XXIInd WORLD ROAD CONGRESS
DURBAN 2003

CANADA-QUEBEC - NATIONAL REPORT

STRATEGIC DIRECTION SESSION ST1
Road quality service levels and innovations to meet user expectations

Principal Submitter:

Martin Boucher, Eng., M. Eng.
Ministère des Transports du Québec

Submitters:

Nathalie Gosselin, Eng.
Michel Masse, Eng.
Céline Payer
Gilles Roux, Eng.
Jean Sauriol, Eng.
Francine Tremblay

Ministère des Transports du Québec

Practices Adopted to Reduce User Inconvenience on Road Work Sites in Québec

TABLE OF CONTENTS

ABSTRACT

Built mostly in the 1960s and 1970s, the Québec road network is now in need of major repairs, which will lead to a considerable increase in the number of road work sites. The Ministère des Transports du Québec is aware of the inconvenience that road work can cause and has adopted a number of practices to diminish it and increase the safety of workers and drivers near and on road work sites.

Special efforts have been made to increase safety at work sites and reduce driver inconvenience. To prevent speeding near road work sites, the Ministry plans to post appropriate maximum speed limits, increase police surveillance, and launch an information and ad campaign targeting drivers. A number of measures have also been implemented with regard to road work signage, such as the use of 1.2 meter high traffic channelizers, variable message signs, and signs with fluorescent orange coating. Measures to reduce driver inconvenience include the use of moveable barriers and various special measures for urban environments. In addition, a number of work site management measures have been planned, including doing most of the work at night and restricting lane closing time, as well as implementing the lane rental principle and managing noise output.

Road maintenance and restoration techniques must be carefully selected on the basis of rigorous technical and economic criteria, and must also allow for the impact of road work on road users. A number of pavement rebuilding and maintenance techniques make it possible to accelerate road work. Examples include on-site road material recycling, in-place roadmixing with a hydraulic binder, cold asphalt concrete recycling, fast-track concrete paving, and trenchless techniques for culvert reconstruction.

In terms of communication, the challenge is to stress the importance of road work in improving the road network, while seeking driver cooperation to facilitate the process and ensure road work site safety. In addition to informing road users of the cost and type of road work, as well as when and where it will occur, certain measures have been planned to encourage drivers to change their behavior and, in some cases, their driving habits.

The cooperation of all partners in the implementation and harmonization of measures to reduce inconvenience is essential. Accurate planning of all work site management activities is a key to success. The Ministry’s management plan is designed to balance distribution of projects throughout a particular region and standardize the signage announcing the mitigation measures in place.

A feedback mechanism has also been created to ascertain the effectiveness of the road work measures and make adjustments as necessary. A summary of the strengths and weaknesses of road work management will contribute to the continued improvement of the process.

PREFACE

In May 2000, the Québec National Assembly passed the Public Administration Act aimed at achieving an in-depth reform of Québec management practices. This act calls for the Ministries to adopt management practices that focus more on results and on serving the public. The Ministère des Transports du Québec has therefore undertaken a broad analysis of the services it provides directly to the public with a view to transforming the nature of the relationship it maintains with citizens.

It is with this in mind that road work site management was addressed. All measures implemented since then have focused on informing the public, reducing the inconvenience often caused by extensive road work, and encouraging driver cooperation and understanding regarding the Ministry's mission. Results thus far are convincing, and encourage us to continue working in this direction.

Anne-Marie Leclerc, Eng., M. Eng.
Assistant Deputy Minister, Infrastructure and Technology
Ministère des Transports du Québec

1. Introduction

1.1 Issue

Built mostly in the 1960s and 1970s, the Québec road network has since seen a significant increase in the number of vehicles using it. Increases of 100%—and even 300% for heavy vehicles—were recorded between 1980 and 1995. Today, the road network has reached maturity, and major investments are needed for reconstruction. This issue affects both municipalities and the Ministère des Transports du Québec, which is responsible for the primary road network. In tackling this situation over the past five years, the Ministère des Transports has had to more than triple its annual budget allotted to the Road Network Maintenance and Improvement Fund. In addition, the 2002–2003 season marks the beginning of a ten-year road network reconstruction plan that will add several hundred million dollars per year to the Ministry's upcoming annual road work projects.

These major investments will considerably increase the number of work sites on Québec roads, thus compounding traffic and safety problems for drivers and workers.

Traffic blockage caused by road work leads to reduced average travel speeds, occasional detours, and gridlock. All this increases vehicle operating costs and wastes time, not only for commuters but also for truckers transporting merchandise. We must also take into account the costs of collisions, which are more likely to occur around road work sites. Noise and dust may also adversely affect the quality of life of individuals living near work sites. In addition, work sites are likely to interfere with businesses located nearby.

In Québec, the ideal period for carrying out road work is relatively short—from May to October, depending on the nature of the work—so road work is mostly done in the summer. But this period also corresponds with the tourist season when there are more drivers, many of whom are unfamiliar with the routes they are taking.

All these problems have led the Ministère des Transports du Québec to strengthen measures aimed at reducing driver inconvenience and increasing driver and road worker safety. The measures described herein address all aspects of road work sites, from road work planning, site organization, and construction design to informing the public and soliciting its feedback.

1.2 Road Work Management Guide

The growing number of road work sites, increased traffic, and the obligation of the Ministère des Transports to provide a high quality product by the announced target date require the constant improvement of road work management techniques. This approach is in keeping with the government's commitment to making the public the focus of everything it does.

The *Guide de gestion des travaux routiers* (*Road Work Management Guide*) published in January 2002 presents the major steps taken to reduce the inconvenience of road work and ensure the safety of road workers and drivers. It is a reference tool to help road work managers ensure that all possible impacts of road work projects are taken into account from the early planning stage. The purpose of the *Guide* is to officialize the road work management process and standardize practices within the Ministry.

Thus, for each road work management activity, a support document (memo, study, report, etc.) justifying the choices made must accompany the file at the following stages:

- Before Road Work:
  - Annual planning and coordination
  - Analysis of work type and work site environment
  - Scenario development and project impact assessment
  - Scenario and work management plan finalization
  - Mitigation measures
  - Approval by technical committee in charge of project monitoring (control point)
  - Preparation of signage plan and specific requirements to be included in call for tenders
  - Assessment by outside review committee
  - Preparation of a communications plan
  - Mobilization and preparatory activities
- During Road Work:
  - Opening the work site
  - Follow-up on work requirements and progress
- After Road Work:
  - Closing the work site
  - Operations overview, summary of strengths and weaknesses of work management process, feedback, and recommended changes to current measures

2. Road Work Planning

Road work planning is divided into a number of steps. The first step is to draw up an exhaustive list of all road work management activities to be undertaken in order to complete work by the target date. This step includes consulting the list of work to be done in each region throughout the year. The proposed road work timelines must take into account the effects of road work on traffic and travel. Any other Ministry work in surrounding areas or sites that may be scheduled by others must also be taken into consideration.

This evaluation must consider work site characteristics, notably the site location, expected duration of work, traffic volume, and specific concerns related to the work site. A thorough understanding of the type of work and work site environment makes it possible to develop various management scenarios and more accurately assess their impact. A comparative analysis of the different scenarios then makes it possible to choose the optimal solution and determine the nature and scope of the mitigation measures to be implemented.

2.1 Work Site Organization

At the Ministère des Transports du Québec, the objective of reducing driver inconvenience received a boost with the adoption of the *2001–2003 Action Plan on Road Work Site Safety*. The measures put forward in this action plan complement existing measures and break new ground in order to ensure that road work is planned, carried out, and followed up on according to the targeted objectives. The action plan addresses issues of safety, traffic, signage, training, and communication with drivers. Past experience has shown the need to more carefully analyze the aspects of road work organization that have a direct impact on the choice, cost, and benefits of mitigation measures.

2.1.1 Safety

Road work disrupts traffic and the resulting congestion and delays are a source of frustration to road users. Speeding and careless driving are the main causes of accidents near road work sites. The challenge is to improve worker and driver safety in road work zones while maintaining a smooth flow of traffic.

2.1.1.1 Preventing Speeding

Speeding is a major problem, for the safety of both workers and drivers. To prevent speeding near road work sites, the Ministry plans to post appropriate maximum speed limits, increase police surveillance, and launch an information and ad campaign targeting drivers.

The Ministry has developed a flexible method to set speed limits for each work site. This method, which takes into account the road environment and distinctive features of the work site, enables the Ministry to determine an acceptable speed limit that ensures driver and worker safety and that drivers will consider reasonable. Speed limits for similar work zones, notably on major roads, are also coordinated.

Partnership with the police is one of the keys to ensuring a higher degree of work zone safety. In 2002, 120 zones targeted for the type of work being carried out and the expected traffic problems have had the benefit of a special police presence. The presence of police encourages drivers to obey the posted speed limits. Recent legislation on speed limits in work zones imposing the same fines as for failure to obey permanent signage is another dissuasive measure.

Raising driver awareness about work zone safety is a way to make drivers more responsible. Various means are used, including the use of special radio frequencies to give drivers information on road work sites as well as signage posted at the entrance to work zones. The sign displaying the message “Au nom de la vie, ralentissez!” asks drivers to reduce their speed around road work sites (see figure 1).

Figure 1: Sign asking drivers to slow down around road work sites

2.1.1.2 Preventing Careless Driving

Various measures have been taken to prevent careless driving: information and awareness campaigns to draw attention to road work zones and encourage drivers to be cautious, the installation of variable message signs, and the use of fluorescent orange coating on road work signs and markers to increase their visibility. Another method occasionally used is auditory marking via rumble strips or the application of a special product to the middle of the lane. As the car passes over these auditory markers, the sound and vibration that are produced alert drivers of the approaching work zone.

2.1.1.3 Displaying Traffic Conditions

New measures in the Ministry’s action plan provide drivers with more accurate information on intermittent traffic problems caused by road construction. They include the following improvements to advance warning of road work:

- Install warning signs that read “Distance à parcourir avant l’aire de travail” 2 kilometers from the work site (figure 2 A) and lane merge signs 1.5 kilometers from construction (figure 2 B), in addition to the standard signage sequence beginning 1 kilometer before the construction.
- Add one of the following devices to warn about congestion when the backup extends over 1 km from the work zone:
    - Variable message sign 5 km before the construction zone indicating that there is congestion (figure 2 C)
    - Accompanying vehicle equipped with the “Congestion 500 m” sign (figure 2 D) that stays on the shoulder 500 meters in front of the backup
    - Backup detectors connected to variable message signs
- Add other devices to round out congestion signage:
    - Radio frequency 15 km from construction (figure 2 E) to broadcast regular traffic reports and suggest alternate routes 24 hours a day
    - Messages on public radio
    - Signed alternate routes (more details in section 2.1.2 Signage).

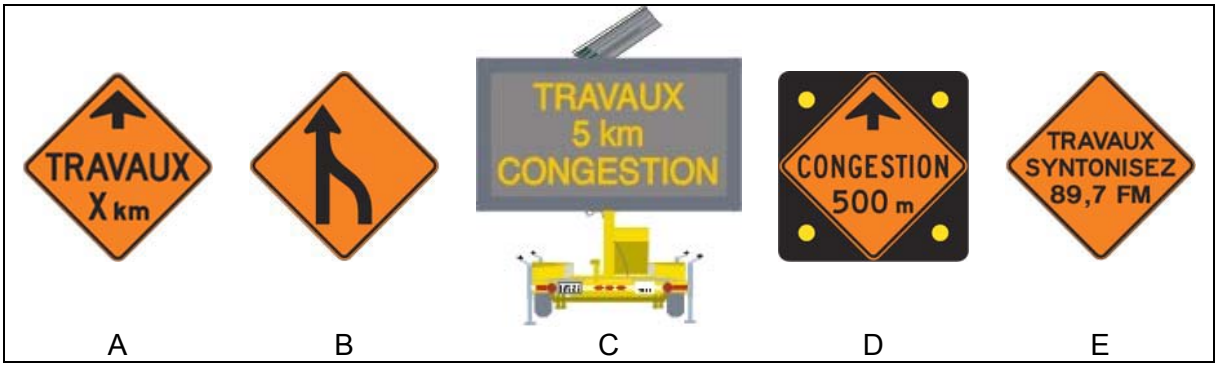

Figure 2: Traffic signs

2.1.1.4 Training

The Ministry has tightened its training requirements. It now requires that all Ministry flaggers and private contractors pass a special course. Work site personnel from traffic control companies must undergo basic flagging training. The basic flagging training requirement applies to all flaggers at a work site, whether they are Ministry employees or from a private contractor. This training is dispensed by an independent organization that is open to all, and the Ministry must approve its content. Proof that workers have successfully completed training must be included in all tenders.

2.1.1.5 Temporary Crash Cushions

Temporary crash cushions are used to improve worker protection in work zones that are exposed to traffic, and to improve driver safety when construction work or the layout of the work site has created new obstacles. Lateral crash cushions are used to protect the work area as well as to separate traffic lanes and redirect vehicles. Frontal crash cushions are used to reduce the intensity of impact on a fixed object.

The action plan prescribes the increased use of temporary crash cushions, notably for all long term work on structures and their surroundings, to isolate traffic lanes from work zones and other potential dangers, as well as for other long term work on 90 km/h or higher roads when workers are on traffic lanes. Vehicles equipped with a crash attenuator (see figure 3) are used to install signage and protective equipment for road work zones and to perform all mobile alkyd highway marking.

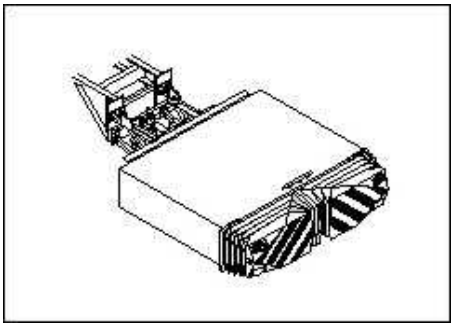

Figure 3: Truck-mounted crash attenuator

2.1.2 Signage

The Ministère des Transports du Québec has recently implemented a number of road work signage measures of note. Most, however, are improvements to measures already in effect.

Standardized designs: The Ministry has created a series of standardized road sign designs and developed guidelines for their use in four different work categories: very short term, short term, long term, and mobile. This bank of periodically updated standardized designs makes it possible to maintain high standards and ensure uniformity of signage in Québec road work zones. An example of their standardized use is given in figure 4 A.

Traffic Channelizer: The use of 1.2 meter high traffic channelizers (cone-shaped drums and beacons) made of light, flexible materials and that give on impact is now standard on highways for long term work (figure 4 B). Metal traffic channelizers are now used exclusively on roads where the speed limit is higher than 70 km/h, and they will be completely banned as of 2003.

Variable message signs: Variable message signs are recommended on shoulders or above traffic lanes. Signs should—

- Convey clear, simple, brief messages
- Use pictograms as often as possible
- Change as road work conditions change or accidents occur

This type of sign requires a real-time awareness of the state of traffic, not only in the road work zone, but also on the proposed alternate route, as the case may be. Remote monitoring of variable message signs ensures that the messages are relevant at all times.

Pictograms: The use of pictograms makes it easier for drivers to read road signs, particularly English-speaking tourists from Canada and the United States. In addition to arrows—the pictograms most often found on signs—figures and symbols indicating restrictions or instructions are also used.

Flaggers: The use of yellow-green vests is new. This vest makes flaggers more visible. In addition, the sign “arrêt/lentement” is now used on all road work sites, whether long or short term. The same is true for flags over the advance warning sign announcing that a flagger is present (figure 4 C).

Fluorescent orange coating: The use of signs with type V fluorescent orange coating is being standardized for all long and short term work on highways. This coating significantly increases visibility, especially during the day.

Alternate route: Some drivers seek to take alternate routes when congestion occurs unexpectedly, or in rush hour. “Alternate Route” signs give drivers a choice of alternate routes so they can avoid potential traffic problems caused by road work ahead (figure 4 D).

The Ministry makes it easier to use alternate routes by avoiding simultaneous road work on parallel highway corridors and by making maximum use of the residual capacity of affected roads. As the time available to perform road work grows increasingly short, better road work planning and the use of alternate routes are ways to optimize the time at the contractor’s disposal.

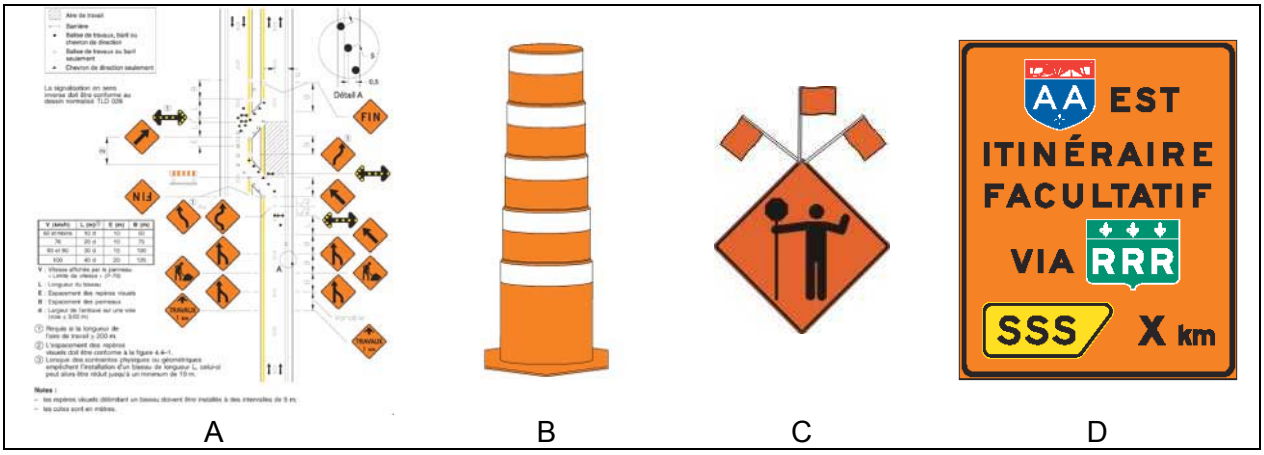

Figure 4: Signage measures

2.1.3 Traffic

Mitigation measures seek to promote the flow of traffic in construction zones. They are also designed for pedestrians, cyclists, and businesses that may be inconvenienced by road work.

Moveable barriers: Construction on high traffic roads causes two types of problems: dangerous work conditions and an increase in congestion caused by the interruption or slowing of traffic. Moveable barriers make it possible to increase the number of lanes open during rush hour and enlarge the work area afterwards while still providing a barrier that protects workers from vehicles. This equipment, shown in figure 5, moves laterally at a speed of 10 km/h. The system makes multiple configurations possible for different times of the day. It has proven its effectiveness as a traffic management tool and is welcomed by drivers.

Figure 5: Moveable barriers

Reducing traffic disruptions: Reducing traffic disruptions is an important measure, particularly for target work sites during critical periods. A critical period is a period when the flow of traffic is higher, due to a holiday, summer vacations, or an important event. As much as possible, work is started after morning rush hour and avoided on Mondays and after holidays. The same holds true for phase changes. In addition, work sites are emptied and traffic disruptions reduced on Friday afternoons before long weekends.

Camera network: A network of road surveillance cameras in various strategic locations in the Montréal and Québec City areas facilitates traffic management at large-scale construction sites as well as updates to radio traffic reports and variable message signs. Cameras also make it possible to identify situations that require rapid emergency response.

Special urban needs: In urban environments, additional measures may be necessary to lessen the impact of road work on the various road users (truckers, mass transit users, cyclists, pedestrians, etc.) as well as on local businesses and organizations. In addition to measures to reduce noise and dust, it may be necessary to encourage car users to switch to public transit (bus or train), install free parking, set aside lanes for vehicles with more than three passengers, or organize informational meetings and form a committee of businesspeople to pass measures and organize activities to eliminate the impact of road work on businesses. Providing alternate transportation services can ease pressure on the road network and reduce traffic during road work.

2.1.4 Work Site Management

Work site management measures reduce the inconvenience to road users and local residents. These measures include cooperation with partners, management by thoroughfare, work scheduling, lane rental, and noise management.

2.1.4.1 Cooperation with Partners

Cooperation with partners like police forces, municipalities, contractors, the tourism industry, the media, concerned stakeholders, public utilities, etc. is vital if the impact of road work on traffic is to be reduced. Cooperation makes it possible for everyone to work together.

In order to encourage ongoing discussion within the Ministry, a meeting of all road construction partners was arranged at the Summit on Road Work Contract Management in November, 2001. A number of possible solutions to current problems were put forward. One of the measures adopted at the Summit was to accelerate the contract awarding process. This makes it possible to begin construction projects earlier in the summer season, which means they can be spread out over a longer period.

Also, for all work sites where traffic flow is higher than 5,000 vehicles a day, the contractor must put someone in charge of signage. This gets contractors more involved in signage and traffic issues. A special work site meeting may also be organized before construction begins for the sole purpose of discussing these issues, with another during construction if necessary.

2.1.4.2 Management by Thoroughfare and Phase

Management by thoroughfare enables a better distribution of road work sites within a given region. It prevents work being done simultaneously on parallel highway corridors or repeatedly in the same sector of the road network. It also makes it easier to coordinate mitigation measures.

At the planning stage, we calculate the network's ability to meet demand during the road work not only in terms of traffic flow, but also accommodation of oversized loads, emergency services, and the transport of hazardous materials. Special measures may be taken such as splitting up work into different phases. Drivers are notified of major phase changes to ensure they have very up-to-date information on the progress of road work and on changes in the lane configuration within work zones. For large-scale work sites, users are given advance notice of the beginning of road work and any changes in configuration. These informative measures allow motorists to better plan their road travels, change their driving habits, or simply be more careful when driving through work zones.

2.1.4.3 Scheduling

In order to ease the impact on traffic flow, particularly in urban areas, the Ministry does most of its work after hours or at night whenever possible. It may also limit lane closing times to adjust for temporary increases in traffic, such as at rush hour or due to a special event. However, such measures may lead to a loss of productivity on construction sites as well as increased costs.

2.1.4.4 Lane Rental

Lane rental is a measure that imposes a fee on contractors for each lane they close. This is a financial incentive to the contractor to reduce the duration of lane closings. Each time contractors proceed with an authorized lane closing, the applicable fee is deducted from a set amount awarded to the contractor. When the work is finished, any balance left over goes to the contractor as a bonus, whereas any negative balance must be made up by the contractor as a penalty. The bonus or penalty cannot exceed the sum agreed upon in advance.

2.1.4.5 Noise Management

Very noisy reconstruction work such as demolition, which requires the use of percussion drills, can generate elevated noise levels as high as 80 to 90 dBA for local residents. When road work continues over a long period, mainly after hours and at night, the quality of life of residents living near work sites may be seriously affected.

The main noise reduction measure at work sites is to put the emphasis on informing and training the various workers (contractors, construction workers, supervisors, etc.) in order to change their work habits. In addition, the use of equipment producing less noise than traditional equipment such as Gentle Jack percussion drills, will gradually be mandatory for road work carried out in residential sectors. Figure 6 shows the brochure distributed to road workers.

Figure 6: Worker awareness brochure on construction site noise reduction

2.2 Work Methods

The duration of the construction and its intended durability play a big role in determining what type of work will be undertaken. Mitigation measures and their cost will depend on the approach selected and must therefore be included in the project design phase.

Rigorous technical and economic criteria must guide the selection process, which must also take into account all impacts on the road network. The recurrent costs incurred as a result of mitigation measures, traffic redirection, the need to reinstall signs, and the indirect cost of extending work over a number of years, are often substantial. In some cases, it has proven to be more profitable in the long run to rebuild a structure than to undertake repairs that would have been less durable and that would have led to recurring inconvenience.

A number of pavement reconstruction and maintenance techniques make it possible to increase the speed of road work and, as a result, reduce driver inconvenience. The main techniques used are presented in the section below.

2.2.1 Recycling of Work Site Materials

In addition to the many ecological advantages it presents, the on-site recycling of road materials such as asphalt and cement concrete from the existing pavement and structures makes it possible to significantly reduce the number of trucks traveling to and from the work site to dispose of old materials and bring in new materials. As a result, traffic around the work zone is reduced.

2.2.2 In-place road mixing with hydraulic binder

The Ministry routinely uses the in-place road mixing technique to repair certain sections of pavement. The addition of a binder to stabilize granular materials increases cohesion between granules and improves the material's overall mechanical properties.

The simple use of hydrocarbon binders only (emulsions and foamed asphalt) has gradually been replaced by the use of mixed binders that incorporate a certain amount of concrete in the hydrocarbon binder, usually ranging from 0.5% to 1.5%. The presence of a small amount of hydraulic binder has proven effective in reducing the stabilized material's curing time and in increasing its short-term mechanical properties. As a result, the repaired pavement can be returned to normal service faster.

2.2.3 Cold Asphalt Concrete Recycling

Cold asphalt concrete recycling is a repair technique that presents certain environmental and economic advantages. In fact, it makes it possible to fully recover bituminous residues, which then are used to make asphalt without heating the materials.

For most departmental works, cold asphalt concrete recycling is carried out entirely on-site using a recycling train, at a rate of 0.7 km to 2 km/day/lane. This equipment includes a milling machine, a crusher, a mixing unit, and a paver. Compaction follows and traffic is permitted 500 meters from the work site. This way, traffic is only impeded in one lane and can be restored the same day.

The cold recycling technique slows reflection cracking by several years compared to conventional bituminous overlay, where up to 70% of cracks reappear after the first year. The pavement's deterioration and aging are slowed by approximately 6 years. Moreover, the rutting rate is comparable to that observed on sections that have simply been covered with hot asphalt. These advantages make this a potentially beneficial process to further delay the need to begin new road work.

2.2.4 Fast-track Concrete Paving

Fast-track concrete paving has become a routine practice for repairing and rebuilding cement concrete road infrastructures. Depending on the time available and traffic constraints, the methods may vary. When used properly, fast-track concrete paving can lead to a decrease in traffic disruption or a reduction in the duration of construction work while providing a durable and high quality product.

As for the material itself, the concrete mixture can be modified by—

- Using a quick-setting concrete (type 30)
- Increasing the concrete's temperature based on the ambient air and foundation temperature
- Using plastic covers for curing and to maintain the temperature
- Reducing the water/concrete ratio
- Using a material with open grading
- Using appropriate and compatible admixtures

There is more to fast-tracking than simply using quick-setting concrete. It is a comprehensive construction approach that draws on a variety of techniques to hasten reconstruction. As such, the planning and organizational aspects presented in chapter 2 are an integral part of the fast-track process.

2.2.5 Trenchless Techniques

Numerous culvert structures are necessary to allow water to cross a road. Like pavements, these structures need to be rebuilt when they show signs of deterioration. The traditional technique consists in excavating the culvert, repairing or replacing it, then backfilling it. This method requires major excavations when the culvert is located under a large embankment, and thus causes major inconvenience to drivers while damaging the infrastructure, the foundation, and the texture of the pavement.

Trenchless culvert reconstruction techniques reduce the inconvenience of excavation. The main on-site reconstruction techniques used in Québec include—

- Inserting a steel, reinforced concrete, or high density polyethylene pipe or a multiplate conduit into the existing conduit and then filling the annular space between the old and new conduits
- Installing steel plates and a truss anchored on sturdy parts of the culvert, then using shotcrete to completely repair the deteriorated portion of the conduit.

3. Informing the Public

In terms of communication, the challenge is to stress the importance of the planned road work in improving the road network, while seeking driver cooperation to facilitate the process and ensure work site safety. In addition to informing road network users of the cost and type of road work, as well as when and where it will occur, certain measures seek to encourage drivers to change their behavior and, in some cases, their travel routes.

3.1 Information and Advertising Campaign

The Ministère des Transports unveils its annual road work schedule at the beginning of the year. This is an opportunity to release a summary list of major construction sites that will be launched across Québec. Subsequently, regional press conferences presided by political or administrative authorities present the primary work sites slated for each region. While the work is ongoing, close contact is maintained with the media.

Press releases are regularly distributed to update the public on work in progress, traffic disruptions, phase changes, and alternate routes. They mainly concern major work sites and construction affecting major traffic arteries, but they also cover work sites of note for other reasons, such as their proximity to popular tourist attractions. Press releases are also published when traffic is expected to increase, notably before holidays and during the summer vacation and the back-to-school periods. Aside from being released on the news wires, press releases are sent to traffic reporters and Ministry partners, including the police and ambulance services.

In addition, a team of officers and computer technicians is responsible for the dissemination of information on road closings, incidents, or accidents on the road network. The messages are broadcast by a pager service to which all traffic reporters and electronic media subscribe. This service provides subscribers with real-time information on what is happening on the road network as well as on road closings and reopenings.

During the construction period, public announcements are also broadcast on radio to encourage drivers to slow down and obey the road signs and flaggers. The main purpose of these messages is to foster greater goodwill with regard to traffic disruptions and encourage greater respect for road work signs, notably speed limit signs and instructions from flaggers. For major work, drivers are asked to make an even bigger contribution by changing their travel routes, carpooling, or using the modified mass transit services for the duration of the construction.

Radio campaigns are rounded out with print media messages on the nature and progress of the road work. These messages are designed to inform the public about the construction work: type and duration, disruptions, alternate transportation, etc. They are generally published in the weekly press in regions where construction is taking place. They can sometimes take the form of leaflets, inserts, or handout sheets intended for people affected by the construction. Inserts are also placed in the trade press in order to reach certain types of users, notably drivers of heavy vehicles and transport companies. Lastly, signs showing the information campaign slogan are installed at and around the work site itself to encourage motorists to drive with caution.

The Ministry has also concluded a cooperation agreement with the specialty TV station Météomédia to broadcast 60 second news reports twice an hour between April and October. They focus on major work sites in the Montréal area and on major Québec highways. Thirty-second vignettes on safe driving in construction zones are also broadcast after these news updates.

Studies on the effectiveness of these measures in previous years have shown that road users are receptive to the safe driving messages and feel it is important to have information on work in progress, particularly its duration. Polls also indicate that construction zone safety is a big concern of road users.

3.2 Information Network

As part of mitigation measures in the Montréal area, a special information network made up of traffic reporters and Ministry employees was set up to provide continuous, real-time updates on the current road situation. Each member possesses a transmitter-receiver using Montréal police radio waves. During rush hours, Ministry officials transmit information collected on road conditions, which is used by traffic reporters to notify drivers via radio or television.

3.3 Road Works Info

The Road Works service of the Ministère des Transports du Québec is designed to give drivers information on the location of road work sites, their duration, traffic disruptions, and suggested alternate routes. This information lets drivers know if there is road work in progress on the route they have chosen and how to change their route if necessary. The Road Works service is free and in effect 24 hours a day by phone and via the Ministry's Website.

The telephone service is available throughout Québec via toll free numbers for each individual region as well as a special line for wireless (cellular) Bell Mobility subscribers. This system provides standard information on traffic disruptions caused by road work via a menu that lets callers select the desired region and route.

The Road Works information pages on the Ministry's Website contain information on the exact location of work sites, type of work in progress, start and end dates, resulting traffic disruptions, lane closings, and trucking restrictions. This information is updated daily and the Website pages reload every fifteen minutes.

The information is accessible either by directly selecting the region or route, or by consulting the road map that shows the road work sites. Figure 7 is an example of the map generated by the Road Works info Website. The map makes it possible to quickly get an idea of all road work in progress across Québec. On the map, each work site is represented by a traffic cone that indicates by color the scope of traffic disruptions caused by road work: green (no disruption), yellow (traffic disrupted during the week only), red (traffic disrupted during the week and weekends) or blue (traffic disrupted on weekends only).

When a route is selected, a window containing information on all the work in progress on the road in question opens automatically. When a traffic cone is selected, a window with information on the work site automatically opens.

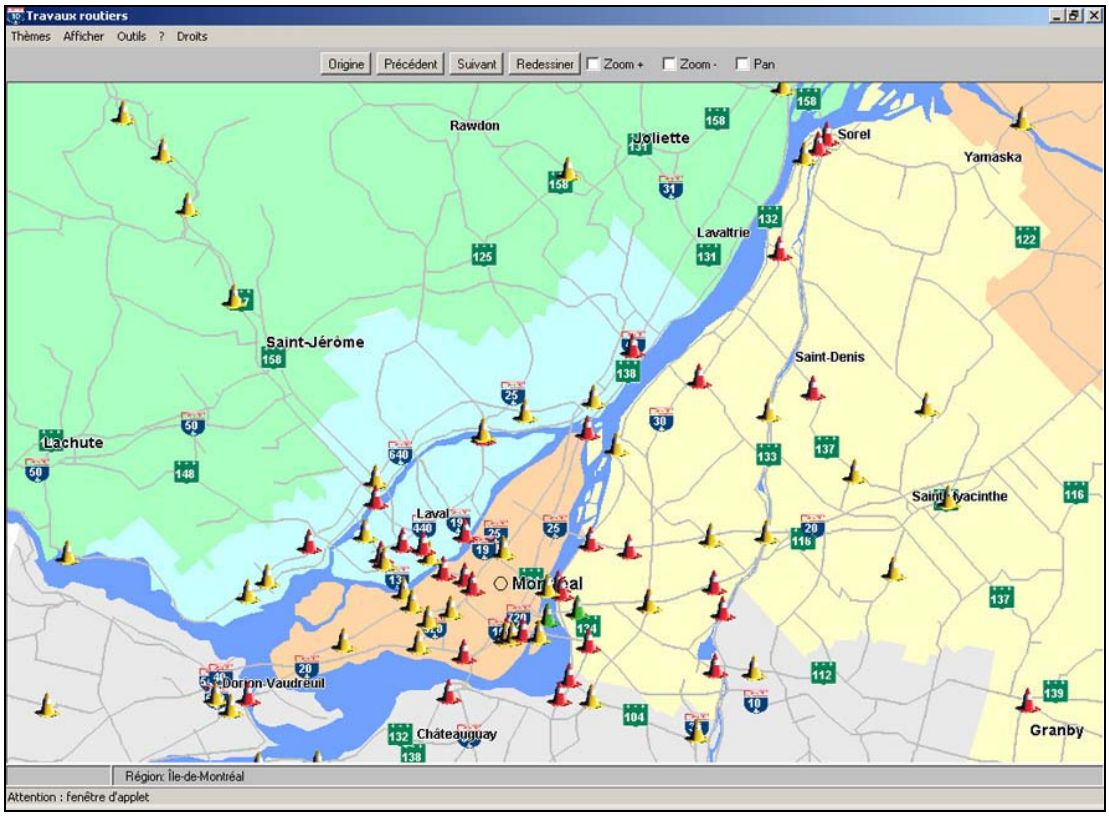

Figure 7: Map generated by the Road Works Website showing road work sites

4. Road Work Assessment

A final inspection to ascertain that the road work complies with the plans and specifications is standard practice in the field. However, there is also an increasing tendency to evaluate the effectiveness of the mitigation measures taken to reduce inconvenience for drivers and local residents by comparing them to the objectives set before construction. Those in charge of the project must write up a summary of the strengths and weaknesses noted in their work site management process. For projects with a major impact on the road network, a meeting of main partners is held to complete the evaluation process. The conclusions help contribute to the ongoing improvement of the process.

Studies of several construction sites have identified the following benefits brought about by mitigation measures:

- Significant decrease in backups
- Increase in safety for drivers and workers
- Less disruption for local residents: noise; dust; difficult access to residences, businesses, and industries; and loss of enjoyment of the surroundings
- Maintenance of reasonable travel time for emergency vehicles
- Increased cooperation between partners and local stakeholders, thereby reducing the risk of disputes regarding the work

- General increase in the satisfaction of drivers, local residents, and partners
- Improvement of the Ministry's image in terms of its management of public funds
- Positive perception of users regarding the Ministry's capacity to manage traffic during the road work in a way that takes their needs and expectations into consideration

At year end, a study on campaign impact is carried out to gain a general idea of the effectiveness of the information provided to road users and to gather user comments on how the work was performed. For certain major sites, notably those that required a large number of mitigation measures, the communications strategy calls for intermittent communication with the public via media inserts and, in some cases, even billboard advertising to thank drivers for their cooperation.