

OM-12: Road Weather Management Program

1-15 points

Goal: Plan, implement, and monitor a road weather management program (including snow and ice control) to reduce environmental impacts with continued or better level of service.



Affected Triple Bottom Line Principles

Sustainability Linkage

Implementing an effective and efficient road weather management program supports all of the triple bottom line principles by improving safety, increasing mobility, reducing delay and traffic interruptions, increasing productivity of the labor force, and reducing impacts of materials used for management on the human and natural environments.

Background and Scoring Requirements

Intelligent Transportation Systems (ITS) solutions are included in OM-13: Transportation Management and Operation, including techniques for information dissemination and traffic control strategies, and are not duplicated in this criterion. Technologies related to infrastructure surveillance, monitoring and prediction; and response and treatment strategies are included in this criterion.

Background

FHWA's [Road Weather Management Website](#)¹ explains that "adverse weather conditions have a major impact on the safety and operation of our Nation's roads, from signalized arterials to Interstate highways. Weather affects driver behavior, vehicle performance, pavement friction, and roadway infrastructure. Weather events and their impacts on roads can be viewed as predictable, non-recurring incidents that affect safety, mobility and productivity. Weather affects roadway safety through increased crash risk, as well as exposure to weather-related hazards. Weather impacts roadway mobility by increasing travel time delay, reducing traffic volumes and speeds, increasing speed variance (i.e., a measure of speed uniformity), and decreasing roadway capacity (i.e., maximum rate at which vehicles can travel). Weather events influence productivity by disrupting access to road networks, and increasing road operating and maintenance costs."

Determining the most sustainable approaches to Road Weather Management requires a balance of best practices with impacts. For instance, providing an improved level-of- service (LOS) for the roadway during weather events must be balanced with the environmental impacts associated with the resulting increase in materials applied. Materials used to treat snow and ice can harm adjacent flora and fauna and leach into nearby bodies of water and negatively impact plant and animal habitats. The use of these materials to improve LOS during weather events must be weighed against potential impacts. The development of plans and best practices included in this criterion requires a balance of these trade-offs based on the goals of the individual agency.

Scoring Requirements

Requirement OM-12.1

2-4 points. Road Weather Management Program

- **Requirement OM-12.1a**

2 points. Develop a Road Weather Management Program

A Road Weather Management Program (RWMP) includes strategies that can be used to mitigate the impacts of rain, snow, ice, fog, high winds, flooding, tornadoes, hurricanes, avalanches, and other inclement weather impacts on traffic. The RWMP will vary in size and scope depending on the needs of the agency. It could be a combination of multiple documents that cover management of different conditions or different regions, or could be a single, consolidated document. For the purposes of evaluating this criterion, the agency should consider all applicable materials and respond according per the majority of their practices. One of the following scores applies:

0 points. The agency does not have an RWMP.

1 point. The agency has multiple RWMP documents that cover all geographies and weather types within the agency (may be separated by geography, weather type, etc.)

2 points. The agency has single, consolidated RWMP document that covers all geographies and weather types within the agency.

- **Requirement OM-12.1b**

2 additional points. Address Long-term Weather Changes in RWMP

The RWMP developed in requirement OM-12.1a addresses weather events based on long-term predictions and trends, rather than historical weather data only. Anticipated impacts to operations and maintenance based on long-term weather/climate changes should be developed consistently with the approaches discussed in SP-16: Infrastructure Resiliency, including Hazard Identification, Vulnerability Assessment and Risk Assessment and should be updated on an established evaluation and update cycle.

Requirement OM-12.2

2-3 points. Set Goals and Monitor Progress

To earn points for this scoring requirement, the agency must have a Road Weather Management Plan as described in scoring requirement OM-12.1. If the RWMP contains multiple documents, each document must include the following requirements. Scoring is based on the following, cumulative requirements. The first requirement must be accomplished to earn the second.

- **Requirement OM-12.2a**

2 points. Establish Quantifiable Metrics

Establish quantifiable performance metrics for the RWMP program. Measures could be based on level of service, amount of materials used per event, and other relevant parameters. Measures could be qualitative and/or quantitative.

- **Requirement OM-12.2b**

1 additional point. Monitor Progress and Demonstrate Sustainable Outcomes

Monitor progress towards the goals set in requirement OM-12.2a for at least one year after goal establishment and show measurable advancement towards stated goals.

Requirement OM-12.3

1-2 points. Implement a Road Weather Information System

Road Weather Information Systems (RWIS) are a way to monitor pavement and weather conditions in real-time using sensors to measure atmospheric, pavement, and/or water level conditions. Atmospheric data include air temperature and humidity, visibility distance, wind speed and direction, precipitation type and rate, tornado or waterspout occurrence, lightning, storm cell location and track, as well as air quality. Pavement data include pavement temperature, pavement freezing point, pavement condition (e.g., wet, icy, flooded), pavement chemical concentration, and subsurface conditions (e.g., soil temperature). Water level data include tide levels (e.g., hurricane storm surge) as well as stream, river, and lake levels near roads. This data are used to maintain awareness of current conditions and to feed into roadway models, and they allow the operator to make the best decisions about which actions to take. For example, it enables a maintenance manager to decide when to apply chemicals, how much to apply, and what type of chemical to apply, thereby reducing the amount of salt and chemical applied and increasing its effectiveness.

The agency implements a RWIS which measures the weather and road conditions using sensors on the side of the road to track weather and road conditions to plan and implement the appropriate treatment actions. The RWIS should provide timely information on prevailing and predicted conditions to both transportation managers and motorists (e.g., posting fog warnings on Dynamic Message Signs (DMS) or listing flooded routes on web sites). One of the following scores applies:

0 points. The agency does not have an RWIS.

1 point. The agency implements a RWIS in select areas identified, but has not implemented a system agency-wide.

2 points. The agency implements a RWIS agency-wide in most or all areas identified vulnerable to weather conditions (e.g., mountain passes, high wind areas, bridges, etc.) and shares the data with the NWS.

Requirement OM-12.4

1-2 points. Implement the Standards of Practice or Standard Operating Procedure (SOP) For Weather-Related Issues

Scoring is based on the following, cumulative requirements. The first requirement must be accomplished to earn the second.

- **Requirement OM-12.4a**

1 point. Include Snow and Ice Control in RWMP

Have an RWMP that includes, at a minimum, the following elements specific to snow and ice control:

- Reducing salt use in environmentally sensitive areas
- Existence of an anti-icing program
- Conducting periodical training program for proper use of salt and chemicals
- Best Management Practice (BMP) for chemical storage facilities
- Proper storage of chemical and chemical-abrasive stockpiles
- Proper calibration of equipment
- Reducing cost and improving fuel efficiency by planning and optimizing routes

- **Requirement OM-12.4b**

1 additional point. Include Performance Standards to Demonstrate Sustainability

The agency's program includes performance standards that take into account sustainability and demonstrate a reduction in treatment materials and truck fuel usage.

Requirement OM-12.5

2 points. Implement Materials Management Plan

Successful implementation of a Materials Management Plan to monitor quantities of salt applied and level of service (e.g., interstates bare and dry 1 hour after event) during and after an event; includes salt, chemicals (de-icing agents), sand, etc.

Requirement OM-12.6

1-2 points. Implement a Maintenance Decision Support System

Deploy a Maintenance Decision Support System (MDSS) to improve the effectiveness and efficiency of roadway weather treatments and implement best practices. The MDSS can be based RWIS installed roadside or mounted on maintenance vehicles to measure and monitor the road conditions.

One of the following scores applies:

- **0 points.** The agency does not have an MDSS.
- **1 point.** The agency's MDSS is based on roadside RWIS.
- **2 points.** The agency has MDSS processes that are based on both roadside RWIS and vehicle mounted sensing technologies.

Resources

Above-Referenced Resources

The following resources are referenced in this criterion and consolidated here:

1. FHWA, Road Weather Management Website, <http://www.ops.fhwa.dot.gov/weather/index.asp>

Additional Resources

The following resources provide information on this criterion topic in addition to the sources directly referenced:

2. FHWA, *An Introduction to Standards for Road Weather Information Systems (RWIS): Siting Standards, Calibration Standards, Communications Standards* (2002), <http://www.standards.its.dot.gov/Content/documents/rwis-standards.htm>
3. FHWA, *Best Practices for Road Weather Management* (2012), <http://ops.fhwa.dot.gov/publications/fhwahop12046/fhwahop12046.pdf>
4. FHWA – RITA, *Road Weather Management Performance Measures – 2017 Update*, <https://ops.fhwa.dot.gov/publications/fhwahop17048/ch2.htm>
5. WSDOT, *Road Weather Information Systems: Enabling Proactive Maintenance Practices in Washington State* (2002), <http://www.wsdot.wa.gov/research/reports/fullreports/529.1.pdf>
6. NCHRP, *Benefit/Cost Study of RWIS and Anti-icing Technologies* (2001), <http://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=1459>
7. NCHRP, *Test Methods for Evaluating Field Performance of RWIS Sensors* (2006), http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_w87.pdf
8. Prepared by Montana DOT for FHWA, *Recommendations for Winter Traction Materials Management on Roadways Adjacent to Bodies of Water* (2004), https://www.mdt.mt.gov/other/webdata/external/research/docs/research_proj/traction/final_report.pdf
9. NCHRP, *Report 526: Snow and Ice Control: Guidelines for Materials and Methods* (2004), http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_526.pdf

Scoring Sources

The program is considered to have met this criterion if the requirements above can be reasonably substantiated through the existence of one or more of the following documentation sources (or equal where not available):

1. Road Weather Management Program, and related plans and programs.
2. Materials Management Plan, MDSS, and documentation of RWIS for the jurisdiction (state, county, city). A qualified plan should include quantitative goals for reductions in chloride and other chemical applications, reduction of plow truck mileage, and a description of the tools and hardware used to monitor and operate the snow and ice control activities. A qualifying plan shall outline specific strategies to be implemented by specific agencies or stakeholders to achieve the plan.
3. Annual reports of plan progress, including data supporting goal performance and actions taken during the previous period. Minutes of monthly or quarterly meetings of interagency stakeholders to demonstrate active efforts to implement the plan.