularly worrisome with respect to pedestrians and cyclists. From 5 to 10 % of pedestrians hit by a vehicle driving at 30 km/h at the time of impact will die; at 50 km/h, the rate is 45 %; it reaches 85 % at a speed of 65 km/h. The probability of death rises very rapidly (exponentially), even for relatively small differences in speed (ex. a 10km/h difference). By reducing driving speed, a slower motorist will if not avoid an accident at least reduce the severity of the injuries to the vulnerable user.

As is shown in a recent public awareness campaign of the Société de l'assurance automobile du Québec, someone driving at 50 km/h can stop over a distance of 31 m and avoid hitting a pedestrian, while someone driving at 60 km/h, in decelerating, at the same distance of 31 m, would still be moving at 44 km/h at the time of impact with the pedestrian.

3.3 RELATIONSHIP BETWEEN POSTED AND OPERATING SPEEDS

“Requesting a change in the speed limit, usually lowering the limit, is often the only solution that comes to people's mind. Such requests are often based on the mistaken notion that reducing the speed limit will in fact result in a reduction of accidents and vehicle speeds⁸.”

Nor should filling municipal coffers be the determining factor in setting speed limits; for example, a very low limit in an area where the road geometry sends the driver a very different message.

6. MINISTÈRE DES TRANSPORTS DU QUÉBEC and SOCIÉTÉ DE L'ASSURANCE AUTOMOBILE DU QUÉBEC, *Politique de sécurité dans les transports 2001-2005 — Volet routier*, Québec, Ministère des Transports, 2001, p. 80.

7. Special compilation by the Direction de la planification et de la statistique, SAAQ, 2001.

8. MINISTÈRE DES TRANSPORTS DU QUÉBEC, *op.cit.*, note 2, p. 10.

According to a study by the ministère des Transports in 1989⁹, speed limits were adhered to by:

- 23 % of drivers in built-up areas (50 km/h);
- 36 % of drivers on highways (90 km/h);
- 25 % of drivers on freeways (100 km/h).

The data show a significant difference between posted speeds and operating speeds. In built-up areas, speeds in excess of 50 km/h often lead municipalities to lower speed limits without further analysis despite the scarcity of positive results.

3.4 ELEMENTS CONSIDERED BY DRIVERS IN CHOOSING THEIR SPEED

All drivers adapt their behaviour, including their speed, according to their conscious or unconscious reading of the view before them and compare it with a series of preset images in their minds¹⁰.

3.4.1 ROADWAY CHARACTERISTICS

Roadway characteristics are the first elements that influence driver behaviour: the condition of the road, its width, homogeneity, etc. Drivers have an instinctive reaction to road elements. For example, when a road is straight and wide, “instinct takes over”, and drivers speed up.

When planning the construction of a road, officials set a design speed that takes into account the various physical characteristics of the roadway and the roadside within the right of way. This theoretical speed is the “highest continuous safe driving speed for a vehicle under the most favourable weather conditions when traffic flow is light¹¹”. It is not surprising therefore that motorists tend to drive near that speed nor that they have difficulty driving at a lower speed¹².

3.4.2 ROADSIDE CHARACTERISTICS

The roadside also plays a sizeable role in driving speed choices. When buildings are far from the public road and there is little vegetation, motorists are induced to drive faster. The phenomenon is linked to speed perception: when objects are far from the road, drivers are under the impression they are driving more slowly.

Drivers are more alert if there are more access points to adjacent buildings (driveways). They know that vehicles can appear suddenly, that possible conflicts might then arise and that other vehicles will slow down in the traffic lane in order to access it. On the same instinctive basis, the presence of sidewalks alerts drivers to the possible presence of pedestrians and their sometimes unexpected movements.

3.4.3 BEHAVIOUR OF OTHER DRIVERS AND OTHER TYPES OF USERS

Drivers will tend to adopt the same speed as preceding drivers, if it seems reasonable to them. In this way, driving is simplified since, among other things, avoidance maneuvers are no longer necessary. If drivers observe that preceding drivers are slowing down, they generally assume that there has been an incident and that they must also slow down. This type of ability follows from a long learning period and increases with driving experience.

Nevertheless, if drivers consider that the driving speed of preceding drivers is too slow and does not correspond with their reading of the road, they will try to overtake them and regain their perceived safe and comfortable cruising speed.

Drivers also register the presence of an important number of pedestrians and cyclists. They notice youngsters whose behaviour is often unpredictable; an informed driver generally drives more cautiously.

9. L. GUIMONT, *Relevés des vitesses pratiquées au Québec — Rapport de l'opération 1989*, collection « Études et recherches en transports », 1990, 47 pages.

10. MINISTÈRE DE L'ÉQUIPEMENT, DU LOGEMENT, DE L'AMÉNAGEMENT DU TERRITOIRE ET DES TRANSPORTS (MELATT) (France), *P'titagar — Une méthodologie pour l'étude des traverses des petites agglomérations en application de principes de lisibilité de la route*, Bagneux, France, SETRA, 1989, 104 p.

11. ASSOCIATION QUÉBÉCOISE DU TRANSPORT ET DES ROUTES INC. (AQTR), *Normes canadiennes de conception géométrique des routes*, Montréal, 1987, AQTR.

12. B.N. FILDES, and S.J. LEE, *The Speed Review*, Canberra, Australia, Federal Office of Road Safety, 1993, in two volumes.

3.4.4 POLICE PRESENCE

When roadway and roadside characteristics do not present any specific constraints with respect to speed choice, drivers will give greater weight to deterrence factors such as the risk of being stopped by a police officer, of being sentenced, of being heavily fined or even of losing their driving permit. The majority of drivers who are aware of the level of police surveillance will adapt their behaviour accordingly.

3.4.5 SIGNAGE

“The aim of road signage is to:

- make driving safer;
- facilitate traffic flow;
- identify or remind drivers of regulations prescribed by regulatory authorities, when necessary;
- point out dangers;...

It is not nor can it be an ironclad guarantee against the risks, dangers and inconveniences of traffic for road users¹³.”

Of course, signage can be useful but its efficiency should not be overestimated. Thus, while drivers read road geometry and react instinctively to it,

“the reading of signage is a very learned behaviour: reading and recognizing colours and symbols and their meaning, is required. This reading is complicated. It is obviously by working on the easiest reading modes (by working on roadway and roadside characteristics)... that drivers will be reached and their driving behaviour influenced naturally¹⁴.”

In a word, signage plays only a minor incentive role when road geometry encourages undesirable driver behaviours.

13. MINISTÈRE DES TRANSPORTS DU QUÉBEC, *Normes — Ouvrages routiers*, Tome V — Signalisation routière, Sainte-Foy, Québec, Les Publications du Québec, April 2001, Chap. 1, p. 3.

14. MINISTÈRE DE L'ÉQUIPEMENT, DU LOGEMENT, DE L'AMÉNAGEMENT DU TERRITOIRE ET DES TRANSPORTS (MELATT) (France), *op. cit.* note 10, 104 pages.

3.4.6 PERCEIVED LEEWAY

In his study on speed¹⁵, Jean-Luc Marret mentions that “in Québec as elsewhere, drivers for the most part consider the acceptable speed not to be the posted speed but rather the one that will not be penalised by police officers.” When circumstances permit, these individuals drive at a speed equal to the sum of the posted speed and the presumed police leeway. It is very interesting to examine how well speed limits are respected when taking into account a margin above the speed limits.

During the last ten years, the Société de l'assurance automobile du Québec has monitored speed in different locations in Québec and the results¹⁶ show that:

- in most areas with 50 km/h speed limits, offenders represented some 20 to 50% of drivers; however, there were never more than 15 % driving above 60 km/h;
- in three areas where the speed limit was set at 70 km/h, 30 to 60 % of drivers exceeded the limit, yet less than 10% drove above 85 km/h;
- where the limit was 90 km/h, approximately 50% of drivers were driving above the limit, yet less than 20 % exceeded 105 km/h.

15. J.-L., MARRET, *En vitesse...ou en sécurité ? Éléments de compréhension et pistes de réflexion*, Québec, Société de l'assurance automobile du Québec, 1994, p. 53.

16. Special compilation by the Direction de la planification et de la statistique, SAAQ, April 2001.

The method described in Part 4.3 outlines general rules for setting speed limits on municipal road networks.

4.1 BUILT-UP AREAS AND UNBUILT AREAS

The ministère des Transports uses the term ‘built-up area’ to describe a “group of houses forming a unit and considered independently of administrative boundaries”.

Because needs differ, the decision-making criteria used vary according to whether the public road is in a built-up area or an unbuilt area. A municipality may encompass one or several built-up and unbuilt areas.

In this Manual, a built-up area is defined as a group of buildings that accommodate at least 50 persons and where not one building is further than 200 m from the other. The area is characterised by a population density equal to or above 400 inhabitants/km². It has 20 or more housing units per 300 m of road in the case of a linear development. Such linear developments are most often located at village entrances or exits, at crossroads or in resort areas¹⁷.

In built-up areas, potential conflicts are numerous. They occur among different types of users: car drivers, truck drivers, pedestrians, cyclists, public transit users. There are also conflicts between traffic and access needs, for example, during parking manoeuvres. In built-up areas, such conflicts occur because the public road fills many needs (see Annex III).



Road in built-up area

In unbuilt areas, distances are greater and conflicts among public road users are less frequent. The ‘mobility’ aspect is therefore of greater importance and thus posted speed limits are usually higher in this type of environment.



Road in unbuilt area

4.2 SETTING SPEED LIMITS

The speed limits for each road class are set out in section 328 of the Highway Safety Code.

In the majority of cases, these speed limits are well suited to the situation.

By virtue of the provisions of subsection 4 of section 626 of the Code, a municipality may vary section 328 speed limits within its territory, provided it sets the maximum or minimum speed for road vehicles by bylaw or ordinance, except on public roads where the Minister of Transport is responsible for maintenance or has placed signage in accordance with section 329. To come into force, the bylaw or ordinance passed by the municipality must be approved by the Minister of Transport, in accordance with section 627. The Minister’s power has been delegated, among others, to the regional directors of the ministère by the Regulation authorising a public servant to sign certain contracts or written documents of the ministère des Transports.

17. MINISTÈRE DES TRANSPORTS DU QUÉBEC, *Normes — Ouvrages routiers, Tome I : « Conception routière »*, Sainte-Foy, Québec, Les Publications du Québec, 1994, Chap. 2, p. 43.

Section 628.1 of the Code also allows the Minister of Transport to come to an agreement with any municipality to exempt it from the obligation of submitting for approval, as the case may be, a bylaw, resolution or ordinance with respect to speed made in accordance with section 627. The agreement must specify the public roads that are the responsibility of the municipality and set out the terms and conditions to be met for the setting of a speed limit that differs from the one set out in the Code. In addition, the agreement must specify the conditions relating to consultation of other municipalities concerned.

To facilitate the drafting and the processing of requests for changes in speed limits on municipal road networks, this Manual offers a simplified method, based on various criteria: the number of traffic lanes, the width of the paved surface, the longitudinal sight distance, the length of the homogeneous zone, the average annual daily traffic flow, the roadway hierarchy, the number of access points per kilometre, the lateral sight clearance, and in certain cases, the operating speed.

When a municipality wants to vary its speed limits from the limits provided by the Highway Safety Code for roads with no more than two traffic lanes, it examines the schedule that corresponds to the environment being driven through: Table A for a reduction to 30 km/h in a built-up area, Table B for an increase to 70 km/h in a built-up area and Table C for an unbuilt area. In the case of Table C, if more than one speed limit meet the criteria, the one that meets the most criteria will be favoured. As for Tables D and E, they have been developed specifically for four-lane roadways, whether contiguous or divided, located in built-up areas or in unbuilt areas. A contiguous four-lane roadway is made up of four lanes that run side by side, the two traffic directions separated only by horizontal signage (markings). A divided four-lane roadway includes a median island, with or without curbs, that separates the two traffic lanes in one direction from the two traffic lanes in the other direction.

The aim of the method described herein is to optimise the work of municipal officials when they are considering the modification of a speed limit as provided by the Highway Safety Code. The municipality may use another recognised method (see Annex IV), if that method seems more practical.

This Manual covers a limited number of speed limits taking into account those stipulated in the Highway Safety Code. It is desirable to restrict the number of speed limits and to set them in 20-km/h increments so as to help users better differentiate among them and adapt their driving behaviour accordingly.

The arrangement of Table A is based on the usual characteristics of public municipal roads in Québec. In certain exceptional cases, the road configuration is such that a single criterion is sufficiently restrictive to justify a 30-km/h speed limit; for example, on a street with a succession of pronounced horizontal curves, motorists cannot drive safely at a higher speed. In such cases, checking operating speeds is advisable.

In several built-up areas, speed limits of 30 km/h have been set, notably on streets where there are schools or parks, on residential streets or even on collector or arterial streets. A maximum speed of 30 km/h is very low; if set on overly long sections of road, it lengthens trip time considerably and leads to driver impatience. Too many 30-km/h limits leads to desensitisation and increases the number of infractions.

Consequently, a change in the speed limit should not force motorists to drive more than 500 m at 30 km/h before reaching a public road where the speed is 50 km/h or more. For example, on a hierarchical network, it is possible to have a 30-km/h speed limit for local streets and a 50-km/h limit for a collector street.

4.3 NOTES ON THE USE OF TABLES A, B, C, D AND E

As explained in Part 4.1, the situation in built-up and unbuilt areas is very different and the method herein makes a clear distinction between the two environments. The method is centred on the influence of public road geometry on driver behaviour. Scoring keys and associated responses in Tables A, B, C, D and E were set according to the importance of the criterion supposed to make compliance of the speed limit being considered legitimate: if the public road meets enough favourable scoring criteria, motorists will be induced to drive at the expected speed.

4.3.1 EXPLANATION OF THE CRITERIA IN TABLES A, B AND C

4.3.1.1 Number of traffic lanes

The number of traffic lanes corresponds to the total number of lanes on the public road.

Experience shows that a road with more than one traffic lane in each direction induces motorists to drive at higher speeds. Moreover, an increase in the number of traffic lanes is usually linked to the need to allow for considerable traffic.

4.3.1.2 Width of the paved surface

The width of the paved surface includes all parts of the public road, including the shoulders, covered with asphalt, concrete or paving stones. The width considered is that of the traffic lanes and of the parking lanes (generally located between the curbs or the sidewalks). The paved surface includes bicycle lanes if they have not been separated from the traffic lanes by a continuous and permanent barrier curb.

Where a road is wide, drivers detect no constraints with respect to driving speed. On the other hand, a narrow road will induce drivers to reduce their speed. This effect is amplified when widths are very narrow; the scoring schedule has been set accordingly.



One-way road with one traffic lane



One-way road with two traffic lanes



Two-way road, with two traffic lanes



Here, the width of the paved surface includes the two traffic lanes, a parking lane and a bicycle lane.

In unbuilt areas, the width of the traffic lanes and of paved shoulders, if any, is included; the scoring schedule distinguishes between less than 6.5 m and 6.5 m or more.

4.3.1.2.1 Parking in built-up areas

Parking is a complex element in the setting of speed limits. It is in fact a dynamic phenomenon; demand can easily vary from one extreme to another within a few hours: for example, a single event can fill all the parking spaces available on the street and empty them once the event is over. It is not unusual to have important fluctuations in the use of parking spaces. Driver behaviour will be affected; but how do we take this into account in setting speed limits that are by definition permanent?

This Manual approaches the issue by using parking regulations on the one hand and by evaluating true usage of space on the other hand (see Part 4.3.1.8).

For instance, in built-up areas, we may be talking about a public road where parking is allowed on



Road with parking spaces commonly in use

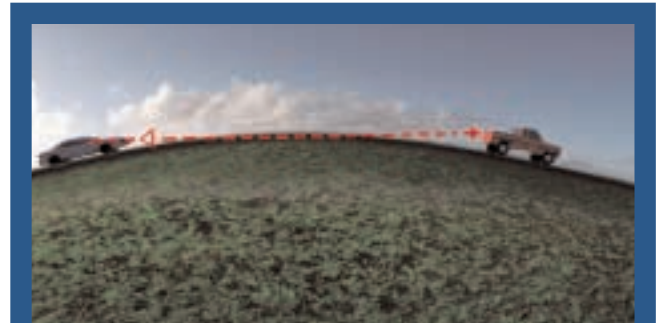
at least one side; in such a case, the scoring key distinguishes widths of less than 8.5 m from those equal to or above. This width was chosen on the premise that situations are rare where two vehicles are parked opposite each other across traffic lanes. If

in built-up areas, parking is prohibited, the scoring is set at less than 6 m or 6 m and more.

The municipality should use the **with parking** scoring key where parking spaces are commonly used and where there is real friction or constraint. When parking spaces are little used or not used, the stated width of 8.5 m is too high and the **without parking** scoring key should be the reference.

On the other hand, where real usage of parking spaces (usually with a width of 2.0 to 2.5 m per parking aisle) interferes with traffic flow to the point that the space for traffic is reduced to less than 3 m per traffic lane, an additional criterion of Table A has been met (that is six of nine criteria must be met rather than six of eight).

4.3.1.3 Longitudinal sight distance (Lsd)



Lsd in vertical curve situation



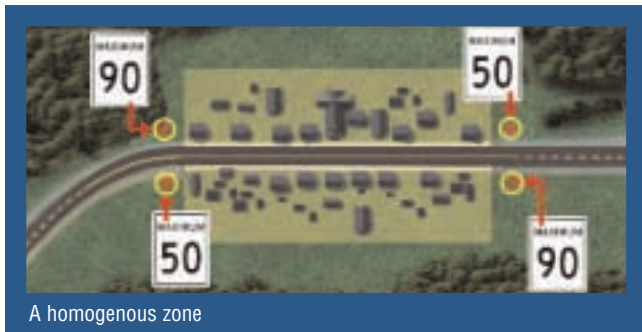
Lsd in horizontal curve situation

Longitudinal sight distance (Lsd) is the distance motorists can see a vehicle moving ahead of theirs on the road without any visual interference. The distance varies according to vertical or horizontal curves.

If motorists can see far to the horizon on the road, they will tend to accelerate. In the opposite case, they will tend to decelerate. As the effect is progressive, four categories have been set: less than 100 m, from 100 to 150 m, from 150 m to 200 m and more than 200 m.

Note: If the distance varies too much, the shortest one is used.

4.3.1.4 Length of the homogeneous zone (Lhz)



The length of the homogeneous zone (Lhz) is the length of the zone under consideration with similar physical properties: number of traffic lanes, width of the roadway, traffic flow, access point density, lateral sight clearance, presence of sidewalks or ditches, etc.

4.3.1.5 Average annual daily traffic flow (AADT)



The average annual daily traffic flow (AADT) is the usual daily traffic flow on a public road (see Annex VI).

Traffic flow is an indication of the importance of the road in ensuring the flow of goods and people on the territory of a municipality. It is normally tied to the functional classification of roads; since this Manual deals with both built-up and unbuilt areas, where traffic flows are not of the same magnitude, there are two scoring keys. In some environments, traffic flows may vary considerably over the course of the

year; in such circumstances, the analysis may cover either a given period of the year or the whole year.

4.3.1.6 Roadway hierarchy



In this Manual, the roadway hierarchy is defined as follows:

- The unique function of the **local street** in built-up or unbuilt areas is to provide access to roadside properties. There is practically no through traffic;
- The **municipal collector road** is used for accessing adjacent properties and for through traffic. In Tables A, B and C, the term 'collector' includes public roads usually called 'local distribution roads' and 'semi-collector roads';
- **Arterial roads** are earmarked for through traffic over a longer distance, even if they are also used to serve adjacent properties.

4.3.1.7 Number of access points per kilometre (Nap/km)

Categories of access points per kilometre (Nap/km) are as follows: residential access points serving five units or less; commercial access points, including residential access points serving six units or more; industrial and institutional access points; main access points to farms with buildings; and intersections of streets and alleys (for each intersection approach). To take into account differences in traffic flow through these access points, and therefore the influence of the traffic flow on speed and safety requirements, access points have been weighted.

Note:

The weighted values are as follows:

- A - Residential access points serving 5 units or less = 1.0
- B - Residential access points serving 6 units or more = 1.5
- B - Commercial, industrial and institutional access points = 1.5
- B - Main access point for farm with buildings = 1.5
- B - Street or alley intersections (for each intersection approach) = 1.5

The number of access points per kilometre is weighted as follows:

$$\text{Access points/km} = \frac{\text{Residential access points (5 or less)} + 1.5 (\text{Residential access points (6 and more)} + \text{commercial} + \text{industrial} + \text{institutional} + \text{farms} + \text{intersections (for each intersection approach)})}{\text{Length in kilometres}}$$

$$\text{Nap/km} = \frac{A + 1.5 B}{\text{Length in km}}$$

Where: A= total number of category A access points
B= total number of category B access points



Residential access point



Commercial access point



Institutional access point



Main access point for farm with buildings



Street intersection

The number of access points is an approximation of the intensity of roadside activities. In a dense sector, there will be more access points and therefore more entry and exit manoeuvres on the public road and more intersections where vehicles could suddenly appear. Motorists must then better control their speed. The number of access points used can vary over the year, particularly in resort areas; in such cases, the analysis takes into consideration all access points, even the seasonal ones.

4.3.1.8 Lateral sight clearance (Lsc)



In the case of roads with no more than two traffic lanes, lateral sight clearance includes the width of the paved surface from the centre line of the roadway, the usually grass covered boulevard or planting strip between the roadway and the sidewalk if there is one, the sidewalk, the balance of the right of way and the building setback.

Note:

- This space can be reduced if boulevard or setback vegetation is too dense and hinders visibility.
- The distance can also be reduced to take into account vehicles parked along the traffic lanes, where usage is high.

In addition to being influenced in their choice of speed by the width of the road, drivers react to the visual space on the sides of the road¹⁸.

4.3.2 EXPLANATION OF CRITERIA IN TABLES D AND E



Tables D and E were devised specifically for the analysis of roads with four contiguous or divided traffic lanes. The two tables apply to built-up and unbuilt areas.

A contiguous four-lane road is made up of four traffic lanes that run side by side where the two directions of traffic are separated merely by horizontal signage (markings).

A divided four-lane road includes a median island, with or without curbs, that separates the two traffic lanes in one direction from the two traffic lanes in the other direction.



4.3.2.1 Operating speed

In this Manual, “operating speed” is understood as the real functioning speed when weather conditions and the condition of the driving surface are good. The 85th percentile speed is a statistical indicator linked to operating speed; it corresponds to the value below which 85% of vehicles drive and it is calculated on the speed distribution.

4.3.2.2 Width of the paved surface

In built-up areas, parking may be allowed on the public road at least on one side. The width considered is the width of traffic lanes and of parking lanes, if there are any (usually between the curbs or the sidewalks). The paved surface includes bicycle lanes if they are not separated from the traffic lanes by a continuous and permanent barrier curb.

In unbuilt areas, the width considered is

18. M. BRAULT, *Enquête vitesse 1993-1994 : une analyse par la régression pour caractériser la relation entre la vitesse et certaines variables environnementales et de circulation*, Proceedings of the Canadian Multidisciplinary Road Safety Conference IX, Montréal, Laboratoire sur la sécurité des transports, Centre de recherche sur les transports, Université de Montréal, May 1995, pp. 433-443.

the width of traffic lanes and paved shoulders, if there are any.

4.3.2.3 Roadway hierarchy

The **local street**'s unique function is to provide access to roadside properties. There is practically no through traffic.

The **municipal collector road** is used both for accessing adjacent properties and for through traffic. The expression 'municipal collector road' includes public roads generally called 'local distribution roads' and 'semi-collector roads'.

Arterial roads are meant to handle through traffic over a longer distance, even if they are also used to serve adjacent properties.

The **regional** network links smaller (generally 5,000 to 25,000 inhabitants) urban areas among themselves and with major urban areas.

The **provincial** network consists mostly of interregional roads and roads that link major urban areas (generally more than 25,000 inhabitants).

The scoring schedule includes under **other**:

- **arterial roads** on municipal road networks;
- **collector roads** as defined by the functional classification on the ministère des Transports du Québec's road network;
- **regional roads** as defined by the functional classification on the ministère des Transports du Québec's road network;
- **provincial highways** as defined by the functional classification on the ministère des Transports du Québec's road network.

4.3.2.4 Number of access points per kilometre (Nap/km)

The number of access points (Nap/km) is equivalent to the weighted number of access points per kilometre. The weighted values associated with the different categories of access points are described in Part 4.3.1.7.

4.3.2.5 Lateral sight clearance (Lsc)

In the case of four-lane roads, lateral sight clearance (Lsc) includes the width of the paved surface from the roadway edge line, the usually grass covered boulevard or planting strip between the roadway and the sidewalk if there is one, the sidewalk, the balance of the right of way and the building setback.

Note:

- This space can be reduced if boulevard or setback vegetation is too dense and hinders visibility.
- The distance can also be reduced to take into account vehicles parked on the roadside where usage is high.
- The continuous white edge line marks the edge of the roadway as well as the proximity of curbs.

4.3.3 ADDITIONAL INFORMATION ON TABLES A, B, C, D AND E

4.3.3.1 Influence of pedestrians

Pedestrian presence was not integrated into Tables A to E, because the number of pedestrians varies considerably over time. Speed surveys must be done at times of normal pedestrian flow and not at peak times when an exceptional pedestrian presence might skew results.

An important pedestrian presence can greatly influence driver behaviour. If it is shown that many pedestrians are present throughout the day, the analyst should take this aspect into consideration, even if it is not included in Tables A to E.

4.3.3.2 Speed zone differentiation

40-km/h and 60-km/h speed limits are not included in Tables A to E, not because they might not be appropriate but rather because it is preferable to differentiate speed zones in 20-km/h increments to allow for better identification by motorists of the type of zone, urban, suburban or rural, that they are driving through, and thus to promote uniform operating speeds. The 30-, 50- and 70-km/h reference speed limits listed in the tables are congruent with the section 328 provisions of the Highway Safety Code (R.S.Q., c. C-24.2) that designate 50-, 70- and 90-km/h speed limits for the whole Québec road network. There is an exception, an 80 km/h speed limit in Table C, for unbuilt areas. This situation can occur in rural areas, in locations where the geometry of the road is not sufficiently safe to permit a 90-km/h speed limit, nor constraining enough to induce motorists to respect a maximum speed limit of 70 km/h.

4.3.3.3 Role and function of Tables A, B, C, D and E

Tables A, B, C, D and E constitute a simplified method for setting speed limits, based on the influence of road geometry on driver behaviour. The criteria they contain are set according to their importance in promoting compliance with the speed limit being considered.

The tables have been designed to guide municipal managers and allow them to measure, both easily and technically, the feasibility of making a change to speed limits that is in harmony with the road environment. In the case of an analysis where the total of the criteria listed in the table would not justify the change being considered in a speed limit, it can be concluded that certain elements of the environment would not induce motorists to comply with the changed speed limit.

In the event it was nevertheless necessary to change the speed limit in such a location, it would be appropriate to analyse the possibility of instituting safe compliance-inducing measures to lead motorists into following the new speed limit.

4.4 LENGTH OF SPEED ZONES

The total length of a public road is an indicator of the potential distance that a motorist will have to cover.

If a road is very short, a low speed does not increase the length of a trip appreciably and motorists generally are not tempted to speed up. On the other hand, if the road is long, an increase in speed can reduce the length of a trip significantly.

It is best to avoid posting several different speed limits along a public road so driver attention will not be monopolised by too many different messages. Long sections at moderate speeds should also be avoided. The minimum and maximum length of zones for which a modified speed limit is set along a public road should ideally be as follows:

Speed Limit	Minimum Length	Maximum Length
30 km/h	300 m	500 m
50 km/h	500 m	1,000 m
70 km/h	1,000 m	1,500 m

If the total length of public road is shorter than the minimum lengths above, the speed limit may nonetheless be posted.

4.5 SPEED LIMIT SIGNAGE

4.5.1 END OF THE MODIFIED SPEED ZONE

When a municipality changes a speed limit on a public road, it should inform motorists by installing a tab sign D-40-P-2 'New Speed' under sign P-70 'Speed Limit'¹⁹ during a period of one month. In this way, motorists will be able to adapt their behaviour and avoid being surprised by police checks.

By consulting Tables A, B, C, D and E, it is possible to set a speed limit on all or part of a public road. When the speed limit is changed on only a section of a public road, the municipality must install a sign at the end of the section indicating a return to the speed prescribed by the Highway Safety Code, that is 50 km/h in a built-up area or 90 km/h in an unbuilt area.

Generally, when a speed limit is changed on one public road, it is not necessary to install a sign indicating the speed prescribed by the Code on contiguous roads. The Code provides that the prescribed speed applies.

However, contiguous roads sometimes present geometric characteristics comparable to those of the road where the speed limit has been changed. To avoid confusion, it is necessary to post the return to the speed prescribed by the Highway Safety Code.

4.6 SCHOOL ZONES AND PLAYGROUNDS

The ministère des Transports generally favours reducing the speed limit in zones where there are schools and playgrounds on local roads. As the aim is user safety, particularly that of children, it is important to provide various incentives to ensure the efficiency of such a measure:



- the presence of school crossing guards;
- clear signage;
- appropriate design; etc.

According to the new provisions of the Highway Safety Code, a school zone sign can only be used by itself where the speed limit is already set at 50 km/h. It reminds motorists of the presence of a school and of the possible movement of schoolchildren. In each case where the prior speed limit differs from 50 km/h, the school zone sign must be accompanied by a speed limit sign specifying the periods of school use during which the modified speed limit applies in the school zone.



19. MINISTÈRE DES TRANSPORTS DU QUÉBEC, *Normes – Ouvrages routiers*, Tome V : « Signalisation routière », Sainte-Foy, Québec, Les Publications du Québec, avril 2001, chap. 3, p.7.

A municipality may be grappling with a problem of excessive operating speed; sometimes, an analysis of the situation and the use of the method herein do not allow for the choice of a speed limit different from the existing one. In that case, the municipality should consider other means of controlling speed.

A simple change in speed limits does not change behaviour. There is no magic traffic sign. Road design measures are more likely to result in safe operating speeds compatible with the environment.



Two examples of traffic-calming designs

5.1 RE-EVALUATING STREET LAYOUT

There must be congruence between the posted speed and the reading motorists make of the road. Indeed, roadway and roadside design play a determining role in the safety of road users, notably with respect to actual operating speeds. Motorists adapt their behaviour to their reading of the road, be it conscious or unconscious. It is the physical characteristics of the roadway (the width of the lanes, the condition of the surface, etc.) and of the roadside (the number of access points, the lateral sight clearances, etc.) that have such influence. Roadway enhancements such as lighting, traffic signals, signage, etc. are also important.

There are several kinds of traffic-calming designs. To make the best choice, a diagnosis of the roadway and roadside characteristics is necessary. The designs chosen should modify these characteristics. They must also be developed according to the desired speed, the roadway hierarchy and the number of traffic lanes. Some constraining designs adapted to a 30-km/h speed limit on a local street should not be implemented on an arterial road where speed is limited to 50 or 70 km/h.

Generally, the following are suggested types of design:

- reducing the width of the traffic lanes: markings, curbs;
- sharing the road with a bias towards pedestrians and cyclists: sidewalks, curb extensions, bicycle facilities;
- shortening sight distances: aligned plantings or realigning existing plantings to be nearer, vertical elements, street furniture, landscaping;
- doglegs (lateral shifts).

On local streets, appropriate measures include:

- chicanes, for example by alternating parking on both sides of the street;
- speed humps;
- pedestrian crosswalk improvements: raised crosswalks, specific crosswalk markings.

On municipal collector or arterial streets, appropriate measures include:

- roundabouts;
- pedestrian crosswalk improvements: pedestrian islands, pedestrian signals, specific crosswalk markings, raised intersections, etc.;
- gateways to alert drivers that they are entering a neighbourhood or an built-up area, along a through traffic route;
- synchronising traffic signals.

5.2 SIGNAGE

5.2.1 ABUSIVE USE OF "STOP" SIGNS

A 'Stop' sign (P-10)²⁰ indicates an obligation to stop at an intersection. The sign must be installed at an intersection and cannot be used for the sole purpose of slowing down traffic.

The Highway Safety Code (R.S.Q., c.C-24.2) reads as follows in section 368:

“The driver of a road vehicle or any person riding a bicycle must stop his vehicle when facing a stop sign, and comply with section 360.”

And in section 360:

“Unless otherwise directed by a sign or signal, when facing a flashing red light, the driver of a road vehicle or any person riding a bicycle must stop his vehicle and yield the right of way to a vehicle approaching on another roadway that is entering the intersection, or is so close that it constitutes a hazard.”

The 'Stop' sign was developed to establish priority at intersections and to improve safety where there were visibility problems. Unfortunately, its use for other purposes leads to diminished compliance with the mandatory stop.

5.2.2 TRAFFIC SIGNALS

On major roadways, it is possible to synchronise traffic signals to a speed slightly below the speed limit. Regular users of the road can then drive with more regularity and avoid a series of stops and starts. However, experience shows that several motorists do not understand the principles of the system and that they accelerate and brake repeatedly.

5.3 PUBLIC AWARENESS CAMPAIGNS

Municipalities can broadcast messages on road safety and on speed via different media: municipal bulletin, local weekly, electronic media, posters, etc. The Société de l'assurance automobile du Québec recognises the significance of speed as a cause of accidents. For this reason, it ran awareness campaigns in 1993 and 1995 on the theme: 'Speed kills'. Municipalities were invited to participate in the campaigns by installing posters at the entrance to urban areas.

From 1999 to 2001, the SAAQ ran operations under the name 'Lead Foot' in municipalities of the Mauricie and Estrie regions in conjunction with municipal police forces and the Sûreté du Québec

5.4 PLANNING AND CONTROL

Municipalities can contribute to the reduction of excessive speed and associated problems by good land use planning. The attention given to roads and to the location of facilities within the right of way can greatly contribute to the creation of a safe and pleasant environment.

20. MINISTÈRE DES TRANSPORTS DU QUÉBEC, *Normes — Ouvrages routiers Tome V « Signalisation routière »*, Sainte-Foy, Québec, les Publications du Québec, April 2001, Chap. 2, p. 5.

5.4.1 REGIONAL DEVELOPMENT PLAN AND CITY MASTER PLAN

The Act respecting land use planning and development requires regional county municipalities to describe and plan the organisation of land transportation and to indicate projected major improvements and new infrastructure in their development plan.

Several elements of the regional development plan (including the complementary document) and the municipal land use plan can contribute to better speed management, for example:

- spatial organisation design, overall vision and major land use designations can influence the number of trips and their length by all modes of transport and therefore can influence exposure to risk;
- fixing urban boundaries and minimal subdivision and land use rules can determine the density of access points to the road: driveways and intersections;
- the description of the nature of the infrastructure, land transport equipment and the major types of roadways can help define the roadway hierarchy;
- infrastructure and equipment improvements can make driving speed compatible with the environment that users are driving through;
- the nature of new transportation infrastructure or equipment, the proposed layout of major roads, the approximate place where they will be located as well as the water and sewer systems and public utilities, can all influence the street grid.

5.4.2 PLANNING BYLAWS

Several provisions of the subdivision and zoning bylaws can contribute to better management of speed, for example:

- lot dimensions, number of access points per lot, type of usage, density of land use and spacing of buildings can influence the number of access points per kilometre;
- the municipality can set the location of access to lots;
- building setbacks and the planting or felling of trees will impact lateral sight clearance;
- the way streets must be laid out and the distance to be maintained between them will determine the street grid;
- the width of the street itself can be controlled.

Since roadway and roadside characteristics influence driver behaviour, these municipal powers are particularly important.

5.4.3 HIGHWAY SAFETY CODE

Through the powers with respect to signage granted them by the Highway Safety Code, municipalities have “truly substantive powers where traffic control is concerned²¹”. They are responsible for the installation of stop signs and traffic signals.

In addition, since February 2001, the Highway Safety Code authorises the Minister of Transport to sign an agreement with any municipality to exempt it, under certain conditions, from the obligation to obtain the Minister’s permission to change speed limits on its road network.

21. J. HARDY, *Les pouvoirs municipaux en matière de sécurité routière*, Municipalité, February-March 1995, pp. 28-31.

5.4.4 POLICE FORCES

The Police Act specifies those municipalities that can have their own police force, while the Regulation on basic police service sets out the level of service they must offer. In municipalities without municipal police forces, it is the Sûreté du Québec that offers the police service in accordance with agreements between the regional county municipality that the municipality is part of and the Minister of Public Security of Québec. These agreements set out the services offered, the terms of payment and the conditions related to enforcement of municipal bylaws by the Sûreté du Québec.

5.5 ENFORCEMENT

When it cannot change the characteristics of a public road, a municipality can ask its police force to re-evaluate enforcement methods. Obviously, there could be an increase in the hours of surveillance but it is also possible to target more appropriate surveillance periods or to have a more efficient prosecution of offenders. One of the strategies that can be considered is the reduction of the control margin, that is the margin made up of the technical margin of machine error and of the margin of police discretion, to have it as close as possible to the margin normally considered by the courts.

A publication of the ministère des Transports du Québec, the *Manual for setting speed limits on municipal road networks* is the fruit of ample research and analysis of driver behaviour as well as of the expectations of citizens and municipal elected representatives with respect to the road networks under municipal responsibility.

Each municipality's road network includes several types of roads. This diversity and the particularities of each type of road, especially in highly urbanised areas, make the analysis required to set speed limits complicated. It is impossible to define and include all these particularities in a user-friendly manual.

The present set of technical data is not exhaustive; moreover, it has not been developed to include all the particularities of municipal road networks. It is first and foremost a thought provoking tool for municipal officials to assist them in making enlightened decisions while ensuring uniformity in the setting of speed limits from one municipality to the other.

TABLES AND ANNEXES

EXPLANATION OF CRITERIA IN TABLE A FOR ROADS WITH NO MORE THAN TWO TRAFFIC LANES

⇒ NUMBER OF TRAFFIC LANES

The number of traffic lanes is the total number of traffic lanes on the public roadway.

⇒ WIDTH OF THE PAVED SURFACE

In a built-up area, parking may be allowed on at least one side of a public roadway. If, in a built-up area, parking is prohibited, the scoring key is set at less than 6m or 6m and above. The width considered is the width of traffic lanes and of parking lanes (usually between the curbs or the sidewalks).

NOTE: • In a built-up area, the paved surface includes bicycle lanes if they are not separated from the traffic lanes by a continuous curb.

- In a built-up area, the 8.5 m value under the **with parking** scoring key implies that two vehicles are seldom parked opposite one another on each side of the traffic lanes.

The **with parking** scoring key should be applied when the parking spaces are commonly used and where there is friction or constraint.

Where parking spaces are little used or not used at all, the 8.5 m width under the scoring key is too wide and the **without parking** scoring key should be applied.

- When true usage of parking spaces (whose width is generally between 2.0 and 2.5 m per parking lane) interferes with traffic to the point that space for traffic is reduced to less than 3.0 m per traffic lane, an additional criterion is met (that is six of nine rather than six of eight criteria should be met).

⇒ LONGITUDINAL SIGHT DISTANCE (Lsd)

Longitudinal sight distance (Lsd) is the distance motorists can see a vehicle moving ahead of theirs on the road without any visual interference. The distance varies according to vertical or horizontal curves.

NOTE: If this distance varies too much, the shortest is used.

⇒ LENGTH OF THE HOMOGENEOUS ZONE (Lhz)

The length of the homogeneous zone is equal to the length of the zone under consideration with similar physical properties: number of traffic lanes, width of the roadway, traffic flow, access point density, lateral sight clearance, presence of sidewalks or ditches, etc.

In a built-up area, motorists should not have to drive more than 500m at 30 km/h to reach a public road where the posted speed is 50 km/h or above.

⇒ AVERAGE ANNUAL DAILY TRAFFIC FLOW (AADT)

The average annual daily traffic flow (AADT) is the usual daily traffic flow on a public roadway (see Annex VI for calculation methods).

⇒ ROADWAY HIERARCHY

The unique function of a **local street** in built-up or unbuilt areas is to provide access to roadside properties. There is practically no through traffic.

A **municipal collector road** is used for accessing adjacent properties and for through traffic. In Table A, the term 'collector road' includes public roads usually called 'local distribution roads' and 'semi-collector roads'.

Arterial roads are earmarked for through traffic over a longer distance, even if they are also used to serve adjacent properties.

⇒ NUMBER OF ACCESS POINTS PER KILOMETER (Nap/km)

Categories of access points per kilometre (Nap/km) are as follows: residential access points serving five units or less; commercial access points, including residential access points serving six units or more; industrial and institutional access points; main access points to farms with buildings; and intersections of streets and alleys (for each intersection approach).

NOTE: Weighting is as follows:

A - residential access points serving five units or less	= 1.0 ;
B - residential access points serving six units or more	= 1.5 ;
B - commercial, industrial and institutional access points	= 1.5 ;
B - main access points to farms with buildings	= 1.5 ;
B - intersections of streets and alleys (for each intersection approach)	= 1.5 .

Weighting of access points per kilometre is as follows:

$$\text{Nap/km} = \frac{A + 1.5 B}{\text{Length in km}} \quad \text{where: } A = \text{total number of cat. A access points} \\ B = \text{total number of cat. B access points}$$

⇒ LATERAL SIGHT CLEARANCE (Lsc)

Lateral sight clearance includes the width of the paved surface from the centre line of the roadway, the usually grass covered boulevard or planting strip between the roadway and the sidewalk if there is one, the sidewalk, the balance of the right of way and the building setback.

NOTE: • If boulevard or setback vegetation is dense and high, it should be taken into account as a hindrance to visibility.

- High usage lateral parking should also be taken into account as a hindrance to visibility.

⇒ TOTAL

The total is equal to the sum of positive (yes) responses for each possible exception.

NOTE: For each possible exception, a minimum of six criteria or more should be met.

N.B. The arrangement of Table A is based on the usual characteristics of public municipal roads in built-up areas of Québec. In certain exceptional cases, the road configuration is such that a single criterion is sufficiently restrictive to justify a 30-km/h speed limit; for example, on a street with a succession of pronounced horizontal curves, motorists cannot drive safely at a higher speed. In such cases, checking operating speeds is advisable.

Changes to 30-km/h speed limits on roadways with more than two traffic lanes should be banned.

When reducing a speed limit to 30 km/h where less than six criteria are met, the municipality should install suitable design measures to induce motorists to comply with the new limit.

TABLE A FOR ROADS WITH NO MORE THAN TWO TRAFFIC LANES

Exception to section 328 of the HSC,
recommended when six or more criteria are met

IN BUILT-UP AREAS

SPEED ACCORDING TO THE PROVISIONS OF SECTION 328 OF THE HSC		(50 km/h)
EXCEPTION AT		30 km/h ⁽¹⁾
CRITERIA	SCORING KEYS	RESPONSES
Number of traffic lanes	1 (one way)	no
	2 (one way)	no
	2 (two way)	yes
Width of the paved surface	without parking < 6 m	yes
	without parking ≥ 6 m	no
	with parking < 8.5 m	yes ⁽²⁾
	with parking ≥ 8.5 m	no ⁽²⁾
Longitudinal sight distance (Lsd)	Lsd < 100 m	yes
	Lsd ≥ 100 m	no
Length of the homogeneous zone (Lhz)	Lhz < 500 m (only if this is the total length of the road)	yes
	Lhz ≥ 500 m	no
Traffic flow (AADT)	AADT < 2,000	yes
	AADT ≥ 2,000	no
Roadway Hierarchy	local street	yes
	municipal collector road	no
	arterial road	no
Access points/km (Nap/km)	Na/km < 20	no
	Na/km ≥ 20	yes
Lateral sight clearance (Lsc) (from centre line)	Lsc < 5 m	yes
	Lsc ≥ 5 m	no
TOTAL		

- (1) A motorist should not have to drive more than 500 m at 30 km/h to reach a public roadway with a posted speed of 50 km/h or above. To reduce a speed limit to 30 km/h where fewer than six criteria are met, a municipality should install suitable design measures to induce motorists to comply with the new limit.
- (2) When true usage of parking spaces (generally with a width of 2.0 to 2.5 m per parking lane) interferes with traffic to the point of restricting traffic to a width of less than 3.0 m per lane, an additional criterion is met (that is six of nine criteria, rather than six of eight, should be met).

EXPLANATION OF CRITERIA IN TABLE B FOR ROADS WITH NO MORE THAN TWO TRAFFIC LANES

➔ NUMBER OF TRAFFIC LANES

The number of traffic lanes is the total number of traffic lanes on the public roadway.

➔ WIDTH OF THE PAVED SURFACE

In a built-up area, parking may be allowed on at least one side of a public roadway. If in a built-up area parking is prohibited, the scoring key is set at 6 m or 6 m and above. The width considered is the width of traffic lanes and of parking lanes (usually between the curbs or the sidewalks).

NOTE:

- In a built-up area, the paved surface includes bicycle lanes if they are not separated from the traffic lanes by a continuous curb.
- In a built-up area, the 8.5 m value under the **with parking** scoring key implies that two vehicles are seldom parked opposite one another on each side of the traffic lanes.

The **with parking** scoring key should be applied when parking spaces are commonly used and where there is friction or constraint.

When parking spaces are little used or not used at all, the 8.5 m width under the scoring key is too wide, and the **without parking** scoring key should be applied.

➔ LONGITUDINAL SIGHT DISTANCE (Lsd)

The longitudinal sight distance (Lsd) is the distance motorists can see a vehicle moving ahead of theirs on the road without any visual interference. The distance varies according to vertical or horizontal curves.

NOTE: If the distance varies too much, the shortest distance is used.

➔ LENGTH OF THE HOMOGENEOUS ZONE (Lhz)

The length of the homogeneous zone (Lhz) is equal to the length of the zone under consideration with similar physical properties: number of traffic lanes, width of the roadway, traffic flow, access point density, lateral sight clearance, presence of sidewalks or ditches, etc.

➔ AVERAGE ANNUAL DAILY TRAFFIC FLOW (AADT)

The average annual daily flow (AADT) is the usual daily traffic flow on a public roadway (see Annex VI for calculation methods).

➔ ROADWAY HIERARCHY

The unique function of the **local street** in built-up areas is to provide access to roadside properties. There is practically no through traffic.

The **municipal collector road** is used for accessing adjacent properties and for through traffic. In Table B, the term 'collector road' includes public roads usually called 'local distribution roads' and 'semi-collector roads'.

Arterial roads are earmarked for through traffic over a longer distance, even if they are also used to serve adjacent properties.

➔ NUMBER OF ACCESS POINTS PER KILOMETRE (Nap/km)

Categories of access points per kilometre (Nap/km) are as follows: residential access points serving five units or less; commercial access points, including residential access points serving six units or more; industrial and institutional access points; main access points to farms with buildings; and intersections of streets and alleys (for each intersection approach).

NOTE: Weighting is as follows:

A - residential access points serving five units or less	= 1.0 ;
B - residential access points serving six units or more	= 1.5 ;
B - commercial, industrial and institutional access points	= 1.5 ;
B - main access points to farms with buildings	= 1.5 ;
B - intersections of streets and alleys (for each intersection approach)	= 1.5 .

Weighting of access points per kilometre is as follows:

$$\text{Nap/km} = \frac{A + 1.5 B}{\text{Length in km}} \quad \text{where: } A = \text{total number of cat. A access points} \\ B = \text{total number of cat. B access points}$$

➔ LATERAL SIGHT CLEARANCE (Lsc)

Lateral sight clearance (Lsc) includes the width of the paved surface from the centre line of the roadway, the usually grass covered boulevard or planting strip between the roadway and the sidewalk if there is one, the sidewalk, the balance of the right of way and the building setback.

NOTE:

- If boulevard or setback vegetation is dense and high, it should be taken into account as a hindrance to visibility.
- High usage lateral parking should also be taken into account as a hindrance to visibility.

➔ TOTAL

The total is equal to the sum of positive (yes) responses for each possible exception.

NOTE: For each possible exception, a minimum of six criteria or more should be met.

N.B. To increase a speed limit to 70 km/h, a municipality should do a speed study and meet a minimum of six criteria.

TABLE B
FOR ROADS WITH NO MORE THAN TWO TRAFFIC LANES

Exception to section 328 of the HSC,
recommended if six or more criteria are met

IN BUILT-UP AREAS

SPEED ACCORDING TO PROVISIONS OF SECTION 328 OF THE HSC		(50 km/h)	
EXCEPTION AT		70 km/h⁽¹⁾	
CRITERIA		SCORING KEYS	
CRITERIA		RESPONSES	
Number of traffic lanes	1	(one way)	yes
	2	(one way)	yes
	2	(two way)	yes
Width of paved surface	without parking	< 6 m ≥ 6 m	no yes
	with parking	< 8.5 m ≥ 8.5 m	no yes
Longitudinal sight distance (Lsd)	Lsd	< 150 m	no
	Lsd	≥ 150 m	yes
Length of the homogeneous zone (Lhz)	Lhz	< 1 Km (only if it is the total length of the road)	no
	Lhz	≥ 1 Km	yes
Traffic flow (AADT)	AADT	< 10,000	no
	AADT	≥ 10,000	yes
Roadway hierarchy	local street		no
	municipal collector road		no
	arterial road		yes
Number of access points/km (Nap/km)	Nap/km	< 40	yes
	Nap/km	≥ 40	no
Laterally sight clearance (Lsc) (from centre line)	Dvl	< 5 m	no
	Dvl	≥ 5 m	yes
TOTAL			

(1) To increase the speed limit to 70 km/h, a municipality should do a speed study and meet a minimum of six criteria.

EXPLANATION OF CRITERIA IN TABLE C FOR ROADS WITH NO MORE THAN TWO TRAFFIC LANES

➔ NUMBER OF TRAFFIC LANES

The number of traffic lanes is the total number of traffic lanes on the public roadway.

➔ WIDTH OF THE PAVED SURFACE

In unbuilt areas, the width of the paved surface includes the width of the traffic lanes and the paved shoulders, if any.

➔ LONGITUDINAL SIGHT DISTANCE (Lsd)

The longitudinal sight distance (Lsd) is the distance motorists can see a vehicle moving ahead of theirs on the road without any visual interference. The distance varies according to vertical or horizontal curves.

NOTE: If the distance varies too much, the shortest distance is used..

➔ LENGTH OF THE HOMOGENOUS ZONE (Lzh)

The length of the homogeneous zone (Lhz) is equal to the length of the zone under consideration with similar physical properties: number of traffic lanes, width of the roadway, traffic flow, access point density, lateral sight clearance, presence of sidewalks or ditches, etc..

➔ AVERAGE ANNUAL DAILY TRAFFIC FLOW (AADT)

The average annual daily flow (AADT) is the usual daily traffic flow on a public roadway (see Annex VI for calculation methods).

➔ ROADWAY HIERARCHY

The unique function of a **local street** in unbuilt areas is to provide access to roadside properties. There is practically no through traffic.

A **municipal collector road** is used for accessing adjacent properties and for through traffic. In Table C, the term 'collector road' includes public roads usually called 'local distribution roads' and 'semi-collector roads'.

Arterial roads are earmarked for through traffic over a longer distance, even if they are also used to serve adjacent properties.

➔ NUMBER OF ACCESS POINTS PER KILOMETRE (Nap/km)

Categories of access points per kilometre (Nap/km) are as follows: residential access points serving five units or less; commercial access points, including residential access points serving six units or more; industrial and institutional access points; main access points to farms with buildings; and intersections of streets and alleys (for each intersection approach).

NOTE: Weighting is as follows:

A - residential access points serving five units or less	= 1.0 ;
B - residential access points serving six units or more	= 1.5 ;
B - commercial, industrial and institutional access points	= 1.5 ;
B - main access points to farms with buildings	= 1.5 ;
B - intersections of streets and alleys (for each intersection approach)	= 1.5 .

Weighting of access points per kilometre is as follows:

$$\text{Nap/km} = \frac{A + 1.5 B}{\text{Length in km}} \quad \text{where: } A = \text{total number of cat. A access points} \\ B = \text{total number of cat. B access points}$$

➔ LATERAL SIGHT CLEARANCE (Lsc)

Lateral sight clearance (Lsc) includes the width of the paved surface from the centre line of the roadway, the usually grass covered boulevard or planting strip between the roadway and the sidewalk if there is one, the sidewalk, the balance of the right of way and the building setback.

NOTE: • If boulevard or setback vegetation is dense and high, it should be taken into account as a hindrance to visibility.

- High usage lateral parking should also be taken into account as a hindrance to visibility.

➔ TOTAL

The total is equal to the sum of positive (yes) responses for each possible exception.

NOTE: • For each possible exception, a minimum of six criteria or more should be met.

- In unbuilt areas, the site analysis should be done on the basis of the three possible exceptions (50, 70 et 80 km/h limits) and the one meeting the greatest number of criteria should be chosen.

N.B. Table C is not meant to justify by itself an increase in speed limits in unbuilt areas. **One should be cautious in increasing speed limits in unbuilt areas when a minimum of six criteria justify doing so. The road geometry (curve radii, intersections, etc.) should be checked to see whether an increase is suitable and the signage should be changed accordingly.**

TABLE C FOR ROADS WITH NO MORE THAN TWO TRAFFIC LANES

Exception to section 328 of the HSC,
recommended if six criteria or more are met

IN UNBUILT AREAS

SPEED LIMIT ACCORDING TO PROVISIONS OF SECTION 328 OF THE HSC		(90 km/h paved roads)		
EXCEPTIONS AT		50 km/h	70 km/h	80 km/h
CRITERIA	SCORING KEYS	RESPONSES		
Number of traffic lanes	2 (two-way road)	yes	yes	yes
Width of paved surface	< 6.5 m ≥ 6.5 m	yes no	yes yes	no yes
Longitudinal sight distance (Lsd)	Lsd < 100 m 100 m ≤ Lsd < 150 m 150 m ≤ Lsd < 200 m Lsd ≥ 200 m	S S ⁽¹⁾ yes no no	S S ⁽¹⁾ S S ⁽¹⁾ yes yes	S S ⁽¹⁾ S S ⁽¹⁾ no yes
Length of the homogeneous zone (Lzh)	Lhz < 500 m (only if it is the total length of the road) 500 m ≤ Lhz < 1 km Lhz ≥ 1 km	yes yes	no yes	no no Use QDOT procedure ⁽²⁾
Traffic flow (AADT)	AADT < 2,000 2 000 ≤ AADT < 10,000 AADT ≥ 10,000	yes yes no	yes yes yes	yes yes yes
Roadway hierarchy	local street municipal collector road arterial road	yes yes no	yes yes yes	no yes yes
Number of access points/km (Nap/km)	Nap/km < 20 20 ≤ Nap/km < 40 Nap/km ≥ 40	no yes S S ⁽¹⁾	no yes S S ⁽¹⁾	yes yes S S ⁽¹⁾
Lateral sight clearance (Lsc) (from centre line)	Lsc < 5 m Lsc ≥ 5 m	yes no	yes yes	no yes
TOTAL				

(1) In unbuilt areas, such a situation should logically not occur. A safety study (SS) should be done in such a case.

The safety study should be performed according to accepted practice, and, depending on the nature of the problem, should cover an analysis of the prescriptive elements of road geometry, road environment, traffic flow, driver behaviour, etc.

(2) The criteria listed in Table C do not apply to roads 1 kilometre long or longer in unbuilt areas. Instead of Table C, the *Procedure for setting speed limits on the QDOT's highway network* in Annex V, that includes relevant factors for the analysis of this type of road and is designed to provide an appropriate solution, should be used.

EXPLANATION OF THE CRITERIA IN TABLES D AND E FOR FOUR-LANE ROADS (contiguous and divided)

A contiguous four-lane road is made up of four traffic lanes that run side by side, the two traffic directions separated only by horizontal signage (markings). A divided four-lane road includes a median island, with or without curbs, that separates the two traffic lanes in one direction from the two traffic lanes in the other direction. Using Tables D and E implies analysing the two speed limits listed for built-up areas, that is 50 km/h and 70 km/h and the three listed speed limits for unbuilt areas: 50 km/h, 70 km/h and 90 km/h.

➤ OPERATING SPEED

Operating speed is the true speed practised given road geometry, weather conditions, the state of the driving surface, the physical condition of the driver and the operating condition of the vehicle. The method to be followed to determine the 85th percentile user operating speed is explained under point 3 of Annex V.

NOTE: After the speed survey, if the 85th percentile speed is 15 km/h or more above the speed determined by the analysis, a safety study should be done. The safety study should be performed according to accepted practice and according to the nature of the problem, include an analysis of prescriptive elements of road geometry, including sight distances, roadway environment, traffic flow, user behaviour, etc.

➤ WIDTH OF THE PAVED SURFACE

In built-up areas, the paved surface can be a public road with parking allowed at least on one side. The width considered is the width of traffic lanes and of parking lanes, if there are any (usually between curbs or sidewalks).

NOTE: In built-up areas, the paved surface includes bicycle lanes if they are not separated from the traffic lanes by a permanent continuous curb. The **with parking** scoring key is to be used where parking spaces are commonly used and there is friction or constraint. If parking spaces are little used or not used at all, the **without parking** scoring key is to be used. In unbuilt areas, the width of traffic lanes and paved shoulders, if any, are considered.

➤ ROADWAY HIERARCHY

The unique function of a **local street** is to provide access to roadside properties. There is practically no through traffic.

A **municipal collector road** is used for accessing adjacent properties and for through traffic. In Tables D and E, the term 'collector road' includes public roads usually called 'local distribution roads' and 'semi-collector roads'.

Arterial roads are earmarked for through traffic over a longer distance, even if they are also used to serve adjacent properties.

The **regional network** links smaller (generally 5,000 to 25,000 inhabitants) urban areas among themselves and with major urban areas.

The **provincial network** consists mostly of interregional roads and roads that link major urban areas (generally more than 25,000 inhabitants).

The scoring schedule includes under **Other:**

- arterial roads on municipal road networks;
- collector roads as defined by the functional classification on the ministère des Transports du Québec's road network;
- regional roads as defined by the functional classification on the ministère des Transports du Québec's road network;
- provincial highways as defined by the functional classification on the ministère des Transports du Québec's road network.

➤ NUMBER OF ACCESS POINTS PER KILOMETRE (Nap/km)

Categories of access points per kilometre (Nap/km) are as follows:

A - Residential access points serving 5 units or less	= 1.0 ;
B - Residential access points serving 6 units or more	= 1.5 ;
B - Commercial, industrial and institutional access points	= 1.5 ;
B - Main access points to farms with buildings	= 1.5 ;
B - Intersections of streets and alleys (for each intersection approach)	= 1.5 .

Weighting of access points per kilometre is as follows:

$$\text{Nap/km} = \frac{A + 1.5 B}{\text{Length in km}} \quad \text{where: } A = \text{total number of cat. A access points} \\ B = \text{total number of cat. B access points}$$

➤ LATERAL SIGHT CLEARANCE (Lsc)

Lateral sight clearance (Lsc) includes the width of the paved surface from the roadway edge line, the usually grass covered boulevard or planting strip between the roadway and the sidewalk if there is one, the sidewalk, the balance of the right of way and the building setback.

NOTE: High dense vegetation in the planting strip or the setback rising approximately 1.0 metre or more above the roadway should be taken into account as a hindrance to visibility. High usage lateral parking should also be taken into account as a hindrance to visibility.

➤ TOTAL

The speed limit must represent, under certain conditions, a reasonable point of equilibrium between mobility and safety. The total represents the sum of positive answers (**yes**) for each of the speed columns in the Table. The one where the highest number of criteria are met should be chosen.

NOTE: For each possible speed limit exception, a minimum of four of five criteria should be met. If the analysis does not result in at least four of five criteria being met, a more elaborate study should be performed before posting the new speed limit to determine the exact nature of the problem and the relevant corrective action. When the analysis results in two equal totals with at least four of five criteria being met, the preferred choice is the speed that most closely approximates the 85th percentile result under the **Operating Speed** scoring key.

N.B. *Changes to 30-km/h speed limits on roads with four lanes or more should be banned. Tables D and E are not designed to justify by themselves an increase in speed limits in unbuilt areas. One should be cautious in increasing speed limits in unbuilt areas when a minimum of four criteria justify doing so. The road geometry (curve radii, intersections, etc.) should be checked to see whether an increase is suitable and the signage should be changed accordingly. Land use, existing buildings and adjacent activities are implicit in the criteria **Number of access points per kilometre**, **Lateral sight clearance** and **Roadway hierarchy**. Vehicle movement is recognized as free flowing given that it takes place and is monitored according to levels of service A or B²². In the case of roads highly congested over the whole day, for example from five to seven hours continuously, readings can be performed during a period of the day when the level of service is closest to level B.*

TABLE D
TABLE FOR SETTING SPEED LIMITS
FOR CONTIGUOUS FOUR-LANE ROADS (4) ONLY
Exception to section 328 of the HSC,
recommended if four or more criteria are met

SPEED LIMIT ACCORDING TO PROVISIONS OF SECTION 328 OF THE HSC		Built-up areas (50 km/h)		Unbuilt areas (90 km/h)			
		50 km/h	70 km/h	50 km/h	70 km/h	90 km/h	
EXCEPTIONS TO		SCORING KEYS					
CRITERIA							
Operating Speed	$C_{85} < 65$ km/h	yes	no	yes	no	no	
	$65 \leq C_{85} < 85$	no	yes	no	yes	no	
	$C_{85} \geq 85$ km/h	no	yes	no	no	yes	
Width of the paved surface ⁽¹⁾	Between curbs and/or sidewalks	without parking ≤ 15.0 m	yes	no	yes	yes	no
		without parking > 15.0 m	no	yes	no	no	yes
		with parking ≤ 19.0 m	yes	no	N/A	N/A	N/A
	Without curbs or sidewalks	with parking > 19.0 m	no	yes	N/A	N/A	N/A
		without paved shoulders ≤ 14.0 m	N/A	N/A	yes	yes	no
		without paved shoulders > 14.0 m	N/A	N/A	no	no	yes
Roadway hierarchy	with paved shoulders ≤ 16.0 m	yes	no	yes	yes	no	
	with paved shoulders > 16.0 m	no	yes	no	no	yes	
	local street	yes	no	yes	yes	no	
Number of access points/km ⁽²⁾ (Nap/km)	Municipal collector road	yes	yes	no	yes	yes	
	other	yes	yes	no	no	yes	
	$20 \leq$ Nap/km < 20	N/A	N/A	no	yes	yes	
Lateral sight clearance ⁽³⁾ (Lsc) (from the edge line)	Nap/km < 40	yes	yes	no	yes	no	
	Nap/km ≥ 40	yes	no	N/A	N/A	N/A	
	Lsc ≤ 5.0 m	yes	no	yes	no	no	
	Lsc > 5.0 m	no	yes	no	yes	yes	
TOTAL							

- (1) The values under the **Width of the paved surface** scoring key apply to the two traffic directions taken in their entirety.
- (2) The criterion **Number of access points/km** takes into account all access points noted on both sides of the roadway.
- (3) High dense boulevard or setback vegetation rising at least 1 m above the roadway surface should be taken into account as a hindrance to visibility and so too should high usage lateral parking.
- N/A Theoretically, such a situation should not occur.

TABLE E
TABLE FOR SETTING SPEED LIMITS
FOR DIVIDED FOUR-LANE ROADS ONLY

Exception to section 328 of the HSC,
recommended if four or more criteria are met

SPEED LIMIT ACCORDING TO PROVISIONS OF SECTION 328 OF THE HSC		Built-up areas (50 km/h)		Unbuilt areas (90 km/h)			
		50 km/h	70 km/h	50 km/h	70 km/h	90 km/h	
EXCEPTIONS TO							
CRITERIA	SCORING KEYS						
Operating Speed	$C_{85} < 65$ km/h	yes	no	yes	no	no	
	$65 \leq C_{85} < 85$	no	yes	no	yes	no	
	$C_{85} \geq 85$ km/h	no	yes	no	no	yes	
Width of paved surface ⁽¹⁾	Between curbs and/or sidewalks	without parking ≤ 8.0 m	yes	no	yes	yes	no
		without parking > 8.0 m	no	yes	no	no	yes
		with parking ≤ 10.0 m	yes	no	N/A	N/A	N/A
	without curbs or sidewalks	with parking > 10.0 m	no	yes	N/A	N/A	N/A
		without paved shoulders ≤ 7.0 m	N/A	N/A	yes	yes	no
		without paved shoulders > 7.0 m	N/A	N/A	no	no	yes
Roadway hierarchy	without paved shoulders ≤ 9.0 m	yes	no	yes	yes	no	
	without paved shoulders > 9.0 m	no	yes	no	no	yes	
	local street	yes	no	yes	yes	no	
Number of Access points/km ⁽²⁾ (Nap/km)	municipal collector road	yes	yes	no	yes	yes	
	other	yes	yes	no	no	yes	
	$20 \leq$ Nap/km < 20	N/A	N/A	no	yes	yes	
Lateral sight clearance ⁽³⁾ (Lsc) (from the edge line)	Nap/km < 40	yes	yes	no	yes	no	
	Nap/km ≥ 40	yes	no	N/A	N/A	N/A	
	Lsc ≤ 5.0 m	yes	no	yes	no	no	
	Lsc > 5.0 m	no	yes	no	yes	yes	
TOTAL							

- (1) The values under the **Width of the paved surface** scoring key apply to each traffic direction treated separately. The most restrictive value of the two sides of the road should be applied for purposes of the Table.
- (2) The criterion **Number of access points/km** takes into account access points on the right side of the road as well as openings on the left side on the median island.
- (3) High dense boulevard or setback vegetation rising at least 1 m above the roadway surface should be taken into account as a hindrance to visibility and so too should high usage lateral parking. The most restrictive average lateral sight clearance between the two sides of the roadway should be applied.
- N/A Theoretically such a situation should not occur.

Sections 298, 299, 300, 327, 328, 329, 330, 331, 626, 627, 628 and 628.1 of the Highway Safety Code (R.S.Q., Chap. C-24.2)

⇒ SECTION 298

“Every municipality to which paragraph 4 of section 328 applies must erect a sign or signal on every public highway under its maintenance that leads to a built-up area to indicate that the speed limit is set at 50 km/h.”

⇒ SECTION 299

“Every municipality that establishes, by by-law, a speed limit other than the rate of speed provided for in section 328 shall indicate that rate of speed by means of signs or signals. If the municipality fails to do so, section 328 applies.

No person may travel at a rate of speed exceeding the limit indicated on any signs erected under this section.”

⇒ SECTION 300

“In the cases described in section 329, the decision of the Minister of Transport prevails over any provision of a by-law passed by a municipality.

The municipality shall, on a notice from the Minister and within the time he indicates, remove the signs or signals erected by it. If it fails to do so within the allotted time, the Minister may remove the signs or signals at the expense of the municipality.”

⇒ SECTION 327

“Any rate of speed or any action that can endanger human life and safety or property is prohibited.

In addition to public highways, this section applies on highways under the administration of or maintained by the Ministère des Ressources naturelles, on private roads open to public vehicular traffic, as well as on land occupied by shopping centres and other land where public traffic is allowed.”

⇒ SECTION 328

“Except on roads where the opposite is indicated by signs or signals and without restricting the scope of section 327, no person may drive a road vehicle at a speed

- 1° of less than 60 km/h or more than 100 km/h on autoroutes, unless a special permit authorizing the use of an outsized vehicle requires that the vehicle be driven at a lower rate of speed;
- 2° in excess of 90 km/h on public highways surfaced with concrete, asphalt or a similar material;
- 3° in excess of 70 km/h on gravel highways;
- 4° in excess of 50 km/h in a built-up area, except on limited-access highways;
- 5° in excess of the maximum rate of speed authorized, according to the circumstances and the time of day, such as periods of school activity, as specified by the illuminated or non-illuminated, variable or non-variable message sign or signal that applies to that portion of the public highway.

Subparagraph 3 of the first paragraph applies on highways under the administration of or maintained by the Ministère des Ressources naturelles. The Minister, on the recommendation of the Minister of Natural Resources, may by order increase the speed limit to 90 km/h on all or any part of such highways.

On access roads leading to a built-up area, subparagraph 4 of the first paragraph applies when the driver reaches the sign or signal indicating the 50 km/h speed limit.

⇒ SECTION 329

“The Minister of Transport may change the speed limits provided for in subparagraphs 1 to 4 of the first paragraph of section 328 for all road vehicles or for certain categories thereof and establish the variable speed limits referred to in subparagraph 5 of the first paragraph of that section.

The installation of traffic signs is proof of the decision of the Minister. The date of the decision and approximate location of the installation of such signs must be entered in a register kept by the Minister.

No person may drive at a speed in excess of the limits indicated on the traffic signs erected under this section, the second paragraph of section 628 or of section 628.1.

In school zones, from Monday to Friday and from September to June, the speed limit shall not exceed 50 km/h between the hours of 7:00 a.m. and 5:00 p.m.

Any speed limit posted on an illuminated variable or non-variable message sign must be registered by the person responsible for the maintenance of the public highway and recorded electronically.”

⇒ SECTION 330

“The driver of a road vehicle must reduce the speed of his vehicle when visibility conditions become inadequate because of darkness, fog, rain or other precipitation or when the roadway is slippery or not completely cleared.”

⇒ SECTION 331

“No person may drive a road vehicle at a low speed that may impede or obstruct normal traffic, except where necessary.

In case of necessity, the driver must use the flashing emergency lights of his vehicle.”

⇒ SECTION 626

“A municipality may by by-law or, where the law so authorizes, by ordinance:

- 1° determine classes of non-motorized vehicles that are subject to registration and determine the amount of the registration fee exigible according to such classes;
- 2° require every resident of its territory who owns a non-motorized vehicle subject to registration that he registers such vehicle;
- 3° provide for the issue of a certificate evidencing the registration of a non-motorized vehicle and require the holder to carry the certificate when using the vehicle;

- 4° prescribe the minimum and maximum speed limits for road vehicles in its territory, which may be different for different locations except on public highways maintained by the Minister of Transport or on which the Minister of Transport has erected traffic signs in accordance with section 329;
- 5° prohibit all vehicular traffic, with or without exception, on the roads it indicates and, where appropriate, for the period it fixes, provided that the prohibition is indicated by traffic signs or traffic officers;
- 6° locate taxi stands and stops for buses and minibuses;
- 7° establish safety zones for pedestrians, and require and regulate their use;
- 8° establish rules regulating the direction of traffic, the meeting of uncoming vehicles and the passing of road vehicles on public highways maintained by it provided that such rules are compatible with the provisions of this Code relating to those matters;
- 9° establish rules regulating the movement of convoys on public highways maintained by it;
- 10° regulate the speed of road vehicles in parks or cemeteries under its control or prohibit the use of road vehicles in the lanes of parks or cemeteries provided that the speed limit or prohibition is clearly indicated by means of signs conspicuously placed at the entrance to the park or cemetery and along the lanes;
- 11° prohibit or restrict the movement of all or certain road vehicles in the vicinity of schools, facilities maintained by an institution operating a hospital centre or a residential and long-term care centre contemplated in the *Act respecting health services and social services* (chapter S-4.2) and hospital centres contemplated in the *Act respecting health services and social services for Cree Native persons* (chapter S-5);
- 12° take the necessary measures to prevent or relieve traffic congestion;
- 13° determine the annual amount it may require for the erection of commercial tourist information signs on a public highway maintained by it;
- 14° permit, on the conditions and for the periods of time it fixes, off-highway vehicles or certain types of off-highway vehicles to be operated on all or part of a public highway it maintains.”

➔ SECTION 627

“Notwithstanding any contrary or inconsistent provision of a general law or special Act, every by-law, resolution or, where the law so authorizes, every ordinance passed or issued by a municipality relating to the means or systems of vehicular transport under the jurisdiction of the Commission des transports du Québec, vehicle construction, heavy vehicle traffic, rate of speed, the traffic of vehicles carrying dangerous substances, the operation of off-highway vehicles on a public highway and the use of vehicles elsewhere than on public highways must, in order to have effect, be approved by the Minister of Transport.

This section does not apply to transportation by taxi within the meaning of the Act respecting transportation by taxi (chapter T-11.1).”

➔ SECTION 628

“The Minister of Transport may approve the whole or only a part of a by-law, resolution or ordinance referred to in section 627. He may also withdraw all or part of any approval given under that section. In such a case, the by-law, resolution or ordinance or part thereof from which approval has been withdrawn ceases to have effect on the date fixed in a notice of the withdrawal of approval published in the *Gazette officielle du Québec*.

The Minister of Transport may remove any sign or signal relating to a by-law, resolution or ordinance which he has not approved or from which he has withdrawn approval, and replace those signs or signals by signs or signals he deems appropriate.”

➔ SECTION 628.1

“The Minister may, for the period the Minister determines, enter into an agreement with any municipality to exempt it from the requirement to submit to the Minister, as the case may be, a by-law, resolution or ordinance made pursuant to section 627 regarding speed. The agreement must specify which public highways are maintained by the municipality and establish the conditions and procedures for establishing a speed limit other than that provided for in this Code. In addition, the agreement must specify the conditions for the consultation of other municipalities concerned.

This section shall not operate to prohibit the Minister from disallowing any by-law, resolution or ordinance respecting speed, made under an agreement referred to in this section, if such by-law, resolution or ordinance may endanger the safety or impair the mobility of persons or goods. The Minister may remove, where expedient, any sign or signal the Minister considers inappropriate where the municipality does not remove it within the time indicated by the Minister.”

ANNEX II

SUMMARY TABLE ²³ EVOLUTION OF THE NUMBER OF VICTIMS ACCORDING TO THE SEVERITY OF INJURIES AND THE TYPE OF USERS 1995-2000

EVOLUTION OF THE NUMBER OF VICTIMS ACCORDING TO THE SEVERITY OF INJURIES: 1995-2000

Severity of Injuries	1995	1996	1997	1998	1999	2000	Average 95-99	00/99	00/95-99
Fatalities	845	858	766	685	762	765	783	0.4 %	- 2.3 %
Serious injuries	5599	5725	5725	5682	5224	5389	5591	3.2 %	- 3.6 %
Minor injuries	42251	41319	41454	40649	43075	46087	41750	7.0 %	10.4 %
Total	48695	47902	47945	47016	49061	52241	48124	6.5 %	8.6 %

EVOLUTION OF THE NUMBER OF VICTIMS ACCORDING TO THE TYPE OF USER AND THE SEVERITY OF INJURIES: 1995-2000

Type of victim and user	1995	1996	1997	1998	1999	2000	Average 95-99	00/99	00/95-99
1) Fatalities									
Automobile occupants	506	516	426	379	474	436	460	- 8.0 %	- 5.2 %
Light truck occupants	71	78	79	72	64	87	73	35.9 %	19.2 %
Heavy truck occupants	11	15	13	19	15	18	15	20.0 %	20.0 %
Motorcyclists	55	47	38	56	56	64	50	14.3 %	28.0 %
Cyclists	25	25	27	20	22	22	24	0.0 %	-8.3 %
Pedestrians	130	135	109	105	111	104	118	-6.3 %	-11.9 %
Other	47	42	74	34	20	34	43	70.0 %	-20.9 %
Total	845	858	766	685	762	765	783	0.4 %	-2.3 %
2) Serious injuries									
Automobile occupants	3394	3491	3545	3430	3146	3303	3401	5.0 %	-2.9 %
Light truck occupants	597	619	659	674	634	685	636	8.0 %	7.7 %
Heavy truck occupants	52	78	99	100	89	91	84	2.2 %	8.3 %
Motorcyclists	350	348	318	345	354	336	343	-5.1 %	-2.0 %
Cyclists	305	246	234	272	217	185	255	-14.7 %	-27.5 %
Pedestrians	627	683	613	610	523	511	611	-2.3 %	-16.4 %
Other	274	260	257	251	261	278	261	6.5 %	6.5 %
Total	5599	5725	5725	5682	5224	5389	5591	3.2 %	-3.6 %
3) Minor injuries									
Automobile occupants	27662	27246	27074	26492	27832	30712	27261	10.3 %	12.7 %
Light truck occupants	4451	4504	4681	4518	4982	5340	4627	7.2 %	15.4 %
Heavy truck occupants	566	527	621	616	707	728	607	3.0 %	19.9 %
Motorcyclists	1436	1436	1385	1436	1531	1417	1445	-7.4 %	-1.9 %
Cyclists	3015	2716	2656	2793	2853	2506	2807	-12.2 %	-10.7 %
Pedestrians	3209	3195	3163	3023	3208	3252	3160	1.4 %	2.9 %
Other	1912	1695	1874	1771	1962	2132	1843	8.7 %	15.7 %
Total	42251	41319	41454	40649	43075	46087	41750	7.0 %	10.4 %

23. SOCIÉTÉ DE L'ASSURANCE AUTOMOBILE DU QUÉBEC, SERVICE DES ÉTUDES ET DES STRATÉGIES EN SÉCURITÉ ROUTIÈRE, Interprétation du bilan routier 2000, Québec, SAAQ, juillet 2001, p. 6.

ANNEX III

THE FUNCTIONS OF STREETS IN BUILT-UP AREAS

The World Road Association (PIARC) document *The Urban Road Network Design* published in 1991 and influenced by European practice, recognizes six urban road functions:

- the transit function, that concerns crosstown through traffic and facilitates the linking of cities;
- the access function, that makes accessing buildings located in the city possible;
- the urban structure function, that concerns the importance of a street in the urban landscape and its contribution to a city's character and identity;
- the social function, that includes the possibility of living and working by the roadside, such as shopping, playing, walking, talking, etc.;
- the ecological function, important for air quality, the microclimate and leisure activities of residents;
- the economic function, that underscores the street's role in the underpinning of commercial and industrial activities.

ANNEX IV

OTHER RECOGNIZED METHODS FOR THE MODIFICATION OF SPEED LIMITS ON MUNICIPAL ROAD NETWORKS

Other recognized methods for the modification of speed limits on municipal road networks:

MINISTÈRE DES TRANSPORTS DU QUÉBEC, *Modèle de détermination de limite de vitesse*, collection « Études et recherches en transports », February 1994, 86 pages.

Procedure for setting speed limits on the QDOT's highway network, featured in Annex V.

PROCEDURE FOR SETTING SPEED LIMITS ON THE QDOT'S HIGHWAY NETWORK

1. APPLICATION

Speed limits applicable to each road class are defined in section 328 of the Highway Safety Code (R.S.Q., Chapter C-24.2).

The procedure herein applies to requests for a change of speed limit, as provided in section 329.

2. HOMOGENEOUS ZONE

It should be noted that Volume V - *Signalisation routière, Normes-Ouvrages routiers*, April 2001, section 2.8, specifies that sign (P-70-2) 'Speed Limit' must be installed for each speed limit zone change made pursuant to statute or regulation.

Therefore, it is important to establish the beginning and the end of the zone which shall be the object of the survey by determining, with the help of the SPEED ZONE SURVEY form below, the homogeneity of the physical characteristics of the road, such as:

- traffic volume;
- density of access points for commercial and residential uses and for farms with main buildings;
- the number of intersections;
- the lateral distance of buildings, of wooded areas or other hindrances to visibility;
- the number and width of lanes;
- the type and width of shoulders;
- the presence of sidewalks and/or curbs;
- the presence of ditches.

By way of example, the illustrations of typical zones shown in Annex A are to be considered as visual references for 50-, 70- and 90-km/h zones.

- 2.1 Going back and forth several times over the area of the target zone is often helpful in perceiving the elements that may influence driver behaviour and in locating the real limits of a homogeneous zone.
- 2.2 Check the authorized speeds in adjacent zones to ensure consistency in the speed succession.
- 2.3 The length of the zone is not always the one suggested in the request. It is the one that reflects the appropriateness of expected behaviour on the road after site analysis.

The length of a homogeneous zone should not be less than 500 m.

The length of a transition zone at the entrance to a built-up area (buffer zone) should not be less than 500 m.

The ministère des Transports du Québec defines a built-up area as "a group of houses forming a unit and considered independently of administrative boundaries".

- 2.4 When a homogeneous zone is more than 5 km long, two speed surveys should be done in two places along the way, at approximately a third of the length's distance.

3. SPEED READINGS

- 3.1 Take speed readings from an unmarked car, using the attached OPERATING SPEED SURVEY, during the summer from May to October in daytime on a precipitation-free day when traffic and weather conditions are normal.

If readings are taken with a photoradar there is no need to use signage (roadwork sign). However those taking the readings should place themselves off the roadway and off the shoulder (Ref.: C.M.N.S.R., File #240).

- 3.2 Use the photoradar in a tangent road section.

On road sections made up of successive curves, make use of an inclinometer in addition to the photoradar while using the attached SHARP CURVE INVENTORY and SPEED COUNTER to establish recommended speeds for each curve (Ref.: Guide des opérations de signalisation, N.4.3.2 - D05).

If available, a counting classifier can also be used. To do so, in the case of brand IRD equipment TC/C, the configuration included in file LIMVIT.SPD should be used.

- 3.3 On a two-lane two-direction roadway, **all vehicles** coming from the opposite direction should be counted.

On a two-direction roadway with four or more traffic lanes, **all vehicles** driving in the same direction as the person taking the readings should be counted.

In both cases, unusually slow vehicles should not be counted.

- 3.4 The length of a speed survey should be spread out according to the following schedule: 200 vehicles or three hours of readings (minimum of 30 vehicles). Traffic should be congestion free (for example, of service levels A or B, as described in Volume I - *Conception routière, Normes-Ouvrages routiers*, September 1998, chapter 3). When a platoon of vehicles drives through, the first vehicle's speed should be recorded and transferred to the total number of vehicles in the platoon.
- 3.5 When the zone is shorter than 2 km, two clearly localized photographs (one for each traffic direction, taken with a 35 mm camera) should be taken at the beginning and the end of the target zone as well as at the place where the speed reading is taken (total: 6 photographs required).

For each additional kilometer of roadway, 2 additional photographs should be taken in the same manner.

4. ADDITIONAL INFORMATION

A thorough examination for a given zone includes the following:

- determine and list the accidents that have occurred in the last three years by order of severity;

In the event a road safety issue is detected by examining accident reports, a complete safety analysis of the site is required to identify solutions to apply the speed suggested by the use of the selection model for two-lane roadways or one of the two tables for four-lane roadways.

- determine the minimal stopping sight distance, as described in Volume 1 - *Conception routière, Normes-Ouvrages routiers*, September 1998, chapter 7 (The design speed used in table 7.2-1.a equals the posted speed plus 10 km/h).

In accordance with the table below, ensure that the corresponding posted speed is taken into account in the application of the selection model and the tables.

MINIMUM STOPPING SIGHT DISTANCE (METRES)	MAXIMUM POSTED SPEED (KM/H)
85 and above	50
110 and above	60
140 and above	70
170 and above	80
200 and above	90

The maximum posted speed associated with the minimum stopping sight distance should be equal or superior to the speed suggested by the speed limit selection model or the table concerned.

Where the minimum stopping sight distance is not attained, an analysis of reported accidents and of the roadside area is required to evaluate the need to intervene in order to be able to apply the speed suggested by the selection model or the table concerned.

5. SAFETY STUDY

On occasion the factors in the selection model for two-lane roadways or criteria in the tables for four-lane roadways bring to light too great a gap between driver operating speed and the expected speed for the location.

We know for a fact that in those cases it is insufficient to reduce the posted speed to obtain the hoped for results. There must be adequacy and agreement between a driver's reading of the road and the posted speed.

In such circumstances, a complete safety study of the location is appropriate in order to identify:

- measures to induce a reduction in operating speed;
- solutions to reestablish road safety when it has proven deficient.

6. NECESSARY DOCUMENTATION

A speed study requires all available pertinent documents, such as:

- correspondence with applicants (municipalities, police forces, school boards, etc.);
- on-site surveys as prescribed in the attached form SPEED ZONE SURVEY;
- any previous study of whatever type (speed, black spot, safety analysis, traffic signals, etc.);
- municipal map on the scale of 1:50000 covering the zone under study and the authorized speeds in adjacent zones;
- hand drawn sketch of the site showing the location of the speed survey, installed signage, street intersections, buildings and main characteristics that might impact on the decision to be taken (bicycle path, school zone, pedestrian crossing, etc.);
- comments and arguments in support of the recommendations from the regional directorate and/or the service centre.

7. RELOCATING THE BEGINNING OF SPEED ZONES

Requests are often made to lengthen speed zones following changes that have occurred (new residential subdivision, roadway redesign, creation of intersections, industrial area). In these cases, it is best to speak of relocating the beginning of the zone rather than of lengthening it.

Such initiatives can be taken at the regional directorate level without the necessity of a new speed study but must meet the following two conditions:

- 1° the speed regulation in the zone is legal, that is authorized under sections 328 or 329 of the Highway Safety Code;
- 2° the homogeneity characteristics of the new section are similar to those of the other section.

In the event section 329 applies, the change must be noted on the Minister's official register.

If the first condition is not met, the whole zone becomes the subject of a speed study.

8. APPROACHES TO TRAFFIC SIGNALS

The appropriate way to treat intersections with traffic signals is described in Volume V - *Conception routière, Normes-Ouvrages routiers*, April 2001, under sections 3.7 (Advanced traffic signal sign) and 3.8 (Prepare to stop).

N.B. The previous procedure of reducing the speed limit to 70 km/h over a maximum of 500 m when approaching traffic signals in 100-, 90- or 80-km/h zones has been abrogated. The 70-km/h signs should be progressively removed.

As these traffic signal approaches with posted speeds of 70 km/h are registered provincially, the new speed limit after the cancellation of these zones must consequently be noted on the register.

9. PROCESSING OF REQUESTS

- 9.1 It should be noted that in accordance with section 329 of the Highway Safety Code (R.S.Q., Chapter C-24.2A), the Minister of Transport can change the speed limits provided in section 328 and such changes must be entered on a register maintained by the Minister.

Since June 4, 1994, in accordance with Decree 701-94 dated May 11, 1994, amended by Decree 1524-06 dated December 4, 1996 and Decree 38-2002 dated January 23, 2002 under the Act respecting the Ministère des Transports, R.S.Q., Ch. M-28A, the Minister has decreed that the Director of Transport Safety and the head of the Program and Partnership Branch as well as a regional director and the head of a regional branch within the purview of their administrative unit are authorized to sign any document for the application of Sections 329 and 627 of the Highway Safety Code:

- 1° recording the modification of speed limits for all or for certain classes of road vehicles;
- 2° approving a regulation, resolution or ordinance with respect to speed adopted by a municipality.

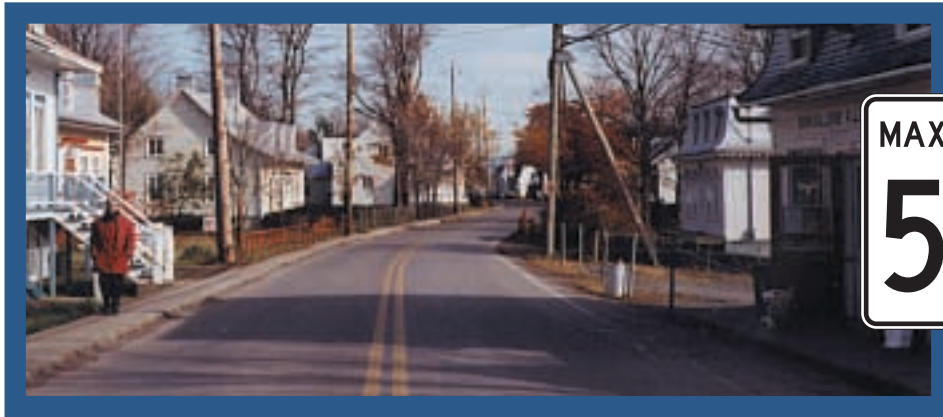
A speed limit modification recorded on the Minister's register (Speed Limit Management System GLV-6014, inventory and register) remains in effect until its cancellation by the manager of the said register. In the event that a modification in speed limits reestablishes the conformity of speeds set out in section 328, the exceptional speed limit previously recorded on the provincial register for that location must be invalidated.

- 9.2 The complete analysis of a legal speed limit modification request is done with the help of among other things the attached SPEED LIMIT SELECTION MODEL or TABLE FOR SETTING SPEED LIMITS, accompanied by forms SPEED DISTRIBUTION and SPEED ZONE SURVEY.
- 9.3 In the case of an increase in the speed limit, ensure that the design of the roadway, the roadside area and its safety elements, the horizontal and vertical signage, as well as the skid resistance conform to present norms of the Ministère.
- 9.4 The exact location as well as the dates of approval and sign installation should be recorded on attached form AUTHORIZED STATUTORY SPEED signed by the Minister's delegate.

2002-03-20

ANNEX A

Typical speed limit zones



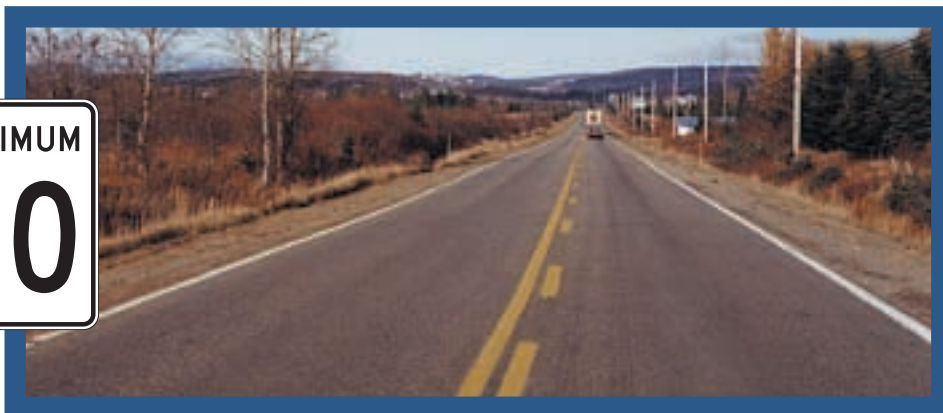
MAXIMUM
50



MAXIMUM
50



MAXIMUM
70



MAXIMUM
90

ANNEX A (continued)

Typical speed limit zones General characteristics

The following contexts are usually associated with each of the legal speeds of 50, 70 and 90 km/h. These present frequent visual cues only and, therefore, there may be differences in specific locations.

It is important to remember that any change in speed limits should be based on a complete analysis and not only on the basis of photographs.

50 KM/H (URBAN)

Section with urban features, high density of access points, small lateral clearance from buildings, roadway more or less wide dependent on the presence or absence of parking lanes, presence of sidewalks and/or curbs (first illustration).

50 KM/H (SOMEWHAT URBAN)

Section with some urban features, medium density of access points, small lateral clearance from buildings, narrow roadway in a low tolerance geometry, few if any shoulders (second illustration).

70 KM/H (TRANSITION)

Section with some rural features, low density of access points, medium to good lateral clearance from buildings, roadway of medium width in a low tolerance often irregular geometry, medium width shoulders.

90 KM/H (RURAL)

Rural section with low access density outside of built-up areas, with a medium to wide road width, excellent and very permissive geometry and medium to wide shoulders.

DT	CS	Year	Month	Day	Séq.
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Identification of survey zone

Municipality				Number of lanes (total of both directions)	
Roadway (name)				Configuration <input type="checkbox"/> Contiguous <input type="checkbox"/> Divided	
Surveyed zone (description) From : _____ To : _____				Posted speed km/h	
Location From : _____ Roadway Section SubSect Chaining To : _____				Length of surveyed zone km	

Area of speed survey zone

Location (description)				Radartrack		Direction of traffic	
Date				Time		Temperature	
Day		Day		Beginning :		End :	
Roadway		Section		SubSect		Chaining	

Distinguishing features

Width		Surface			
		Asphalt	Concrete	Gravel	Other
1	Roadway _____ m	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
2	Right shoulder _____ m	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
3	Left shoulder _____ m	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
4	Total length of sidewalk for each traffic direction		Right _____ m		Left _____ m
5	Total length of curb for each traffic direction		Right _____ m		Left _____ m
6	Average lateral sight clearance _____ m (from the edge line)				
7	A-Residential access points serving 5 units and less _____ = 1.0				
	B-Residential access points serving 6 units and more _____ = 1.5				
	B-Commercial, industrial and institutional access points _____ = 1.5				
	B-Main farm with buildings access point _____ = 1.5				
	B-Street or alley intersections (for each approach) _____ = 1.5				
8	Weighted access point calculation = $\frac{A + 1.5 B}{\text{Length of zone}}$ = _____ /km				
9	Traffic volume (average annual daily traffic flow) _____ Vehicles per day				
10	Number of accidents by severity Fatalities _____ Serious injuries _____ Minor injuries _____ Property damage only _____				
11	Minimum stopping sight distance _____ m				

Previous record

DT	CS	Year	Month	Day	Seq.	Technician : _____
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DT	CS	Year	Month	Day	Seq.
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By 10-km/h increments

1-10	61-70	121-130
11-20	71-80	131-140
21-30	81-90	141-150
31-40	91-100	151-160
41-50	101-110	161-170
51-60	111-120	171-180

Speed (km/h)		Frequency F	Fx	x ²	Fx ²
Class	Mid point x				
1-10	5.5			30.25	
11-20	15.5			240.25	
21-30	25.5			650.25	
31-40	35.5			1 260.25	
41-50	45.5			2 070.25	
51-60	55.5			3 080.25	
61-70	65.5			4 290.25	
71-80	75.5			5 700.25	
81-90	85.5			7 310.25	
91-100	95.5			9 120.25	
101-110	105.5			11 130.25	
111-120	115.5			13 340.25	
121-130	125.5			15 750.25	
131-140	135.5			18 360.25	
141-150	145.5			21 170.25	
151-160	155.5			24 180.25	
161-170	165.5			27 390.25	
171-180	175.5			30 800.25	
	Σ				

Mathematical formulas used

Number:

$$N = \sum F$$

Arithmetic mean:

$$\bar{x} = \frac{\sum Fx}{N}$$

Standard deviation:

$$\sigma = \sqrt{\frac{\sum Fx^2 - (\sum Fx)^2}{N - 1}}$$

85th Percentile:

$$C_{85} = \bar{x} + 1.04 * \sigma$$

* Value of centred standardised normal distribution related to the 85th percentile

Mean \bar{x}	km/h
Std Deviation σ	km/h
85th Percentile C_{85}	km/h

Speed (km/h)	Offenders (%)
100	
90	
80	
70	
60	
50	

Roadway	Section	SubSect	DT	CS	Year	Month	Day	Seq.

	Speed (km/h)	Reading	Traffic direction	Result (km/h)	
Chaining	1				Average (km/h)
From: <u> </u> +	2				
To: <u> </u> +	3				
					Recommended speed (km/h)*

	Speed (km/h)	Reading	Traffic direction	Result (km/h)	
Chaining	1				Average (km/h)
From: <u> </u> +	2				
To: <u> </u> +	3				
					Recommended speed (km/h)*

	Speed (km/h)	Reading	Traffic direction	Result (km/h)	
Chaining	1				Average (km/h)
From: <u> </u> +	2				
To: <u> </u> +	3				
					Recommended speed (km/h)*

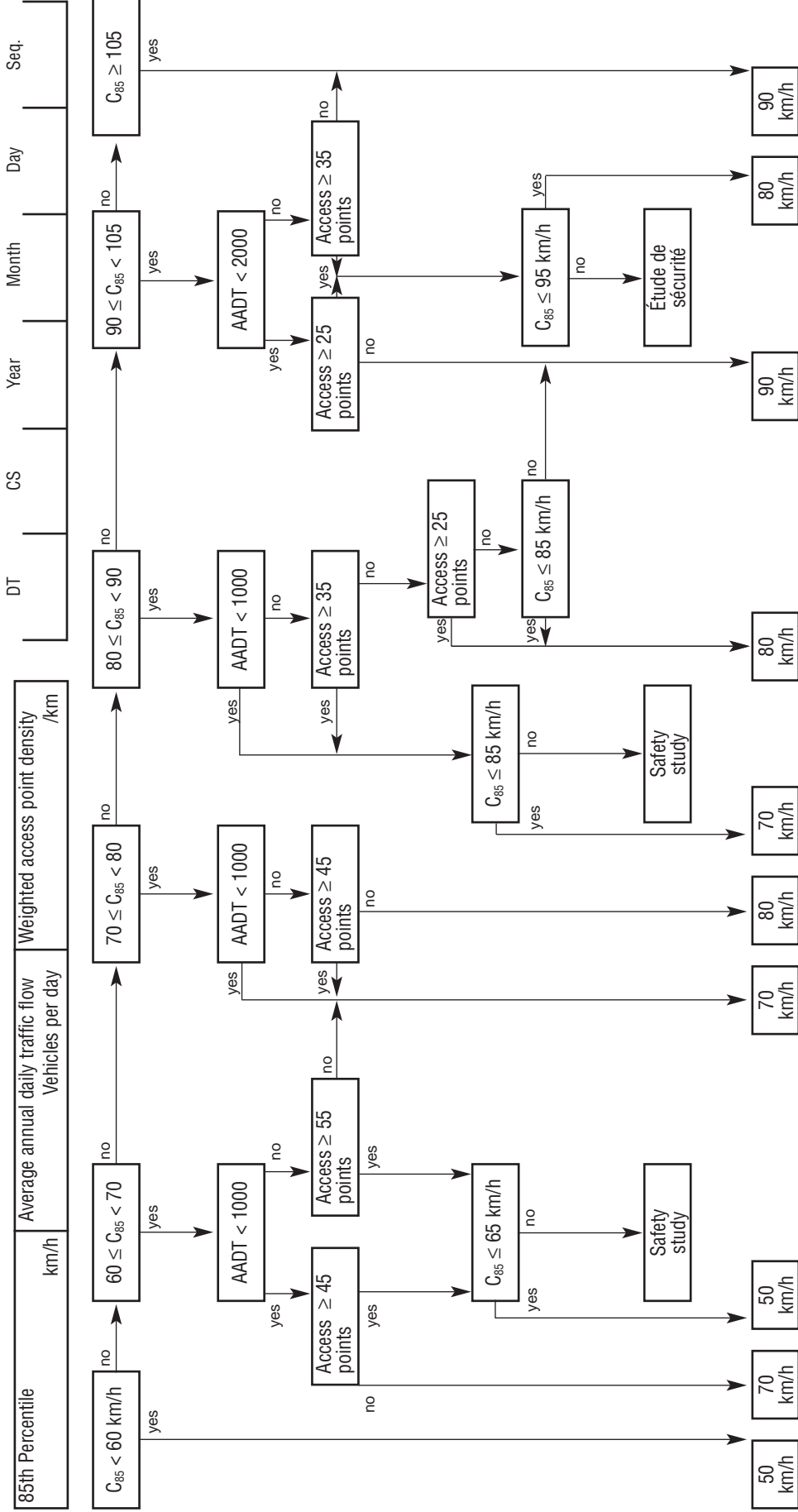
	Speed (km/h)	Reading	Traffic direction	Result (km/h)	
Chaining	1				Average (km/h)
From: <u> </u> +	2				
To: <u> </u> +	3				
					Recommended speed (km/h)*

The recommended speed for a curve is obtained by rounding the average of results as follows:
 Increasing to 5 the numbers ending in 0-1-2-3-4, and reducing to 5 those ending in 6-7-8-9.
 Ex.: Average of 50 → 55 as recommended speed
 Ex.: Average of 59 → 55 as recommended speed

SPEED NOMOGRAPH

Ball bank indicator reading

		Ball																				
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18		
Operating speed	km/h																			km/h		
	20			44	40	38	35	32	31	30	28	27	25									20
	25			55	49	44	40	36	35	34	33	32	30	28	27	25	24	22	20	19		25
	30			62	59	53	49	46	43	40	37	35	33	32	31	30	29	27	25	24		30
	35			67	64	58	54	51	48	45	42	40	38	37	36	34	33	31	29	28		35
	40			72	69	64	61	58	53	51	48	47	43	40	39	37	35	34				40
	45			77	74	69	66	61	58	54	51	49	47	45	44	41	39					45
	50			82	79	74	71	66	63	58	55	53	51	49	48	45	44					50
	55			89	84	79	76	71	68	63	60	57	55	53	51	49	47					55
	60			96	91	84	81	76	73	68	65	61	58	56	53	52	50					60
	65			102	98	90	87	81	78	73	70	65	62	59	56	54	52					65
	70			105	102	97	94	86	83	78	75	70	67	63	60	57	55					70
	75	113	113	109	105	102	98	92	88	83	80	75	72	67	64	60	58					75
	80	113	113	113	109	106	101	98	93	88	85	80	77	72	69	64	61					80
	85	113	113	113	111	109	105	102	95	93	90	85	81	76	73	68	65					85
	90	113	113	113	113	111	109	106	102	99	94	89	86	81	78	73	70					90
	95	113	113	113	113	113	112	109	106	102	98	95	90	86	83	78	75					95
	100	113	113	113	113	113	113	112	110	105	102	98	94	91	88	83	80					100
	105	113	113	113	113	113	113	113	113	109	106	101	98	95	92	88	85					105
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18		
		Reading																				



Frame of reference:
 1- Length of zone considered more than or equal to 500 metres.
 2- No freeway type zones.
 3- The percentage of the length of the zone with a substandard curve is below 25 %.
 4- The percentage of the zone length with a slope above 6% is below 25%.
 5- The zone includes two lanes excluding the approaches to the intersections.

Notes :
 C₈₅ : 85th percentile speed in km/h.
 AADT : Average annual daily traffic flow.
 Access : Weighted access point density (per km).
 Nap/km = $\frac{A + 1.5 B}{\text{Length in km}}$ where: A = total category A access points
 B = total category B access points



TABLE FOR SETTING SPEED LIMITS
CONTIGUOUS FOUR-LANE ROADWAYS ONLY

Exception to section 328 of the HSC, recommended if four or more criteria are met

Criteria		Keys		Built-up areas (50 km/h)		Unbuilt areas (90 km/h)		
				50	70	50	70	90
Operating speed		$C_{85} < 65\text{km/h}$		yes	no	yes	no	no
		$65 \leq C_{85} < 85$		no	yes	no	yes	no
		$C_{85} \geq 85\text{km/h}$		no	yes	no	no	yes
Width of the paved surface ⁽¹⁾	Between curbs	without parking	$\leq 15.0\text{ m}$	yes	no	yes	yes	no
			$> 15.0\text{ m}$	no	yes	no	no	yes
	and/or sidewalks	with parking	$\leq 19.0\text{ m}$	yes	no	N/A	N/A	N/A
			$> 19.0\text{ m}$	no	yes	N/A	N/A	N/A
	Without curbs or sidewalks	without paved shoulders	$\leq 14.0\text{ m}$	N/A	N/A	yes	yes	no
			$> 14.0\text{ m}$	N/A	N/A	no	no	yes
	with paved shoulders	$\leq 16.0\text{ m}$	yes	no	yes	yes	no	
		$> 16.0\text{ m}$	no	yes	no	no	yes	
Roadway hierarchy		local street		yes	no	yes	yes	no
		municipal collector road		yes	yes	no	yes	yes
		other		yes	yes	no	no	yes
Number of access points/km ⁽²⁾ (Nap/km)		Nap/km < 20		N/A	N/A	no	yes	yes
		$20 \leq \text{Nap/km} < 40$		yes	yes	no	yes	no
		Nap/km ≥ 40		yes	no	N/A	N/A	N/A
Lateral sight clearance ⁽³⁾ (Lsc) (from the edge line)		Lsc $\leq 5.0\text{ m}$		yes	no	yes	no	no
		Lsc $> 5.0\text{ m}$		no	yes	no	yes	yes
TOTAL								

N.B. (1) The values listed under the scoring key **Width of the paved surface** apply to both the directions of traffic treated globally.

(2) The criterion **Number of access points/km** takes the total access points on each side of the roadway into account.

(3) High dense boulevard or setback vegetation rising at least 1 m above the roadway surface should be taken into account as a hindrance to visibility and so too should high usage lateral parking.

N/A Theoretically, such a situation should not exist.

**TABLE FOR SETTING SPEED LIMITS
DIVIDED FOUR-LANE ROADWAYS ONLY**

Exception to section 328 of the HSC, recommended if four or more criteria are met.

Criteria		Keys	Built-up areas (50 km/h)		Unbuilt areas (90 km/h)		
			50	70	50	70	90
Operating speed		$C_{85} < 65\text{km/h}$	yes	no	yes	no	no
		$65 \leq C_{85} < 85$	no	yes	no	yes	no
		$C_{85} \geq 85\text{km/h}$	no	yes	no	no	yes
Length of paved surface ⁽¹⁾	Between curbs and/or sidewalks	without parking $\leq 8.0\text{ m}$	yes	no	yes	yes	no
		without parking $> 8.0\text{ m}$	no	yes	no	no	yes
	Without curbs or sidewalks	with parking $\leq 10.0\text{ m}$	yes	no	N/A	N/A	N/A
		with parking $> 10.0\text{ m}$	no	yes	N/A	N/A	N/A
		without paved shoulders $\leq 7.0\text{ m}$	N/A	N/A	yes	yes	no
		without paved shoulders $> 7.0\text{ m}$	N/A	N/A	no	no	yes
		with paved shoulders $\leq 9.0\text{ m}$	yes	no	yes	yes	no
		with paved shoulders $> 9.0\text{ m}$	no	yes	no	no	yes
Roadway hierarchy		local street	yes	no	yes	yes	no
		municipal collector road	yes	yes	no	yes	yes
		other	yes	yes	no	no	yes
Number of access points/km ⁽²⁾ (Nap/km)		$\text{Nap/km} < 20$	N/A	N/A	no	yes	yes
		$20 \leq \text{Nap/km} < 40$	yes	yes	no	yes	no
		$\text{Nap/km} \geq 40$	yes	no	N/A	N/A	N/A
Lateral sight clearance ⁽³⁾ (Lsc) (from the edge line)		$Lsc \leq 5.0\text{ m}$	yes	no	yes	no	no
		$Lsc > 5.0\text{ m}$	no	yes	no	yes	yes
TOTAL							

N.B. (1) The values listed under the scoring key **Width of the paved surface** apply to each of the two traffic directions treated independently. The most constraining value between the two sides of the road is the operative one for the application of the table.

(2) The criterion **Number of access points/km** includes the access points on the right side of the roadway as well as the openings on the left side on the median island.

(3) High dense boulevard or setback vegetation rising at least 1 m above the roadway surface should be taken into account as a hindrance to visibility and so too should high usage lateral parking. The most constraining average lateral sight clearance on the two sides of the roadway should apply for purposes of the table.

N/A Theoretically, such a situation should not exist.

EXPLANATION OF CRITERIA IN TABLES FOR FOUR-LANE ROADS (contiguous and divided)

A four-lane contiguous road is made up of four traffic lanes that run alongside each other with the two traffic directions separated only by horizontal signage (markings). A four-lane divided road includes a median island, with or without curbs to separate one direction's two lanes from the other direction's two lanes. Using the tables for four-lane roads implies the analysis built-up areas of the two listed speed limits, that is 50 km/h and 70 km/h and, in unbuilt areas, the analysis of the three limits listed: 50 km/h, 70 km/h and 90 km/h.

➔ OPERATING SPEED

Operating speed is the true speed practised given road geometry, weather conditions, the state of the driving surface, the physical condition of the driver and the operating condition of the vehicle. The method to be followed to determine the 85th percentile user operating speed is explained under point 3 of Annex V.

NOTE: After the speed survey, if the 85th percentile speed deviation is 15 km/h or more above the speed determined by the analysis, a safety survey should be done. The survey should be a best practice safety survey and according to the nature of the problem, cover the analysis of prescriptive elements of road geometry, including sight distances, roadway environment, traffic flow, user behaviour, etc.

➔ WIDTH OF THE PAVED SURFACE

In built-up areas, the paved surface can be a public road with parking allowed at least on one side. The width considered is the width of traffic lanes and of parking lanes, if there are any (usually between curbs or sidewalks).

NOTE: In built-up areas, the paved surface includes bicycles lanes if they are not separated from the traffic lanes by a permanent continuous curb. The **with parking** key is to be used where parking spaces are commonly used and the rate of friction or constraint is positive. If parking spaces are little or not used, the **without parking** key is to be used. In unbuilt areas, the width of traffic lanes and paved shoulders, if any, are considered.

➔ ROADWAY HIERARCHY

The unique function of a **local street** in built-up areas is to provide access to roadside properties. There is practically no through traffic.

A **municipal collector road** is used for accessing adjacent properties and for through traffic. In Tables D and E, the term 'collector road' includes public roads usually called 'local distribution roads' and 'semi-collector roads'.

Arterial roads are earmarked for through traffic over a longer distance, even if they are also used to serve adjacent properties.

The **regional network** links smaller (generally 5,000 to 25,000 inhabitants) urban areas among themselves and with major urban areas.

The **provincial network** consists mostly of interregional roads and roads that link major urban areas (generally more than 25,000 inhabitants).

The scoring schedule includes under **Other**:

- arterial roads on municipal road networks;
- collector roads as defined by the functional classification on the ministère des Transports du Québec's road network;
- regional roads as defined by the functional classification on the ministère des Transports du Québec's road network;
- provincial highways as defined by the functional classification on the ministère des Transports du Québec's road network.

➔ NUMBER OF ACCESS POINTS (Nap/km)

Categories linked to the number of access points per kilometre (Nap/km) are as follows:

A - Residential access points serving 5 units or less	= 1.0 ;
B - Residential access points serving 6 units or more	= 1.5 ;
B - Commercial, industrial and institutional access points	= 1.5 ;
B - Main access points to farms with buildings	= 1.5 ;
B - Intersections of streets and alleys (for each intersection approach)	= 1.5 .

Weighting of access points per kilometre is as follows:

$$\text{Nap/km} = \frac{A + 1.5 B}{\text{Length in km}} \quad \text{where: } A = \text{total number of cat. A access points} \\ B = \text{total number of cat. B access points}$$

➔ LATERAL SIGHT CLEARANCE (Lsc)

Lateral sight clearance (Lsc) includes the width of the paved surface from the roadway edge line, the usually grass covered boulevard or planting strip between the roadway and the sidewalk if there is one, the sidewalk, the balance of the right of way and the building setback.

NOTE: High dense boulevard or setback vegetation rising at least 1 m above the roadway surface should be taken into account as a hindrance to visibility and so too should high usage lateral parking.

➔ TOTAL

The speed limit must represent, under certain conditions, a reasonable point of equilibrium between mobility and safety. The total represents the sum of positive answers (**yes**) for each of the speed columns in the Table. The one where the highest number of criteria are met should be chosen.

NOTE: For each possible speed limit exception, a minimum of four of five criteria should be met. If the analysis does not result in at least four of five criteria being met, a more elaborate survey should be performed before posting the new speed limit to determine the exact nature of the problem and the relevant corrective action. When the analysis results in two equal totals with at least four of five criteria being met, the preferred choice is the speed that most closely approximates the 85th percentile result under the **Operating Speed** scoring key.

N.B. *Changes to 30-km/h speed limits on roads with four lanes or more should be banned. Tables D and E are not designed to justify by themselves an increase speed limits in unbuilt areas. One should be cautious in increasing speed limits in unbuilt areas when a minimum of four criteria justify doing so. The road geometry (curve radii, crossroads, etc.) should be checked to see whether an increase is suitable and the signage should be changed accordingly. Land use, existing buildings and adjacent activities are implicit in the criteria **Number of access points per kilometre**, **Lateral sight clearance** and **Roadway hierarchy**. Vehicle movement is recognized as free flowing considering that it takes place and is monitored according to levels of service A or B⁴. In the case of roads highly congested over the whole day, for example from five to seven hours continuously, readings can be performed during a period of the day when the level of service is closest to level B.*

ANNEX VI

SIMPLIFIED METHOD OF CALCULATING TRAFFIC FLOW

Traffic flow varies considerably. For the purposes of this Guide, a simplified method will produce a representative and comparable number from one location to another:

1. Choose a Tuesday, Wednesday or Thursday morning in May or October;
2. Record the traffic flow from 7 a.m. to 9 a.m. in 15-minute segments;
3. Use the four consecutive 15-minute segments with the heaviest traffic flow;
4. Total the four segments and multiply by 14 to get the daily traffic flow.

ANNEX VII

Selected metric values for geometric design

SPEED		LANE WIDTH		
km/h	mph	m	ft	%
30	18.64	2.7	8.86	1.56 less than 9' lane
40	24.85	3.0	9.84	1.60 less than 10' lane
50	31.07	3.3	10.83	1.55 less than 11' lane
60	37.28	3.6	11.81	1.85 less than 12' lane
70	43.50			
80	49.71			
90	55.92			
100	62.14			
110	68.35			
120	74.56			

APPROXIMATIVE METRIC CONVERSION FACTORS FOR SI UNITS

Symbol	When you know	Multiply by	To Find	Symbol
ft	Feet	0.305	Metres	m
m	Metres	3.28	Feet	ft
mi	Miles	1.61	Kilometres	km
km	Kilometres	0.621	Miles	mi

