

## **Non-Traditional Safety Measures on Highway Construction Site**

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## **Abstract**

This technical paper presents a comprehensive evaluation of non-traditional safety measures implemented during the construction of a reserved lane on Highway 15 in Quebec, specifically between Blainville and Mirabel. The study focuses on the innovative use of painted shield pavement markings as a visual aid to enhance driver navigation and safety during the relocation of exit ramp 35. Drawing inspiration from historical practices such as those on U.S. Route 66, the painted shields were strategically placed to compensate for the temporary removal of overhead signage. The effectiveness of these measures was assessed through collision data analysis, video surveillance, and a survey conducted among provincial police officers. Results indicate a positive impact on road safety, with a majority of respondents acknowledging the usefulness of the painted shields in reducing collisions. Additionally, the integration of a cloud-based document-sharing system improved coordination between the construction team and the law enforcement. The findings support the broader adoption of painted pavement markings and digital collaboration tools as effective strategies for enhancing safety and operational efficiency on highway construction sites.

## Introduction

Highway 15, known as the Laurentian Highway, is a vital artery in Quebec connecting Montreal to northern regions. Highway 15 is not only an essential transportation route for daily commutes and commerce, but it also offers leisure and discovery opportunities along its path. Between exits 25 and 35, it passes through the cities of Blainville and Mirabel, offering a mix of suburban and rural landscapes. This section of the highway is bordered by points of interest such as Premium Outlets Montreal and the Bois de Belle-Rivière Regional Educational Park, attracting both residents and visitors.

Beginning in June 2023, Highway 15 has been undergoing construction to add a reserved lane in the northbound direction in the Blainville and Mirabel sectors. The project spans approximately 8 km northbound and southbound.

As part of the ongoing commitment to improve the quality and efficiency of services, a thorough technical analysis of the use of painted shields on Highway 15 has been conducted. This technical note aims to provide a detailed evaluation of the technical aspects.

To enhance the efficiency and simplify the operations of the provincial police at construction sites, the surveillance team has created a dedicated folder within OneDrive. This folder is designed to streamline the process of sharing construction site plans, ensuring that the police have easy access to all relevant plans and documents. Regular updates to the folder maintain its effectiveness, providing the police with the most current and accurate data to support their efforts on construction sites.

The results of this evaluation are presented in this document, with the goal of guiding future decisions and ensuring the continued success of the use of painted shields on highways and maintaining effective use of the Cloud with the provincial police.

## Painted Shields on Highways

The practice of painting shield markings directly onto the pavement has an interesting history, particularly associated with Historic U.S. Route 66, often referred to as the "Mother Road," is famous for its iconic shield signs that marked the highway. However, these shield signs were frequently stolen by souvenir hunters, eager to take home a piece of the legendary route. To address this issue, many locations along Route 66 began painting or stenciling the U.S. Route shield directly onto the pavement. This approach not only helped preserve the route's identity but also provided clear visual cues to drivers, enhancing road safety and navigation.

The painted shield markings became a distinctive feature of Route 66, contributing to its charm and historical significance. Today, these markings can be found along various segments of the route, serving as a reminder of its storied past and the practical solutions adopted to maintain its legacy.<sup>1</sup>

Route shield pavement markings are allowed by the Vienna Convention on Road Signs and Signals. They are used in many countries, including the US, France, UK, and Germany. In North America. These markings are covered by the 2009 edition of the MUTCD. A 2010 study by the Texas A&M Transportation Institute found that route shield pavement markings combined with directional arrows were more effective than overhead guide signs in stressful situations.

## Overview

The Laurentian Highway sees a significant number of vehicles each day. Between exits 25 and 35, the Annual Average Daily Traffic (AADT) is high due to the population density and commercial activities in the cities of Blainville and Mirabel. In 2023 and in 2024, the AADT for this section of Highway 15 was approximately 154,000 vehicles per day.<sup>2</sup>

The construction of a temporary deviation was necessary during the work near km 35, and the exit ramp 35 had to be relocated. Since this exit cannot be closed, particularly because it connects to Highway 50, it was moved as illustrated in the following figure dated June 4, 2024, and it was dismantled on November 18, 2024:

Figure 1. Location of Exit Ramp 35



To allow the progress of the work, the overhead sign indicating exit 35 towards Highway 50 had to be dismantled. To facilitate access to exit 35 for road users, the painted shields were installed at the following two locations:

- Around km.31,5
- Around km.31,7

These visual markers, including painted shield and work zone signs, assist drivers in locating the exit effortlessly, even in the absence of overhead sign structures that were removed during construction. The strategic placement of these painted shields ensures that drivers receive clear and effective guidance. The arrangement of the painted shields is detailed in the following table:

Table 1. Arrangement of the Painted Shields

Left lane	Middle lane	Right lane
Straight arrow	Straight arrow	Right arrow
Highway 15	Highway 15	Highway 50

The arrows provide clear directional guidance to drivers, enabling them to make informed decisions about their route. These arrows indicate whether drivers should stay on the Highway 15 or switch to Highway 50, ensuring smooth and efficient navigation. The strategic placement of these arrows minimizes confusion and enhances road safety by clearly marking the available options. The following picture illustrates the painted shields and their corresponding positions, further aiding drivers in understanding their route choices:

Figure 2. Painted Shields on the Highway 15



These visual aids are designed to complement the arrows, providing comprehensive guidance to drivers as they approach the decision point.

## Description of Painted Shields

This section provides detailed information on the type of paint used for highway markings, highlighting their advantages and disadvantages, as well as outlining the steps required to implement the painted shields.

### Type of Paint

The type of paint used was water based acrylic paint. It is known for its quick drying time, high reflectivity, and low environmental impact.

Water-based paints were chosen for highway markings because they offer significant environmental advantages, dry quickly, and are highly durable. These paints contain low levels of volatile organic compounds (VOCs), reducing air pollution and health risks for workers and the public. They dry quickly, minimizing traffic disruptions during application and allowing roads to be reopened sooner. Additionally, water-based acrylic paints offer high reflectivity and strong adhesion to asphalt and concrete surfaces, ensuring long-lasting visibility and safety under various weather conditions. Their ease of application and maintenance further enhances their suitability for road marking projects.<sup>3</sup>

The removal process was carried out smoothly and efficiently. The painted shields were successfully erased without any complications, preparing the area for the next phase of the project. This step ensures that the surface is clean and ready for the upcoming tasks, allowing for a seamless transition to the next stage.

### **Advantages and Inconveniences**

Painted road shields on the pavement are commonly used to convey important information to drivers, such as bicycle lane symbols, directional arrows, and school zone markings, which are essential elements of road signage.

One of the main advantages of painted road shields is their visibility. They are easily noticeable by drivers, even from a distance, allowing for quick and appropriate reactions. Large painted shields with contrasting colors, such as white on black asphalt, are particularly effective in attracting attention. Similarly, adding painted shields to a construction site offers several benefits. Enhanced visibility is one of the primary advantages, as they can make the site more noticeable, helping to guide traffic and improve safety. Furthermore, they can be part of informational signage that provides important details to the public, ensuring that everyone is well-informed about the construction activities.

However, there are also inconveniences to consider. One major issue is visual clutter; too many painted shields can create a crowded visual environment, making it harder for drivers and pedestrians to focus on essential safety signs. The cost of designing, producing, and installing painted shields can add to the overall project expenses, which might be a concern for budget-conscious projects. Maintenance is another inconvenience, as painted shields require regular upkeep to remain clean and visible, adding to the workload.

No maintenance issues were encountered in this case, as the work took place between June and November, avoiding winter conditions. However, if work had occurred during the winter months, paint fading issues would have been a possibility.

### **Steps to Implement Painted Shields**

For the Highway 15 project in Mirabel, the following table describes the steps to implement painted shields on the highway, including the duration of the work and other relevant details:

Table 2. Steps to Implement Painted Shields on the Highway

Steps	Description	Estimated Duration
1. Planning	Define the locations and dimensions of the painted shields	1-2 weeks
2. Installation	Install the painted shield on the highway, adhering to safety measures	2 nights per location
3. Maintenance Schedule	Regular inspections during site tours and maintenance work as needed	Continuous (as required)

By following these steps, the painted shields and directional arrows can be effectively implemented, providing drivers with clear and reliable guidance.

## Collision on Highway 15

This section is divided into two parts: the first part covers collisions reported by provincial police, site supervisors, or the Transportation and Sustainable Mobility Quebec management center, while the second part focuses on collisions identified through surveillance video footage.

### Noted Collision on Highway 15

The recorded collisions span from June 4, 2024, to November 18, 2024, coinciding with the relocation of exit ramp 35 northbound. During this period, a total of 22 collisions were reported by provincial police, site supervisors, or the Transportation and Sustainable Mobility Quebec management center. Among these incidents, 14% were directly associated with exit ramp 35. The implementation of the painted shields likely played a role in mitigating the number of collisions by enhancing the visibility and comprehension of road signs for drivers. These visual aids provided clearer guidance, helping drivers navigate the area more effectively and reducing confusion, which in turn contributed to improved road safety during the construction phase.

### Observed Collision on Highway 15 with Video

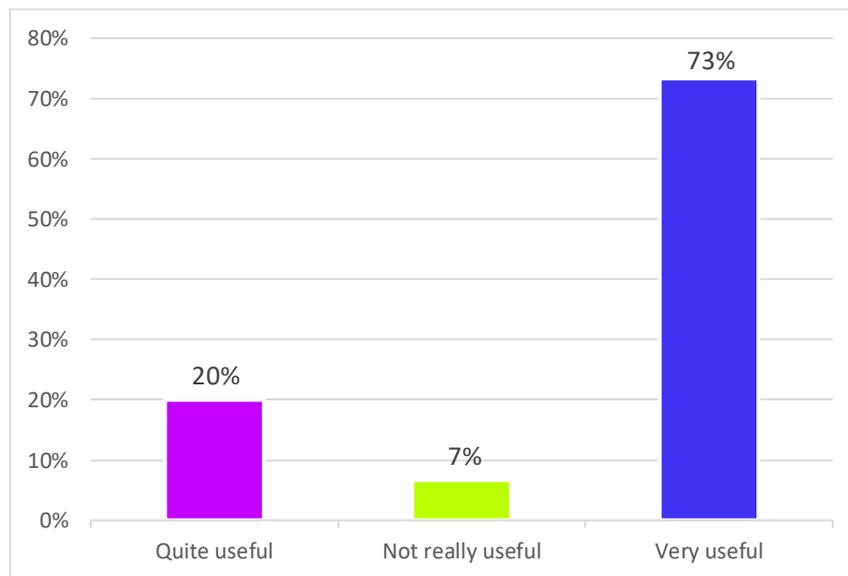
To ensure site compliance, supervisors regularly visit and film the site. These visits are crucial as minor collision can occur without immediate intervention and often go unnoticed. By thoroughly analyzing video footage from June 4, 2024, to November 18, 2024, additional incidents were identified. When these newly observed incidents are combined with the previously reported collisions, it was found that 7% of the total collisions during this period were related to exit ramp 35. This comprehensive approach to monitoring and reporting helps in understanding the full scope of safety issues and contributes to more effective measures for improving road safety.

## Provincial Police Survey

To enhance safety on Highway 15, a cloud-based platform was established with the approval of the Transportation and Sustainable Mobility Québec, enabling provincial police agents to issue tickets more efficiently. This initiative has led to a frequent police presence on the site, contributing to improved traffic management and enforcement.

A survey was conducted among provincial police agents to gather their opinions on the effectiveness of the painted shields. The survey revealed that 100% of respondents had traveled Highway 15 north between km.31 and km.35 since mid-June. The second question focused on the perceived usefulness of the painted shields on Highway 15 North. The results are as follows:

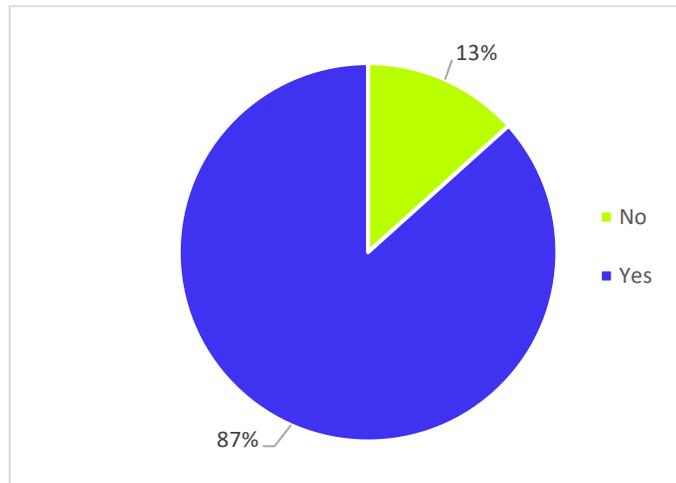
Figure 3. Usefulness of Painted Shields on Highway 15 North



According to the survey results, 73% of respondents deemed the painted shields on Highway 15 north very useful, while 20% found them quite useful, and 7% did not find them useful. These statistics indicate that most agents value the presence of these painted shields, suggesting that their implementation could be beneficial on other highways as well. The positive feedback highlights the significant role these visual aids play in enhancing driver awareness and overall road safety. By providing clear and effective guidance, the painted shields help reduce confusion and improve navigation, emphasizing the importance of incorporating visual aids in traffic management strategies. This success could serve as a model for similar initiatives on other roads, further promoting safe and efficient transportation.

The final question of the survey focused on assessing the impact of the painted shields on the highway and their role in reducing the number of collisions. This question aimed to gauge whether users perceive a correlation between enhanced signage and improved road safety. By understanding the opinions of the respondents, the survey sought to determine if the presence of these visual aids contributes to a safer driving environment. The responses to this question are crucial in evaluating the effectiveness of the painted shields in guiding drivers and preventing collision. Positive feedback would support the idea that clear and well-placed signage can significantly enhance driver awareness and reduce the likelihood of collisions, thereby promoting safer highways.

Figure 4. Impact of the Presence of Painted Shields on the Highway and Their Contribution to Reducing Collision



According to the survey, 87% of respondents indicated that they believe the painted shields contribute to reducing collisions, while 13% did not share this view. These results demonstrate a predominantly positive perception of the effectiveness of the painted shields in enhancing road safety. The high percentage of affirmative responses suggests that most users recognize the value of clear and well-placed visual aids in improving driver awareness and navigation. This positive feedback underscores the importance of effective signage in traffic management and supports the idea that such measures can significantly contribute to safer driving conditions. The findings highlight the potential benefits of implementing similar visual aids on other highways to further promote road safety.

### Cloud Database Used by the Authorities

A dedicated folder within OneDrive was created by the surveillance team to streamline the process of sharing construction site plans with the provincial police. This initiative aims to simplify their operations and enhance efficiency when they are on-site. The folder contains all relevant plans and documents, ensuring that the police have easy access to the information they need.

To maintain its effectiveness, the folder is regularly updated with the latest documents. This ongoing maintenance ensures that the police always have access to the most current and accurate data, further supporting their efforts on construction sites.

Figure 5. Folder for Police Construction Site Plans

Répertoire SQ				
	Nom	Modifié	Modifié par	Taille du fichier
	Plans de fermeture (nuit)	16 août 2023	Legault, Rock	15 éléments
	Plans de fermeture (maintien)	16 août 2023	Legault, Rock	2 éléments
	Périmés	16 août 2023	Legault, Rock	126 éléments
	20241009-Mémo-GC-Introduction Cloud SQv1.pdf	9 octobre 2024	Tufenkjian, Jessica	2,72 Mo
	20241009-Mémo-GC-Conformité SQv3.pdf	9 octobre 2024	Tufenkjian, Jessica	91,3 Ko

The folder is organized into several subfolders, including those for night-time closure plans and long-term closure plans, each updated as needed. Additionally, there is a folder for all the old plans, in case there is a need to access information from a previous date.

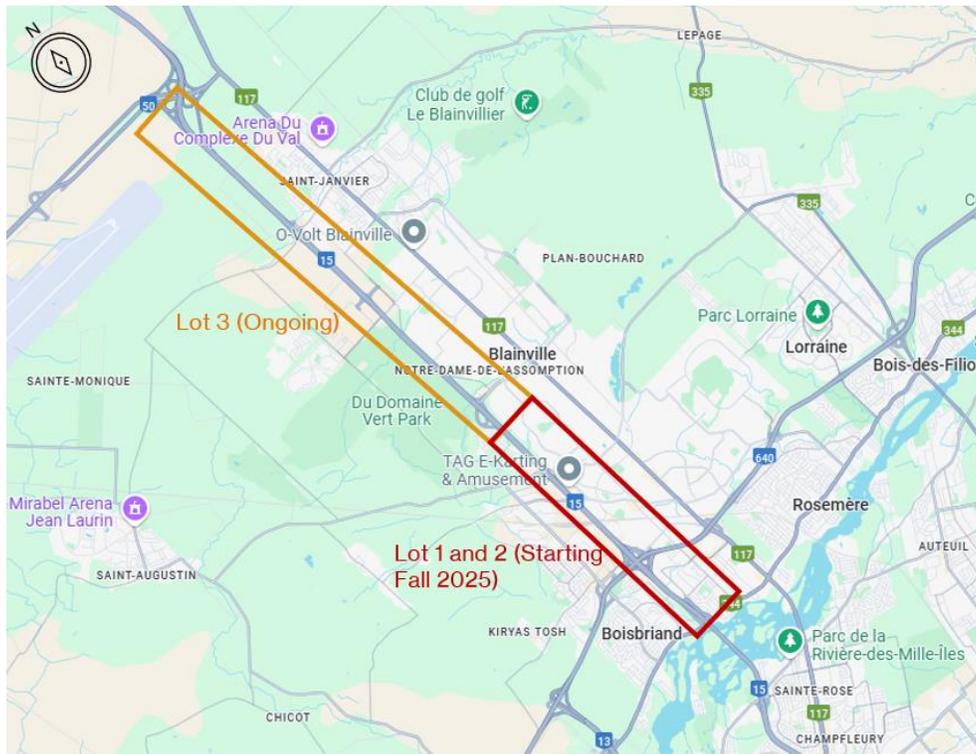
One of the documents is an introductory memo about the collaboration with the provincial police and the use of a shared cloud directory. The memo emphasizes the need for police agents to document infractions issued at construction sites to prevent disputes. It addresses the administrative burden on agents and suggests utilizing existing information from the Ministry of Transportation of Quebec to assist the provincial police and prosecutors. The memo outlines the types of plans and reports available in the cloud directory, including sealed signalization plans, contractual requirements, daily inspection reports, and video documentation. This initiative aims to provide both real-time and historical data to support police agents in their duties, ensuring compliance and efficiency.

The other document is a memo regarding the compliance of signalization for construction projects managed by the Ministry of Transportation Quebec. It outlines the contractual requirements for signalization plans, which must adhere to regulatory and normative standards as specified in Volume V, Traffic Control Devices. This volume covers the comprehensive standards for traffic control devices on highways and bikeways. The memo emphasizes the contractor's responsibilities to install, maintain, and inspect the signalization daily to ensure compliance. Additionally, regular inspections by supervisors are conducted to ensure adherence to contractual requirements and signalization standards.

### **Upcoming Projects**

An upcoming project will involve collaboration with the authorities using the same cloud-based platform. This system, previously implemented with success, enables real-time access to construction site plans and signalization documents. By maintaining a centralized and regularly updated folder, the goal is to streamline communication, enhance coordination, and support the operational efficiency of provincial police and other stakeholders throughout the project.

Figure 6. Upcoming Project Lots 1 and 2



Source: Google Maps, 2025

The map illustrates the Highway 15 project to add a reserved lane in the northbound direction, highlighting two key areas. Lot 3, shown in orange, represents the section where construction work is currently ongoing. Meanwhile, Lots 1 and 2, marked in red, indicate the next phase of the project, which is scheduled to begin in Fall 2025.

Other potential projects may involve collaboration with additional surveillance teams. This expansion aims to standardize our approach across multiple sites, ensuring consistent coordination, data sharing, and operational efficiency.

## Conclusion

In conclusion, the implementation of painted road shields on Highway 15 appears to be a promising measure for enhancing road safety. These visual aids offer clearer guidance and improved visibility, which may contribute to reducing collisions. Survey responses from provincial police agents indicate that a significant majority find the painted shields very useful and perceive them as beneficial for collision prevention. While these findings are encouraging, it is important to note that the absence of a control case, limits the ability to definitively attribute improvements in safety to the painted shields alone. Nonetheless, the positive feedback suggests that similar interventions could be worth exploring on other highways.

During the relocation of exit ramp 35 northbound between June 4 and November 18, 2024, 22 collisions were reported, with 7% related to the ramp. The addition of painted shields likely played a role in reducing collisions by improving visibility and comprehension of road signs.

Overall, the findings emphasize the importance of effective signage in traffic management and support the idea that clear and well-placed visual aids can significantly enhance driver awareness and contribute to safer driving conditions. The success of the painted shields on Highway 15 serves as a model for similar initiatives on other roads, promoting safe and efficient transportation.

Moreover, the creation of a dedicated folder within OneDrive by the surveillance team has significantly streamlined the process of sharing construction site plans with the provincial police. This initiative aims to simplify their operations and enhance efficiency when they are on-site. By ensuring that all relevant plans and documents are easily accessible, the folder supports the police in their duties, promoting better coordination and effective management of construction site activities. A shared cloud-based platform will once again be utilized in collaboration with the authorities for upcoming projects.

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## References

<sup>1</sup> Austin Whittall, "Find the painted shields". Location: TheRoute-66 (2024)

<sup>2</sup> Ministère des Transports et de la mobilité durable, "Débit de circulation". Location: Données Québec (2025)

<sup>3</sup> L. Nanjing Roadsky Traffic Facility Co., "What Type of Paint Is Used for Pavement Marking?". Location: Données Québec (2010)