
Maintenance of the Highway Infrastructure: An Overall Strategy for Highway Maintenance



Ministry of
Transportation

Research and
Development Branch



Ontario
Ministry of
Transportation
Research and
Development
Branch

Maintenance of the Highway Infrastructure: An Overall Strategy for Highway Maintenance

Author(s): R. Carney

Date Published: March 1985

Published by: R&D

Contact Person: Pavements & Roadway Office 235-4742

Abstract:

Comments: Presented at the Symposium on Transportation Technology, Riyadh, Saudi Arabia, April 13 to 15, 1985

Key Words:

**Copyright
Status:**

Crown copyright © 1992 Ministry of Transportation

Maintenance of the Highway Infrastructure: An Overall Strategy for Highway Maintenance

R. Carney

Published by
The Research and Development Branch
Ontario Ministry of Transportation

Published without prejudice as to the application of the findings.
Crown copyright reserved; however, this document may be reproduced for non-commercial purposes with attribution to the Ministry.

For additional copies, contact:
The Editor, Technical Publications
Room 320, Central building
1201 Wilson Avenue
Downsview, Ontario
Canada M3M 1J8

Telephone: (416) 235-3480
Fax: (416) 235-4872

March 1985

Table of Contents

1/ Introduction	1
2/ Infrastructure.....	2
3/ Organizational Structure	3
4/ Corporate Direction	5
5/ Funding Process.....	6
6/ Maintenance Management System.....	6

1/ INTRODUCTION

During the early history of Ontario, settlements grew up along the vast and numerous lakes and rivers in order to maintain communication links with neighbours and the rest of the world. It soon became apparent that these natural communication links were not sufficient to satisfy the transportation needs of a growing population and developing society. Overland travelways emerged. With the increase in roadway mileage, it became necessary to organize a system to ensure rational and consistent development and support of these highways.

In 1917, the Government of Ontario, through the Ontario Department of Public Highways, initiated the Provincial Highways Program. Today, the Ministry of Transportation and Communications continues this tradition of service.

The development of the Provincial Highways Program has been one of steady and continuous growth. During the 20s, a need to reach into frontier areas was observed, and this necessitated administrative and construction initiatives. During the 30s and 40s, economic pressures compelled greater co-ordination of road transportation services, which resulted in the merging of many miles of roads into a provincial highway system of major extent. The economic boom period of the 50s and 60s saw growth and dispersion of the population, as well as a rapid rise in vehicular ownership and use. This required further expansion and improvement of the highway system. The 70s began a transitional phase for the highway system. Widespread expansion now gave way to system stability. A highway system was in place, which had both extent and quality to meet Ontario's needs. In the 80s a major thrust is being made towards maintaining the integrity of the system, in addition to addressing specific areas of growth requiring capital expenditures for new and improved roads.

This paper presents an outline of the manner in which the ministry of Transportation and Communications maintains its highway system as one of the finest in the world.

2/ INFRASTRUCTURE

The province of Ontario occupies an area of some 1 068 000 km² and supports a population in excess of 8.5 million people. The land is diverse in geography and use. The southern portion of the province is relatively flat and fertile. It is in this area where most of the population lives and works within highly urbanized centres. The relatively flat and fertile terrain supports an economic base of agricultural and industrial interests. The vast northern portion consists of some 803 000 km² and supports forestry and mining interests. The population tends to be concentrated around small cities, towns, and communities, considerable distances apart. This part of Ontario tends to be remote and largely uninhabited, but the forest industries and large mines in the area generate a substantial part of the province's exports and, thus, require good high-speed highways capable of carrying heavy vehicles. A first-class highway through this remote area also facilitates the shipment of manufactured goods to the western provinces, which are utilized in their agricultural, mining, and petroleum industries.

To support the diverse transportation needs of the people of Ontario, the province currently has direct jurisdiction over a highway system which is 21 500 km long. In addition, more localized road transportation needs are addressed by a network of roads, totalling 131 000 km in length, under the jurisdiction of local municipal governments, which receive much of their road funding, specifications, and standards from the Ministry.

The diversity of the provincial highway system is demonstrated by the 12-lane urban freeway incorporating a sophisticated freeway traffic control system and multi-level interchanges in the metropolitan area of Toronto and, at the other end of the spectrum, by the many kilometres of two-lane gravel roads providing access to remote resource and tourist areas of the north. Included in this diverse system are tunnels (under the Welland Canal), ferries, and a wide variety of bridges, ranging from the humble structure on a minor two-lane highway all the way to the \$38 million skyway structure currently under construction.

3/ ORGANIZATIONAL STRUCTURE

To ensure that the highway network is maintained to an appropriate standard, there has developed over the years a mature and well-defined organization charged with that responsibility.

The Ministry itself, in organizing to address the transportation and communications requirements of Ontario, is structured along the lines of its five program areas: Transportation Regulation, Provincial Transportation, Municipal Transportation, Communications, and Provincial Highways.

The Provincial Highways Program covers the three elements of designing, constructing, and maintaining the province's road network.

For program delivery purposes, the Ministry is divided, on a geographic basis, into five Regions, each under the jurisdiction of a Regional Director. Within each Region there are a number of Districts (18 throughout the province) under the control of a District Engineer, who reports to the Regional Director. It is these Districts which carry out the day-to-day maintenance of Ontario's highways.

Within each District, the routine maintenance operations are carried out by patrol areas, about 270 of them across the province. Their work includes minor pavement maintenance, grading of gravel surfaces and shoulders, drainage maintenance, and highway surveillance, to prevent any obstructions or failures of the system from jeopardizing the safe passage of motorists.

These crews operate out of depots which are outfitted with complete modern facilities to store maintenance materials and to store and service maintenance equipment.

In some remote locations where accommodation is not available, the Ministry provides all of the facilities required for the workers to live at the site.

A modern radio system provides communication between all crews and the District Office.

These crews are also responsible for snow and ice control during the winter which, in Southern Ontario, extends from about mid-December to late March. In the North, winter comes a few weeks earlier and, similarly, stays later.

The District organization also contains specialized crews for such work as pavement marking, minor bridge repairs, electrical work (illumination and traffic signals), landscaping and right-of-way vegetation control, and major pavement maintenance. In support of these varied functions, each District has a highly skilled equipment repair and maintenance staff which is capable of maintaining all of the specialized Ministry equipment in modern fully equipped facilities.

The Ministry is turning to the private sector to perform a greater proportion of the maintenance effort. Studies have shown that savings can be realized when the private sector can schedule the work to utilize existing equipment, and this frees up Ministry resources for other work. The Ministry has evaluated most maintenance activities to determine where the best returns from privatization can be realized. Specifications, tender items, and payment methods have been developed for each of the activities. In some cases, it was necessary to assist the contractors to prepare suitable purchase specifications for specialized equipment with which they were not familiar and to train their operators.

At the Regional Headquarters, the Regional Director receives support in the maintenance area from the Regional Maintenance Engineer who, with his staff, also provides advice and assistance to the Districts. A major function of the Regional Maintenance Engineer's office is in the area of budgetary allocation and control, and in this he provides a strong link between the Districts and Head Office.

In the Ministry's Head Office, the Executive Director, Highway Operations and Maintenance, is the functional head within the Provincial Highways Program, responsible for ensuring that the various aspects of the maintenance sub-program are given appropriate direction and funding.

Reporting to the Executive Director, the Director of the Maintenance Branch is responsible for the development of policies in the maintenance area, for providing a source of technical expertise, for recommending the appropriate allocation of funds, for monitoring the performance and spending at the District level, and for developing long-range plans for the maintenance activity, which are in line with the Ministry's corporate objectives.

The Maintenance Branch provides expertise to the Districts and Regions in the areas of equipment selection, pavement marking, sign manufacture, electrical repairs, landscaping design, arboriculture, and systems. The Equipment Engineering Office acquires equipment and provides the Districts with specialized expertise in the methods of equipment maintenance, repair garage design and construction, and garage operation.

Comprehensive training programs are prepared by the Head Office sections to ensure that the District staff are competent to operate new sophisticated equipment and use maintenance materials effectively. The District mechanics are also provided with training on new equipment features, and an extensive apprentice program is in place.

4/ CORPORATE DIRECTION

The Ministry's corporate direction is developed through a thorough, periodic examination of the variety of issues which have to be addressed in meeting the transportation and communications needs of the people of Ontario. A carefully structured strategic planning process accommodates the review of issues at all management levels and in both the policy-making and program delivery areas. This culminates in the development of strategic directions for the Ministry -- directions which are given by the Ministry's top executive committee to the various program areas for implementation.

This formal process ensures that the line managers have input to the Ministry's maintenance policies and standards, and that the government's overall objectives are addressed when operations are planned and funded.

One result of this in the Provincial Highways Program area is that the Ministry is dedicated to placing a first priority on the need to preserve the existing highway plant. While recognizing that there continues to be a need to satisfy capacity problems in some areas, that some new links are needed to match economic development, and that the year-round mobility of the travelling public must be satisfied, the emphasis on resource allocation is to be placed on plant preservation.

This means that within the Provincial Highways Program, funding for road and bridge rehabilitation and maintenance is the highest priority.

5/ FUNDING PROCESS

Funds to carry out the Ministry's business are allocated annually from the general revenues of the government. The allocation process does not provide for dedicated funding from specific revenues such as vehicle and driver licence fees or gasoline taxes.

The Ministry's funds are then distributed to the various program and support areas. Within the Provincial Highways Program, this allocation is split further into the activities of design, capital construction, maintenance, and administration.

Given that the program has been directed to emphasize plant preservation, it is important to have in place procedures to ensure that Ministry resources are in fact used in a way that satisfies that objective. To that end, the Ministry's Maintenance Management System is vital.

6/ MAINTENANCE MANAGEMENT SYSTEM

The Maintenance Management System (MMS) is the means by which maintenance work can be rationally planned, accomplishments can be reported and monitored, and appropriate levels of maintenance service can be established.

Quality standards have been developed to ensure an appropriately consistent level of maintenance effort is achieved across the entire network.

These standards are periodically reviewed to ensure that they match the needs of the system and the expectations of the travelling public.

The great variety of maintenance activities have been assigned code numbers so that the resources expended on those activities can be measured throughout the year and so that, each year, plans can be developed at the District and patrol levels in such a way that the effort put forth is compatible with the Ministry's overall objectives.

By means of MMS, a maintenance plan can be developed for each work unit in a District, based on an annual examination of the road system and the application of the quality standards to the identified needs of the system. This plan is adjusted prior to the start of the fiscal year to match the available funds, and it is at this stage that higher priority work is given its due through the development of a final maintenance work plan reflecting the importance of such things as bridge and roadway maintenance. The use of computer technology enables staff to develop the final plan in line with allocated funds with a minimum of effort.

Recent funding restrictions and appeals by the trucking industry to be allowed to transport heavier loads has resulted in a need for more information about pavement. As a result, the Ministry is developing a new Pavement Management System, and many components of the system are already in place. This system is integrated with and operates on information provided by the Maintenance Management System data base. The Pavement Management System will assist the Ministry to

- apportion funds between the pavement maintenance and the reconstruction programs,
- determine the effect of increased load limits on maintenance requirements, and
- determine the effect of various maintenance activities on pavement life.

In other papers you will be given more details of the Maintenance Management System and of the development of the Ministry's Pavement Management System. These will provide a comprehensive picture of the integrated, planned approach to the maintenance and preservation of Ontario's highways.