AASHTO’s Winter Maintenance Program: 
A Proactive Approach to International Technology Transfer

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Each winter, state and local governmental transportation agencies across the United States are commonly faced with the need to control snow and ice on their highways and roads. Conditions such as occurred in the winter of 1993–1994 in east central United States; 1995–1996 in Pennsylvania, New York, Virginia, and Washington, D.C.; 1996–1997 in North and South Dakota and Minnesota; and 1997–1998 in the Midwestern States raise severe safety hazards for those who are traveling and have a major negative economic impact on the area. Even though public transportation agencies have developed and applied an array of practices and techniques for snow and ice control to minimize winter hazards and make highways, roads, and streets safer for travel, their customers—the traveling public—desires more. Therefore, these agencies are continually looking for better ways to address snow and ice problems.

One such effort to seek better ways of snow and ice control was a 1994 International Winter Maintenance Technology Scanning Tour sponsored by the American Association of State Highway and Transportation Officials (AASHTO), through the National Cooperative Highway Research Program (NCHRP) and the Federal Highway Administration’s (FHWA’s) International Outreach Program. A group of state and local government winter maintenance experts, together with a representative from the FHWA, was constituted as a Scanning Team and visited winter maintenance road officials in Japan and Europe. The Scanning Team found many equipment technologies and winter maintenance systems improvements during the tour that were not used in the United States, but were believed to be of potential benefit to Americans.

The Scanning Team developed a proposal for a Winter Maintenance Program and presented those findings to the AASHTO Subcommittee on Maintenance and the Standing Committee on Highways. The Winter Maintenance Program was subsequently presented to the AASHTO Board of Directors and adopted at its November 1994 annual meeting. The Program is designed to have a collaborative relationship with AASHTO and Transportation Research Board (TRB) Committees, such as the Committee on Maintenance Equipment, the sponsor of this 12th Equipment Management Workshop.

This paper describes details of that program and the progress that has been made toward implementation.

INTRODUCTION

North Americans spend $20 billion annually on snow and ice control (1). Still, nearly every winter, major blizzards and ice storms occur in various areas of the United States, crippling transportation, producing major negative economic impacts, and inflicting severe safety hazards on travelers. While governmental transportation agencies have developed a variety of improved practices and techniques for better snow and ice control
to minimize winter hazards and make travel safer, these agencies are continually seeking better ways to handle snow and ice problems. In an effort to find better ways of improving snow and ice control operations, an International Winter Maintenance Technology Scanning Tour was conducted in 1994. The Scanning Team was comprised of a group of winter maintenance experts from state and local government, together with a representative from the FHWA. The Scanning Team met with winter maintenance road officials in Japan and Europe.

During the Scanning Tour, many equipment technologies, procedures and winter maintenance systems were observed that were not being used in the United States, but which the Scanning Team believed would be of significant benefit to Americans. The Scanning Team developed a proposal for a Winter Maintenance Program which would conduct rigorous operational acceptance testing and evaluation of international and domestic winter maintenance technologies to determine their value for snow and ice control in the United States, and to support introduction of those acceptable technologies (2).

The Scanning Team presented its findings and the proposed Winter Maintenance Program to the AASHTO Subcommittee on Maintenance at its summer meeting in July 1994, and to the AASHTO Standing Committee on Highways at its annual meeting in November 1994. On November 13, 1994, the AASHTO Board of Directors approved the establishment of the Winter Maintenance Program. The remainder of this paper details the content of the Winter Maintenance Program, the establishment of the Snow and Ice Cooperative Program (SICOP), and the progress that has been made during the past 2.5 years.

**WINTER MAINTENANCE PROGRAM**

The Scanning Team was impressed with the systems concept that Japanese and European officials used for snow and ice control. The systems concept addressed the vehicle, the driver, and the equipment, as well as the practices for managing roadway and bridge snow and ice control. The AASHTO Board of Directors concurred with the systems concept when it approved its Administrative Resolution AR-3-94 (3), which supported

...the establishment of a project under the National Cooperative Highway Research Program (NCHRP) to develop a comprehensive guide for establishing a systems approach to snow and ice control that addresses the vehicle, the driver, and equipment and practices for managing roadway and bridge snow and ice, for use by Member Departments and local governments to provide them guidance suitable for their geographic and weather conditions. The goals for such a system concept should be to: sustain or improve levels of winter maintenance service with significant cost/benefit improvements; provide an enhanced level of environmental protection; and increase the safety of driving under winter conditions.
The Administrative Resolution continues:

In order to experiment with snow and ice technology and systems not now in use in this nation, to determine their suitability to the United States and to help introduce the use of those with the most promise, the AASHTO Board of Directors endorses the concept of establishing a voluntary AASHTO Snow and Ice Pooled Fund Cooperative Program, under which testing by AASHTO Member Departments volunteering to sponsor and conduct tests can be supported financially with public sector funds voluntarily.

The resolution requested that an AASHTO standing Winter Maintenance Policy Coordinating Committee (WMPCC) consisting of representatives from AASHTO member states, the National Association of County Engineers (NACE), and the American Public Works Association (APWA) be established to monitor and guide the development and implementation of the Winter Maintenance Program. The WMPCC was subsequently appointed by the AASHTO President and the first phase of the Program started.

Development of the Comprehensive Winter Maintenance Guide

This first phase utilized funding under NCHRP Project 20-7, Task 71, to establish a broadly based NCHRP snow and ice control panel and conduct a national workshop to guide the development of the comprehensive winter maintenance guide (4). The workshop was held in Washington, D.C. A work program was developed and an extensive outline was produced for the comprehensive guide. A contractor for NCHRP Project 20-7, Task 83, completed development of the guide (4). A draft of the guide was ready for review by the AASHTO Subcommittee on Maintenance at its summer meeting in July 1998.

Establishment of the Snow and Ice Cooperative Fund Program

The second phase was launched at the AASHTO annual meeting in October 1996 when the Standing Committee on Highways adopted the following motion:

Resolved that based on the favorable returns of a September 4, 1996, ballot of the Member Departments to determine interest in establishing and funding an AASHTO Snow and Ice Pooled Funded Cooperative Program (SICOP), the AASHTO staff be authorized and directed to proceed with implementation of the SICOP, including invoicing the Member Departments agreeing to support start-up costs, in accord with the overall direction provided by AR-3-94.

Thirty-four states, NACE, and APWA each contributed $4,000 to the start-up phase and are actively participating in SICOP.
In December 1996, the WMPCC met to determine what was required to get SICOP up and running. The Scanning Team had originally recommended 11 SICOP project areas. A survey of SICOP participants conducted in 1996 provided information on what was currently being done and not being done in these 11 project areas. A literature search was completed showing planned, ongoing, and completed research, as well as articles published nationally and internationally on snow and ice control. The WMPCC reviewed these materials, determined three additional topics that needed to be added to the project list, and developed an agenda for a SICOP workshop held in Minneapolis, Minnesota, in April 1997. At this workshop, participants reviewed published and ongoing snow and ice control research and evaluation projects, identified gaps between what was needed and what existed or was ongoing, and developed project problem statements for additional research or evaluation projects to fill voids. More than 100 snow and ice control practitioners, equipment specialists, and researchers participated in the 2-day workshop. Breakout sessions led by experienced facilitators provided for in-depth discussions of the SICOP topics. Workshop proceedings were assembled and published in the summer of 1997.

In October 1997, the WMPCC met at AASHTO Headquarters, evaluated the results of the workshop, and determined the next steps for SICOP. The Committee members developed preliminary statements of work and selected the following ten topics as being of the highest priority (listed in priority order):

1. **Anti-icing training for state, county, and municipal highway operations.** The objective is to develop and deliver a comprehensive training program on anti-icing strategy, materials, and procedures for personnel in state and local governments.

2. **Road and weather information system (RWIS) training.** The objective is to develop and deliver a comprehensive training program on the use of RWIS for decision makers regarding winter snow and ice control operations on roadways. Training would utilize realistic scenario-based exercises. Existing mindsets need to be changed and knowledge relative to weather-impacted activities must be transformed into actions based on data and forecasts produced as part of RWIS.

3. **Develop and validate test methods for anti-icing and deicing materials.** The objective is to recognize that since the completion of the Strategic Highway Research Program (SHRP) and FHWA post-SHRP work, some new or modified materials, or both, have been developed and offered for use. With participation of material producers and end users, determine what materials are used in anti-icing and deicing operations and determine the significant characteristics of the materials used.

4. **Urban snow and ice control, best method practices.** In cooperation with NACE and APWA, the objective is to identify special issues impacting winter weather operations in urban environments, and respond with guidance on best management practices and training to achieve wide application of such practices.

5. **Investigate the use and application of Global Positioning System (GPS) equipment and technology in winter maintenance operations.** The objective is to determine the applicability of GPS equipment and technology for improving the efficiency and effectiveness of snow and ice control activities. GPS equipment is available now and is being used in fleet management. Can it be used effectively to monitor snow and ice control maintenance operations?
6. **The measurement of friction on highway pavements during winter activities.** The objective is to identify equipment and determine methods for the measuring and evaluating of friction on pavements during snow and ice control operations. Determine winter friction values that should be maintained at different levels of service in the United States. Winter pavement friction technology is already in use in Japan (5) to set safe speed limits on expressways and in European countries (6) to establish contract levels of service for winter snow and ice control.

7. **Winter maintenance publication information and public relations.** The objective is to form a Winter Maintenance Public Information Task Force under WMPCP charged with identifying and recommending activities to improve communication about winter travel conditions and winter maintenance strategies. This would include the development and promulgation of adequate standards of uniformity for data collection and information dissemination.

8. **Driver education and training.** The objective is to develop a winter driving techniques module that could be incorporated into driver education classes nationwide. Review how government agencies develop and deliver information for the public on winter travel tips, techniques, and guidance. Develop a best practices guide.

9. **More Technology Transfer (T²) Center or Local Transportation Assistance Program (LTAP) resources on anti-icing for local governments.** The objective is to make more information on “best” snow and ice control practices available to counties and municipalities for both their urban and rural snow and ice control responsibilities, especially in support of anti-icing implementation and training.

10. **Creation of a task force under WMPCP to investigate and evaluate opportunities for using computerized controls and onboard interactive display devices in snow and ice control.** The objective is to investigate and evaluate opportunities for using computerized controls and onboard interactive display devices for partially or fully automated snow and ice control equipment functions.

### Proposed 1998 SICOP Work Program and Implementation Plan

The WMPCP agreed to concentrate SICOP efforts on the above listed ten projects. These projects fit into four broad categories: **Training** (Problems #1, #2, #4, #8, and #9); **Materials applications and specifications** (Problem #3); **Technological advancements** (Problems #5, #6, and #10); and **Public relations/communications** (Problem #7). Expert task groups are now being formed in each of the four categories to provide guidance and oversight. As soon as the expert task groups are assembled, they will develop matrices showing who is currently conducting research, testing and evaluation, technology transfer, and implementation activities in each area, with what resources, and at what cost. They also will identify appropriate AASHTO committees with which to liaison on each of the above projects and establish a collaborative relationship. This collaborative relationship will likely include Transportation Research Board’s Committee A3C08 (Maintenance Equipment), the committee sponsoring this 12th Equipment Management Workshop, A3C09 (Winter Maintenance), and A3C03 (Maintenance and Operations Personnel); and AASHTO’s Subcommittee on Maintenance, specifically the Task Force on Equipment and the Task Force on Safety and Winter Operations.
The WMPCC and expert task groups will then establish a work program and budget for each of the ten projects and locate commitments for funding them by

- Soliciting the AASHTO member departments, cities, and counties, and the FHWA, to determine their interest in supporting and funding the projects;
- Approaching private sector and foundation entities, to determine their interest and the availability of funding; and,
- Considering the use of NCHRP as a resource for conducting research projects.

As soon as funding commitments are adequate, WMPCC would obtain concurrence from the AASHTO Standing Committee on Highways to proceed with implementation of the work program. Status reports will be made semiannually to the Standing Committee on Highways. The first status report was presented at the AASHTO mid-year meeting, April 18, 1998. The Minnesota Department of Transportation is supporting a loan staff to work full time with AASHTO’s Program Director for Engineering to administer the SICOP program.

Second Winter Technology Scanning Tour

A second winter technology scanning tour was conducted in 1998. The first tour, conducted in 1994, concentrated its scanning efforts to winter maintenance operations in Japan, Germany, and Austria, while the second tour scanned Switzerland, France, Norway, and Sweden. Most of the findings made in the 1994 tour were being utilized in the four countries visited in 1998. One of the major findings on the 1998 tour was the vast improvement in cab ergonomics on snow plowing trucks. As they had in the past, the Europeans were leading the way in modern cab design—with wraparound windshields, contoured dash panels and operator seats, and fingertip “joystick” plow controllers. Visibility from the operator’s seat was greatly improved over that found in U.S.-designed trucks. There was also improvement in composite material snowplow blades. In 1994 the discovery had been the use of rubber squeegee blades for slush and water removal behind the steel plow, but now the composite blade could do the job of two blades. These new discoveries will be utilized in the SICOP program.

Other Winter Maintenance Programs

Following publication of the results and recommendations of the 1994 scanning tour (2), several smaller Winter Maintenance Program projects were developed and field tested; some examples are snow plow shields to improve snow plow truck operators’ visibility and the rear-mounted wind scoop to improve snow plow truck conspicuity (5). Projects of larger scope, such as the Maintenance Concept Vehicle being developed by the three-state consortium of Iowa, Michigan, and Minnesota, have technology advancements that were discovered on the 1994 international scanning tour (7). All of these projects will be integrated into the SICOP program. The utilization of friction measurements will require national testing and evaluation, not to mention consensus, before it will be adopted by all snowbelt states and integrated into the Intelligent Transportation System.
SUMMARY

The increasing need and desire for safe, year-round mobility for the highway user places great responsibilities on the shoulders of transportation providers. While governmental transportation agencies have developed and implemented a variety of improved practices and techniques for better snow and ice control to alleviate winter hazards and make travel safer and more reliable, progress has been painfully slow. The Strategic Highway Research Program (SHRP) showed that other material application and snow removal techniques could, at least in theory, improve efficiency and effectiveness of winter operations. International winter maintenance technology scanning tours discovered that some of the SHRP research has been implemented with great success elsewhere in the world. AASHTO’s Winter Maintenance Program is designed to stay current with what is the latest cutting edge equipment, materials, and methods technology for snow and ice control. SICOP focuses on testing, evaluating, and implementing that technology.

Since SICOP operates as a self-supporting AASHTO technical service program and relies on voluntary contributions from its member departments (NACE and APWA), the next major implementation effort will be to solicit funds and interest in supporting each project. With a full-time loan staff on board, it is envisioned the program will pick up momentum and some of the high priority projects will be under way by fall 1998.

The SICOP program is flexible enough that future technologies—such as those being assembled in the Maintenance Concept Vehicle and those discovered during the winter 1998 scanning tour—and future tours can be folded into the ongoing program.

REFERENCES