

# 2013

## Winter Service Requirements



New Zealand Transport Agency

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## Winter Service Requirements

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### Service Statement

The New Zealand Transport Agency aims to provide a winter maintenance service, which as far as possible;

- allows the safe movement of traffic on State Highways
- keeps delays due to closures and crashes caused by adverse weather to a minimum
- advises motorists of road conditions, closures and alternative routes with regular updates

### This is achieved by:

- continuous monitoring of weather and road conditions throughout the winter months
- pro-actively treating the roads to overcome potential hazard formation
- closing highways where hazard conditions exist or for operational reasons and before vehicles become stranded
- responding to and treating hazardous conditions when these exist
- implementing contingency procedures to ensure the safety of motorists trapped on the road
- setting priority levels for maintaining the various routes affected by adverse conditions
- accurate and timely public and stakeholder communication
- ensuring the safety of the travelling public is paramount in all decisions taken, and in accordance with the overriding criteria:

**IF IN DOUBT, CLOSE THE ROAD**

## Index

1.	Definitions	4
2.	Management	4
3.	Weather Monitoring	6
4.	Operations	6
5.	Service Targets	6
6.	Treatment of Hazard Conditions	8
6.1	Ice Gritting	8
6.2	Chemical Applications	8
6.3	Snow Clearing	9
6.4	Ice Clearing	9
7.	Road Damage	9
8.	Highway Closures	9
9.	Highway Openings	10
10.	Stranded Vehicles	10
11.	Resources	11
11.1	General	11
11.2	Labour	11
11.3	Plant	11
11.4	Plant GPS/AVL	11
11.5	Materials	12
12.	Communication	12
13.	Briefing and Reviews	13
14.	Training	13
15.	Reporting	13
	Appendix A - Gritting Materials Specification & Grading	14
	Appendix B - Daily Treatment Record	15
	Appendix C - Winter Services Decision Guide	18
	Appendix D - CMA Best Practice Guide	22
	Appendix E – Annual Report Outline	30

# 1. Definitions

**Ice** includes frost

**Treatment** is the work required to deal with snow and ice hazards on the network in order to ensure the network meets the required levels of service.

**Gritting** is the application of grit or abrasives to trafficked surfaces where ice may create or has created a potential traffic hazard.

**Anti-icing** is the application of a liquid chemical to trafficked surfaces prior to the formation of ice to prevent ice forming or binding to the pavement.

**De-icing** is the application of a solid chemical to trafficked surfaces to assist with the removal of snow or ice once formed.

**Extreme Snow and Ice Events** are extreme weather events that result in short periods of times when standard services levels in Table 1 cannot be maintained.

**Snow clearance** is the removal of snow from all trafficked surfaces, including sealed surfaces outside the lead-in lines on the approaches to single lane bridges, when it becomes (or to prevent it becoming) a potential traffic hazard.

**Damage** means gouging of the pavement, removal of the seal, and the removal or harm caused, to drainage facilities, traffic aids, roadside furniture or other road assets so that they no longer meet specification.

**Network Monitoring** is the observation of the network by methods such as weather monitoring, patrolling and other means for the purpose of being proactive in mobilising the appropriate resources as necessary to ensure the specified levels of service are achieved during a winter event.

**Safe** in the context of this specification means that the network has appropriate signage in accordance with COPTMM, the approved TMP plus any restrictions relating to level of service and where either:

- the pavement surface is either free of ice or free of settled snow, or ice is covered with grit such that: a vehicle tyre is not in full contact with ice or snow; and sufficient tyre friction is maintained for traffic to travel without loss of control and that vehicles have the ability to stop without skidding when driving at an appropriate speed for the conditions, or,
- the road can be opened with some restrictions being sign posted appropriately e.g. open to non-towing vehicles, open to vehicles with chain or open with speed restriction.

**Patrolling** is a regular inspection of the highway, initiated during periods when a snow or ice event can be reasonably expected. Patrolling should as far as possible be carried out by a vehicle especially equipped for the purpose, e.g. a vehicle capable of making some immediate response to hazardous situations encountered, such as the capability of spreading grit (or chemical where specified) or ploughing or brooming snow.

**Weather monitoring** consists of regularly obtaining weather information from forecasts, weather stations and obtaining information from road users and visual monitoring. Once an ice or snow event is predicted weather monitoring shall be performed at a maximum interval of 2 hours until the end of the event. An event is at an end when the network is free of any snow or ice and no further events are predicted for the next 24 hours.

**Traffic Operations Centre (TOC)** is the centre which provides operational coverage to the particular network area in question. Currently there are operation centres in Auckland (known as JTOC) covering the northern part of the North Island from Taupo north and in Wellington (WTOC) covering the lower half of the North Island and all of the South Island.

# 2. Management

The Winter Service Requirements details the operational requirements in place in order to deliver the required level of service within those areas where winter weather conditions have an impact on the operation of the network. Winter events shall also be deemed an incident in terms of the Maintenance Specification and the relevant requirements of the specification shall also apply.

The New Zealand Transport Agency has a legal responsibility for the general safety of the public and traffic on State Highways, and this cannot be compromised. Motorists and the public are entitled to expect that if the highway is open for use, it is safe to travel. Conversely, the motorist and public expect that if a highway is not safe, it would be closed.

When snow or ice conditions exist normal contract boundaries are not recognised. Contractors are required to coordinate and if necessary work across boundaries to ensure that a 'seamless' consistent level of service is provided across entire routes.

Contractors will co-operate across boundaries with weather observations, materials and resources and all winter service activities.

Winter weather can be very unpredictable, and the occurrence of snow and ice events varies considerably through any season, and from year to year.

Operational winter maintenance periods are defined, to strike a balance between economy, and providing levels of resources that can provide an acceptable response to adverse highway conditions.

To plan resources regularly on the assumption of a long, severe winter would be wasteful. Conversely, to do so on the assumption of a short, mild winter, could lead to unacceptable response times. Planning is therefore between these two extremes, but with enough backup at reasonable notice to react to severe events.

Winter maintenance periods are defined below, for operational purposes.

Period	Time (Months)	Likely Weather Conditions
High	June, July, August, September	Moderate - Very Severe
Marginal	May, October	Light – Severe
Low	Remainder	Fine – Light

Weather conditions are categorised into the following: -

- Fine:** no frost or ice present
- Light:** frost and/or light snow
- Moderate:** freezing conditions after rain or snow
- Severe:** continuous snow, packed ice
- Very Severe:** hard packed snow/ice with further snowfalls

In parts of the country where winter conditions are usually non-existent there may be occasions where frost conditions will occur on parts of the network due to shade or other factors. The contractor should be aware of these locations, carry out the necessary monitoring of weather conditions and provide the appropriate level of maintenance required, such as spreading grit in the right place and just in time, to make the road safe.

The contractor is required to provide sufficient resources, plant and materials to manage winter services and provide effective operational treatment and road user services as outlined in this strategy.

One of the main management roles will be the provision of a Winter Services Manager (WSM) responsible for full oversight of all winter services, ensuring that performance requirements are met and appropriate decisions are made on treatment, road closures/opening, resources, customer information, traffic management, recovery and evacuation, monitoring “in-storm” progress and reporting. The WSM will be the main contact point for the Client. The WSM may also be the Incident Manager in terms of the Maintenance Specification.

Where winter weather can have a significant effect on the operation of the network the Winter Services Manager will be supported by Winter Services Controllers (WSC) during the high and marginal winter periods (May through to September) that are on duty when storms are likely to occur for monitoring and pre-planning prior to the event, deciding the actions to be taken and will remain on duty throughout the event. WSC’s will be suitably trained and be experienced in determining the most appropriate treatment to be carried out, where and when. This will align with the Client’s requirement for a ‘just in time ‘and ‘at the right place’ treatment regime.

WSC’s will use decision support information including weather information and forecasts provided by the Client, local knowledge and experience in deciding the action to be taken. This decision making should be delegated to a minimum number of persons to build up practical experience and maintain a high level of performance. The quality of decisions made by the WSC will be a key factor in determining the effectiveness of the Winter Service and also how this is perceived by users and the community.

The WSC will maintain close co-ordination across all adjoin networks, ensure that the correct levels of resources are being utilised and efficient and effective snow/ice clearing and treatment is being carried out.

The WSC will also be responsible for the coordination of the VMS and CMS signs with the relevant Traffic Operations Centre (TOC) to ensure they accurately report road openings, closures and conditions. The WSC also provides road condition and road status updates to the Client, ensures that the Road Event System (TREIS) is regularly updated to reflect road status and conditions and maintains regular communication with the TOC during the event.

On-site operations will be under the management of Winter Service Supervisors who will be aware of their duties and be sufficiently competent to fulfil them.

The delivery of a successful Winter Service is dependent on the individual decisions made and actions taken by all those involved. These actions and individual decisions must be supported by adequate training. To ensure that appropriate performance is achieved the training and development of all staff and operatives should be reviewed annually and training provided before the winter marginal period commences.

### 3. Weather Monitoring

The Client has contracted with the NZ MetService to provide specific road weather information targeted at winter services. (Road Weather Information Stations (RWIS) installed at specific locations on the network are owned and maintained by MetService.) The information available through the MetService contract includes:

- Weather alerts
- Road snowfall warnings
- Specific forecasts
- Observation and forecast information
- Ice prediction forecasts

This information is available through the MetService/the Client web site which also provides direct access to a number of MetService publicly available information such as rain radar, satellite images and general forecasting.

The WSC maintains surveillance of the Road Weather Information Stations (RWIS), Ice Prediction tools (Thermal Maps, Forecast Graphs), Numeric Weather Prediction Models, Rain Radar and any other tools provided by the Client. The WSC will interrogate the internet based service to assist with their decision making process.

The WSC may wish to utilise additional weather information to assist their operations. The decision making process will not rely upon any one source of weather information, but formulated by analysis of all the available weather information combined with onsite monitoring, local knowledge and experience.

Thermal Maps in hard copy format are available and can be utilised to determine the likely forecast minimum road surface temperatures along the highways within climatic zones.

The Thermal Map forecast minimum road surface temperatures and real time road surface temperatures and ice/frost warnings are to be integrated into the Contractor's decision making process for the dispatch of ice/frost patrols along with interrogation of all other available weather information.

Monitoring of observed trends from road weather stations against forecast trends gives the WSC an indication of whether forecast freezing conditions will actually occur. Therefore continuous monitoring of observed readings of road surface temperature, air temperature, dew point temperature and road surface state are essential to accurate decision making.

### 4. Operations

Regular inspection of the highway network is initiated during periods when a snow or ice event can be reasonably anticipated by the contractor utilising the weather observations and forecast tools. These patrols are carried out by vehicles equipped such that they are capable of providing immediate response to local hazards as they are identified.

It is important to note that during large storm events multiple highways are likely to be affected at the same time which will require surveillance coverage for the duration of the storm.

Patrols will continue throughout the storm event to observe on-site weather conditions and traffic movements, providing information/feedback to the WSC as necessary to assist with decision making.

It is expected that, by effective utilisation of the forecast tools provided by the Client and other available weather forecast data, the contractor will already be fully mobilised with appropriate equipment when decisions to begin treatment are made. This will allow the contractor to shorten the response time and be able to implement resources to lessen the impact of any event, i.e. the decision making process should aim to have resources established on site before hazards exist.

Notwithstanding this a response time of 30 minute for all winter maintenance activities is to be met. Response time is that time taken from a callout being made until the winter maintenance vehicles are loaded, manned and leaving the Contractors Depot. After leaving the Depot, the Contractor drives directly to the affected site, and begins treatment immediately on arrival.

### 5. Service Targets

The Contractor shall provide the service targets required in the following table. The required service targets for specific locations are provided in the **Maintenance Specification**.

**Table 1.0 Service Targets**

Service Target		Road Availability	Treatment	Method	Monitoring- Leads to Decision Making
1	A	<b>Open 24 hours unrestricted</b>	<i>Treatment 24 hours a day to maintain the road in a safe winter driving condition</i>	<i>Mobilisation to ensure: all sites undergo treatment before ice forms</i>  <i>snow is continually cleared from the road.</i>	<i>Use tools available – “observations” hourly</i>  <i>supplied tools (e.g. weather monitoring services)</i>
	B	<b>Open with some restrictions</b> <i>(applies to some roads only)</i> <i>sign posted appropriately e.g.</i> <ul style="list-style-type: none"> <li>➤ <i>Open to non-towing vehicles</i></li> <li>➤ <i>Open to vehicles with chains</i></li> <li>➤ <i>Open with speed restriction</i></li> </ul>	<i>Treatment 24 hours a day until road is in a safe winter driving condition for service level 1A.</i>	<i>Ice undergoes treatment during an event</i>	<i>Documented process for decision making</i>  <i>Time of predicted ice/snow</i>  <i>Location of predicted ice/snow</i>  <i>Treatment “Just in time”.</i>  <i>Ongoing treatment</i>
	C	<b>Closed</b>	<i>Treatment 24 hours a day until road is in a safe winter driving condition for either service level 1A or 1B.</i>		
2	A	<b>Open between 7am to 7pm (minimum) unrestricted</b>	<i>Treatment to maintain the road in a safe winter driving condition 7 am to 7 pm (minimum) and pro-active treatment before 7 am if an overnight ice or snow event is predicted.</i>	<i>Mobilisation to ensure: all sites undergo treatment before ice forms</i>  <i>snow is continually cleared from the road.</i>	<i>Use tools available – “observations” hourly</i>  <i>supplied tools (e.g. weather monitoring services)</i>
	B	<b>Open between 7am to 7pm (minimum) with some restrictions</b> <i>(applies to some roads only)</i> <i>sign posted appropriately e.g.</i> <ul style="list-style-type: none"> <li>➤ <i>Open to non-towing vehicles</i></li> <li>➤ <i>Open to vehicles with chains</i></li> <li>➤ <i>Open with speed restriction</i></li> </ul>	<i>Treatment 7 am to 7 pm (minimum) and pro-active treatment before 7 am if an overnight ice or snow event is predicted until road is in a safe winter driving condition for service level 2A.</i>	<i>Ice undergoes treatment during an event</i>	<i>Documented process for decision making</i>  <i>Time of predicted ice/snow</i>  <i>Location of predicted ice/snow</i>  <i>Treatment “just in time” within specified hours.</i>  <i>Ongoing treatment</i>
	C	<b>Closed</b>	<i>Treatment 7am to 7pm (minimum) until road is in a safe winter driving condition for either service level 1A or 1B.</i>		<i>Review overnight forecast and take appropriate pro-active action by 7am.</i>

Where the weather does not allow the highest specified service targets in Table 1 to be maintained the road may need to be temporarily changed to a lower service target level. The WSC will make the decision in conjunction with the WSM having considered all aspects of public safety. Closing of roads simply to allow ease of treatment is unacceptable and contrary to the Service Statement for winter services.

## 6. Treatment of Hazard Conditions

### 6.1 Ice Gritting

During frosty weather, early morning frost ice gritting, where necessary, is completed prior to and as close as possible to, the formation of ice.

If ice is identified to have formed already and may become a traffic hazard, or when monitoring indicates that ice may become a traffic hazard, ice gritting applications are initiated as required, within the required response time.

Grit may also be applied to areas that have been chemically treated when conditions exist make either the chemical ineffective or a combination of chemical and grit is more effective.

Grit is to be applied evenly across traffic lanes so that the surface is covered to such an extent that sufficient surface friction is maintained for traffic to travel safely. This may require frequent 'top ups' to maintain safe travel.

Stockpiles of grit will be established at strategic locations such that any delay to a grit treatment operation is kept to an absolute minimum. The stockpiles are to be located so they do not breach any environmental or statutory requirement nor create a traffic hazard by their location or operation. Stockpiles shall not be within 6 metres of a traffic lane. The grit stockpiles shall also be located to minimise the risk of the grit becoming contaminated by over size stone, weed seeds, twigs and branches, silt, clay or similar contaminants.

Grit material to be used is specified in Appendix A.

The grit shall be removed following each event if:

- it obstructs water draining from the road surface
- build-up of grit becomes a traffic hazard
- it is not required because ice or regular frosting is not occurring and there is no immediate threat of ice.
- if required when used in National Parks or Conservation areas

At the end of the winter season, all grit shall be removed from site, including shoulders, berms and under guardrails, to a disposal area that complies with the Local District Plan waste disposal regulations.

Permanently installed folding temporary Ice/Grit signage is opened at times when grit or ice or both are present. This signage conversely is closed when the above hazards do not exist.

These signs lose their effectiveness if left open for periods when no hazard exists.

The Contractor should have sufficient free standing temporary warning Ice/Grit signage available to supplement the permanent signage as necessary and to cover all other areas not currently signed with permanent signage. Signage must be installed in accordance with the Client's Code of Practice for Temporary Traffic Management (COPTTM). Every site gritted must be signed appropriately.

### 6.2 Chemical Application

Calcium Magnesium Acetate (CMA) is the approved chemical for use on roads and is subject to Resource Consent requirements.

Its application and use is to be in accordance with the CMA Best Practice Guide included as Appendix D. The Contractor will supply sufficient plant and resources to effectively and efficiently utilise CMA in accordance with this Guide.

Solid CMA is supplied by the Client in 1Tonne or 25kg bags to the Contractors storage. The Contractor will provide a suitable covered and dry storage facility with a minimum capacity for the quantity stated in the contract specifications and store the chemical in accordance with the manufacturer's instruction.

During fine frosty weather, chemical is applied to the road to those areas where ice is predicted to form, to prevent its formation during the night and early morning. Chemical in this situation is generally applied in liquid form and completed as close as practical to the formation of frost/ice so as to have as little impact as possible on surface skid resistance. However there are situations where an application of dry chemical is more appropriate such as a damp road where temperatures are expected to fall. It is expected that the Contractor has the ability to quickly change from applying liquid chemical to dry chemical as required.



When weather observations indicate that a storm is approaching, chemical is applied in solid or liquid form (solid form should only be applied if traffic volumes are low and it is not too windy). This is done prior to the arrival of the storm as a pre-treatment over the entire length likely to be affected. This is to prevent or reduce ice formation.

Weather conditions preceding a snowfall may mean that this pre-treatment application may be made ineffective. This may be because there is rain preceding the snowfall and the road is saturated, which will dilute the effectiveness of liquid chemical or high traffic volumes and/or high winds combined with a dry road will limit the ability of the chemical in granular form to stay on the road. In this case careful thought as to which method of application is appropriate by the Contractor to make the most efficient use of the chemical.

When temperatures are such that snow and ice does form on the pavement, the action of the chemical allows for a quicker thaw and easier removal of snow and ice by blades.

Chemical can be applied in solid form over top of a snowfall to assist with the prevention of snow particles bonding with each other.

### 6.3 Snow Clearing

The object of snow clearing operations is to remove snow from the highway before it is compacted into an ice base. Different snow conditions exist, which require different actions for snow clearing: -

- If the snow is wet, and the temperature allows for traffic to keep the snow slushed, and thereby maintaining a safe trafficable surface, snow-clearing operations will remove windrows of snow built up by traffic action.
- If the snow is powdery, sticking to the pavement and being packed by traffic action, clearing operations over the width of the traffic lanes is initiated. These operations commence when the WMC ascertains that ploughing will be effective in minimising the chance of a build-up of snow, being packed into an ice base.

Snow shall be cleared as close as possible to the pavement surface without causing damage to the pavement. Snow shall be removed clear of the shoulder and kerb and channels where possible and not left where snowmelt is able to run across trafficked surfaces. As a secondary priority windrowed snow shall not be left where it blocks access ways, side roads or footpaths.

On unsealed roads, windrowed maintenance aggregate resulting from snow clearance shall be evenly re-spread over the trafficked surfaces after the snow in the windrow has thawed.

### 6.4 Ice Clearing

Heavy ice formation may occur through: -

- Compaction of snow by vehicles (pack ice)
- Cuttings and other shaded areas.

Black ice occurs where the pavement surface temperature falls to below 0 degrees C and water/moisture is present. The freeze-thaw-freeze effect is a common occurrence creating black ice conditions especially in low lying and shaded areas. Grit is applied for traction and/or chemicals applied to release the bond between the ice and pavement allowing the ice to be removed by trafficking or with machinery.

## 7. Road Damage

It shall be the Contractor's responsibility to protect the road asset, plus drainage facilities, traffic aids, roadside furniture and other roading assets during the course of any winter service work. Any preventable damage, caused to these facilities by the Contractor shall be made good at the contractor's expense unless agreed with the prior approval of the Client. All damage must be repaired within 24 hours from the time the damage occurred or within the timeframe agreed with the Client.

## 8. Highway Closures

The WSC initiates the closing of the highway, when weather observations or snow clearing operations dictate that safety to the travelling public is being compromised.

This decision is based on on-site observations of traffic safety, weather and pavement conditions, local knowledge and previous experience.

The safety to the travelling public is paramount when assessing the need for a closure, and the WSC always considers the overriding criteria: -

**IF IN DOUBT, CLOSE THE ROAD.**

The Contractor will provide staff in snow huts, gates/closure points or local depots on stand-by, if weather observations indicate that a closure may be required to enable the highway barriers to be closed as soon as possible and traffic denied access if a closure is required.

Other Personnel able to request the WSC to close the highway for safety reasons are: -

- The New Zealand Transport Agency
- New Zealand Police

## 9. Highway Openings

Once clearance activities have cleared the highway of snow and ice, and normal road vehicles can safely negotiate the highway, the WSC will consider the weather forecast, and the current weather conditions on site.

If further heavy falls of snow are predicted, and on site observations indicate that the storm has not yet passed, and that the safe condition of the road may not prevail for long, the highway will remain closed.

If weather forecasts predict a clearing weather pattern, and on site observations confirm this, the highway is re-opened and carefully monitored onsite through normal patrols.

## 10. Stranded Vehicles

Whilst a key focus of Winter Service Management is to close roads before any vehicles become stranded, it is inappropriate not to have a contingency plan for this eventuality. Stranding of vehicles can occur for one of two distinct situations: -

- The stranding of vehicles during the night, when temperature drops rapidly and ice forms. Heavy commercial vehicles can get stuck in the winding sections of the highway, and can physically block the highway. Other HCVs are therefore trapped either side of the stuck vehicle, and the highway has to be closed.
- The stranding of vehicles when the highway becomes impassable, by a sudden dump of snow. The highway is closed immediately in this situation. Although this is the least common situation, it has a potentially greater risk to motorists.

When a low number of vehicles are stranded the WSC will close the highway and attempt to get traffic moving by applying grit and CMA. If this is not successful, the WSC will: -

- ensure all drivers accompany him to a point of safety, or
- organise, sufficient extra resources to enable the removal of stranded vehicles, and
- continue treatment of highway until trafficable.

When a high number of vehicles are stranded, the WSC will: -

- immediately close the highway
- action the contractor's own contingency plan
- advise the WSM how many vehicles are stranded
- advise the WSM whether the Contractor can remove them
- advise the WSM of the estimated clearance time
- engaged additional resources to assist when necessary
- immediately advise all stranded motorists of the situation, and rescue actions in place
- ensure motorists remain in their vehicles and ensure that there is no snow build up around exhaust pipes
- once stranded motorists and vehicles are recovered, continue treatment of the highway until trafficable

The WSM will: -

- advise the Client and NZ Police
- consider, in consultation with the Police, the need for other emergency resources to be called on.

The decision to evacuate people from all vehicles will be undertaken in co-operation with all parties.

The Contractors contingency plan will enable them to draw on additional resources to efficiently remove stranded motorists and their vehicles in the event of motorists becoming stranded in deep snow. It is important to note that stranded vehicles may cause the road to become blocked preventing normal snow clearing machinery to clear snow build up. In this case the Contractor may need to call upon other resources to get around blockages and evacuate motorists.

The Contractor will need to develop strong lines of communication with these resources and have the ability to quickly engage them. Early communication with these resources is essential when adverse weather combined with peak traffic periods (ie holidays) is forecast so that there is a heightened level of readiness.

## 11. Resources

### 11.1 General

The Contractor will ensure that labour, plant and material resources are available in sufficient quantity to enable swift reaction to any hazard situation to ensure that time taken to remove the hazard is minimal. Depots are required at strategic locations to minimise the travel time taken to provide plant, equipment and resources to areas requiring treatment such that treatment can be commenced within the shortest possible time.

### 11.2 Labour

The Contractor is required to ensure that there are sufficient resources available, capable of operating the plant required, to carry out on site patrols and attend snow huts/ closure points, 24 hours per day as necessary.

### 11.3 Plant

A range of plant and equipment is used to deliver winter services. It is important that this equipment is well maintained, calibrated and reliable. The plant and equipment will need to be located at depots which are positioned to ensure that operations are effective and efficient with minimal down time or dead running. Indicative seasonal quantities for winter services are provided in the **Maintenance Specification**. The minimum requirements for Plant to be provided are:

- **Type 1 Plant** (high speed light snow removal plant) shall be capable of moving up to 200 millimetres of snow in a 2.4 metre wide strip at a speed of 60 kilometres per hour on easy curves and grades up to 5%. The equipment must also be capable of moving snow up to 200 millimetres deep on grades up to 17%.
- **Type 2 Plant** (heavy snow removal plant) must be capable of moving up to 400 millimetres of snow in a 2.4 metre wide strip at a speed of 10 kilometres per hour on easy curves and grades up to 5%. The equipment must also be capable of moving snow up to 400 millimetres deep on grades up to 17%.
- **Type 3 Plant** (snow drift removal plant) must be capable of moving at least 120 cubic metres of snow an hour to 10 metres away from snow drifts or windrows on grades up to 17%. The plant must also be able to move between sites at 15 kilometres per hour.
- **Type 4 Plant** (grit spreading plant) shall be capable of spreading grit at rates between 1 and 5 cubic metres per lane kilometre over a width of up to 10 metres. The plant shall be capable of operating on ice affected grades of up to 17%. It shall also be of a configuration that allows loading times together with travel and operating speeds so as it can spread at least 10 cubic metres of grit an hour at various sites ranging up to 10 kilometres from a grit stockpile site. The cost of supplying and operating grit loading equipment for the loading of the grit ex stockpile is considered to be included in the rate for the Type 4 plant with no additional hours or payment being allowed for such loading plant.
- **Type 5 Plant** (grit removal plant), operated in accordance with clause 5.2.4, shall be capable of uplifting for transport all detritus and ice grit from sealed road surfaces at the rate of 100 kilograms of material a minute and from concrete and sealed channels, sumps and catch pits at 80 kilograms per minute. It shall also have the capacity to hold and legally transport on the highways a minimum of 4 tonnes of detritus and ice grit at a minimum speed of 85 kilometres per hour on straight flat sections of road. All operations shall be carried out without any damage to the sealed road surface or channels.
- **Type 6 Plant** (solid chemical spreader) shall be a spreader capable of accurately spreading a chemical at a spread rate of between 5 and 100 grams per square metre to a tolerance of + or – 5%, or + or – 1 gram per square metre (whichever is the greater) at speeds of at least 50 kilometres an hour. The plant shall also be capable of measuring and recording the actual spread rates to an accuracy of + or – 1% or, + or – 0.2 grams per square metre (whichever is the greater).
- **Type 7 Plant** (liquid chemical applicator) shall be capable of accurately spraying chemical at a rate of between 0.02 and 0.15 litres per square metre to a tolerance of + or – 0.003 litres per square metre (equivalent to + or – 1 gram per square metre of CMA in a 25% solution) at speeds of at least 50 kilometres an hour. The plant shall also be capable of measuring and recording the actual spread rates to an accuracy of + or – 1%.

The Contractor shall have the ability to draw on extra resources when required to meet required response times and to be in a position to treat all winter hazards which can be reasonably anticipated before they form in a just in time fashion.

Contractors must anticipate and programme servicing of equipment to minimise the likelihood of causing disruption to service level criteria and response times.

Refuelling of plant resources employed on site during a prolonged snow or ice event is to be done on site using suitable refuelling plant. This is to ensure that delay to reopening of a highway or alleviation of a snow or ice hazard is minimised.

Similarly shift changing of plant operators is to be carried out in such a manner as to minimise delays to plant already performing treatment operations in a snow or ice event.

## 11.4 Plant GPS/AVL

To assist with coordination of plant movements during winter operations plant types 1, 4, 6 and 7 will be equipped with an AVL (Automatic Vehicle Location System) utilising GPS (Global Positioning System).

Real time tracking information from such a system will be made available to the Client so that, as an event progresses, real time information on plant positioning etc. is able to be accessed via the internet. This will be available to be viewed in a 'live' real time map format which displays all the highways likely to be covered (bearing in mind that activities may cross over boundaries).

The map will display:

- the real time location of all plant as specified at all times while they are mobilised and engaged in winter maintenance activities
- a real time graphical representation of the treatment being undertaken such as CMA application, grit application, ploughing and brooming, both in real time and historic tracking.

The AVL system shall also have the ability to provide reports detailing the accurate location of the start and end position (in both SH/RS/RP and coordinate format) of the above treatments, the time and date at which these occurred, the application rates of the CMA and grit treatment and the total quantities used.

This reporting shall be available through the AVL internet site to the Client. In addition the contractor shall provide data in an agreed electronic format to the Client.

This data will be used by the WSM and WSC to help with plant coordination and to ensure that treatment is being applied in the right place and at the right time. It is also used to assist with analysis and refinement of all winter maintenance operations. It may also be used to assist with surveillance and verification of monthly claimed activities and in the event of an enquiry into an event or incident.

## 11.5 Materials

Sufficient stocks of materials are to be maintained at all times. Grit stockpiles are to be replenished daily as grit is used. Suitable quantities of chemical will be stored at the beginning of each marginal winter period, in both liquid and solid form. Contractors will have spare sets of cutting blades for snow and ice clearing equipment in stock at all times. The Contractor shall advise the Client of stock quantities held at regular intervals and will advise in good time if further stocks of CMA are required for the remainder of the winter. CMA is imported and so sufficient advance notice is required to place orders and ship the material to NZ. This can take a minimum of 6 weeks.

CMA supplies are provided NZ wide and the Contractor will assist the Client in re-distributing the material in NZ to meet demands.

## 12. Communication

Road conditions in winter can change very quickly. It is Important that there is effective liaison and communications between the Contractor, the Police, the Client, the media, and the public.

As the Contractors are required to monitor the highways, to ensure the safe operation of the State Highway Network, their communications systems must be effective. The WSM is responsible for ensuring effective lines of communication are well established.

An effective communication system shall be set up by the Contractor which will include mobile phones, pagers and radio telephones, appropriate to the network to minimise the lack of communication coverage in parts of the country.

Although the intent is that the Contractor will be the first to identify an unsafe situation, the reality is that others will on occasions also identify hazards or situations from time to time. It is vital therefore to establish lines of communication with outside independent parties, so that any unsafe area can be reported to the correct personnel immediately. The Contractor will therefore establish lines of direct communication with other regular users of the network such as the Police or specific residents or businesses where necessary.

Winter Service events shall be considered Road Incidents in terms of the Maintenance Specifications and all communication protocols followed. In particular the following should be noted:

- Non automated highway information signs are changed by the Contractor, whenever there is a change in status for any State Highway.
- The Contractor will inform the Client of any change to the status of a highway by SMS, or cell phone.
- The Contractor will update the Clients Traffic Road Event Information System (TREIS) or arrange with the Traffic Operations Centre to carry out the updates.

- The Contractor will contact the Traffic Operations Centre to arrange for VMS signage changes.

During major storm events or road closures, the Client will monitor the weather forecasts and prediction services together with the real time activities of the contractor. The Client may communicate with the WSM and WSC for up to date progress and forward planning.

The Client will undertake all communications with media and the Contractor will refer all enquiries from these sources to the Client.

## 13. Briefing and Reviews

Meetings with the Client will be held to review procedures at any stage during winter if necessary however pre and post winter meetings are held as a refresher for all parties involved in winter maintenance, and covers all aspects of the winter maintenance operational procedures. Parties involved in this meeting may include other stakeholders such as NZ Police, AA, RTA and Councils.

De-brief meetings may be called following a single significant event to discuss any issues that require immediate review and to learn from experience.

The Contractor shall arrange and hold meetings as required or requested by the Client and provide the administrative support.

## 14. Training

To ensure appropriate levels of competence, training and development needs of all those involved in providing the Winter Service should be established and reviewed annually. Training should then be provided where appropriate before the next winter marginal season.

The Contractor should provide training for operators of plant, machinery and equipment and for all those who will be involved on-site with regards health and safety, efficient operations, dealing with emergencies and the Clients requirements and processes. The Contractor shall work with the Client to provide appropriate training for WSM's and WSC's in the areas of road weather forecasting and systems, meteorology, decision support and operational decision making. This may take the form of an annual workshop.

The Client may require underperforming decision makers to undergo further training or be replaced.

## 15. Reporting

Due to the high profile nature of winter events and their impact on road safety and network availability maintaining clear and accurate records of all activities during each event is critical and may be required for legal processes such as Coroner hearings.

The Contractor shall maintain accurate records of treatment decisions, treatment type, time and locations treated and event outcomes. A Daily Treatment Record shall be maintained together with quantities of grit or chemical applied recorded for each event on the formats provided in Appendix B. Records shall be supported by or can be replaced in part or fully by a report printout or file direct from the GPS/AVL system showing the times, locations, grit/CMA rates of application and ploughing undertaken for each item of plant.

These records shall be provided with the monthly report to the client. The client may require records to be provided urgently for any particular significant single or multiple events where this has created issues such as safety concerns or loss of network availability to enable the client to inform the public, media or other stakeholders in a timely manner.

At the conclusion of a winter period an Annual Winter Summary Report is required. The matters to be included in the report are set out in Appendix E however additional information may be required which is particular to the network and/or is necessary due to unusual circumstances within the winter period. The report is to represent a review of the past winter period and will be used to gauge the winter severity in relation to past records and the WSC performance in decisions made as lessons learnt for future improvements.

## Appendix A

### Gritting Materials Specification

Grit or abrasive material used for frost and ice conditions shall meet the following requirements:

- be sharp, angular aggregate.
- have a crushing resistance of at least 100kN when tested to NZS4407 Test 3.10.
- have a grading complying with the grading envelopes in Table 4 when tested to NZS4407 test 3.8.1 or 3.8.2.
- be free of seeds, if used in National Parks and Conservation areas. As confirmed by test results from the Agriquality National Seed Laboratory, Palmerston North.

### Grit Grading

Total Sieve Aperture	Percentage Passing
9.5mm	100
4.75	80-100
2.36mm	40-80
1.18mm	25-60
75 µm	0-2

The Client may approve local variant grading envelopes.

# Daily Treatment Record

Date: \_\_\_\_\_

Area: \_\_\_\_\_

Pre – Event	
Likely event: _____	
Decision: _____	
_____	
WSC Name: _____	Time: _____

Event	
Treatment commenced (time): _____	
Treatment type: <b>CMA</b> <b>Grit</b> <b>CMA/Grit</b> <b>Plough</b> (circle)	

### Event Outcome

#### Frost & Ice

Forecasted	Occurred	Treated	Accuracy (Circle one)
Y	Y	Y	√
Y	Y	N	Risk
Y	N	Y	Waste
Y	N	N	√
N	Y	Y	√
N	Y	N	Risk
N	N	Y	Waste
N	N	N	√

#### Snow

Forecasted	Occurred	Accuracy (Circle one)
Y	Y	1
Y	N	2
N	Y	3

1 = Accurate 2 = Prepared for event, 3 = Not accurate

Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

# Liquid CMA Record

Date:	Driver:
Start Time:	
Finish Time:	

## Application Schedule

SH	From		To		Length	Location	Application Rate (litres/m2)	Total Applied (litres)
	RS	RP	RS	RP				

Total Quantity Used (litres):.....

Verified: .....



# Solid CMA Record

Date:	Driver:
Start Time:	
Finish Time:	

Grit Mix Used [Y][N]

Proportion of grit % \_\_\_\_\_

## Application Schedule

SH	From		To		Length	Location	Application Rate (gms/m <sup>2</sup> )	Total Applied (gms)
	RS	RP	RS	RP				

Total Quantity Used CMA (grams):.....

Total Grit Used (tonnes):.....

Verified: .....

## Appendix C

# Winter Service Decision Guide

### Frost and Ice Pre-treatment

RST Forecast	Dew point Forecast	Surface State Forecast	Interim Precipitation Forecast	Treatment	Rate	Comments
+1 to 0C	Dew < RST	Dry	Dry	None		
		wet	Wet	None		
	Dew = > RST	Frost	Dry	Liquid CMA	Normal	
		Frost	Wet	None		
0 to -2C	Dew < RST	Dry	Dry	None		
		Ice	Wet	Liquid or Solid CMA	Ice 1	If thin ice forms reapply CMA at Ice 1.
	Dew = > RST	Frost	Dry	Liquid CMA	Normal	
		Ice	Wet	Liquid or Solid CMA	Ice 1	If thin ice forms reapply CMA at Ice 1.
-2C to -6C	Dew < RST	Dry	Dry	None		
		Ice	Wet	Solid CMA/Grit	Ice 2	A combined mix of solid CMA and grit or grit followed by solid CMA. If thin ice forms reapply CMA at Ice 1
	Dew = > RST	Frost	Dry	Liquid CMA	Ice 1	If thin ice forms reapply CMA at Normal rate
		Ice	Wet	Solid CMA/Grit	Ice 2	A combined mix of solid CMA and grit or grit followed by solid CMA. If thin ice forms reapply CMA at Ice 1
-6C and below	Dew < RST	Dry	Dry	None		
		Ice	Wet	Solid CMA/Grit	Ice 3	A combined mix of solid CMA and grit or grit followed by solid CMA.
	Dew = > RST	Frost	Dry	Liquid CMA /Grit	Ice 3	Apply liquid CMA followed by grit.
		Ice	Wet	Solid CMA/Grit	Ice 3	A combined mix of solid CMA and grit or grit followed by solid CMA.

Pre-treatments must be adjusted to take account of residual CMA present.

### Snow Pre-treatment

Weather Conditions	RST Forecast	Interim Precipitation Forecast	Snow Type Forecast	Pre - Treatment	Comments	
Snow forecast	0C and rising	Any	All Snow	None		
			Light snow (<10mm/hr)	None		
	0C and falling	Dry to moist	Medium/heavy snow	Pre-treat Liquid CMA at Ice 3 rate		
			Wet or rain	Light snow	None	
			Medium/heavy snow	Grit		

- a) Attention must be paid where water may run across the pavement after heavy rains such as from adjacent land and drains which will wash the chemical from the road. These locations should be closely monitored and may require additional treatment in the evening and morning or at other times if the forecasted RST is 0C or below.
- b) Frosts usually occur in the early morning. Where frosts are forecast treatment should be close as possible and up to 2 hours prior to the expected time of the frost.
- c) When the road is dry and rain is not forecast liquid chemical may be applied more than 2 hours in advance but with caution as moisture will be attracted to the chemical if the dew point approaches RST giving reduced skid resistance. Additional traffic management may be required during this process. Where solid chemical is used this should be applied up to 2 hours in advance to reduce the likelihood of loss of chemical due to traffic or wind action.

**NOTE: This decision guide is used as an aid to identifying the appropriate pre- treatment for various weather conditions and forecasts/predictions. Conditions can vary across the network therefore the pre-treatment will need to be assessed to suit the location. Thermal maps assist in identifying the variable RST's on the network. The objective is to have the appropriate pre-treatment "in the right place – at the right time".**

**Storm Treatment**

Weather conditions	RST	Treatment	Plough	Comments
Snow covering less than 30mm	Any	None	Plough/broom	
Snow covering exceeding 30mm	Any	Solid CMA	Yes	Plough to remove excess snow, slush and ice before chemical application
Hard packed snow/ice	Above -6C	Solid CMA	Yes	Plough until no further snowfall then plough to remove excess snow and ice before chemical application
Hard packed snow/ice	Below -6C	Solid CMA	Yes	Plough until no further snowfall then plough to remove excess snow and ice before chemical application. Chemical will react when RST rises to above -6C
Ice formed	0 to -6C	Liquid or solid CMA	No	Do not apply liquid CMA on ice so thick that the pavement cannot be seen.
	Below -6C	Grit/solid CMA	No	Chemical will react when RST rises to above -6C

- a) Snow, ice and slush should be removed by ploughing as far as possible before treating with chemical.
- b) Time the initial and subsequent chemical applications to prevent deteriorating conditions or development of packed and bonded snow.

**Useful Notes:**

**Thermal classifications**

Surface wind speed (m/s)	Thinly overcast or => 4/8 octas of low cloud	< 4/8 octas cloud
<2	extreme	Extreme
2-3	Intermediate	Intermediate
3-5	Damped	Intermediate
5>	damped	damped

**Treatment**

Type	Cost ratios
Gritting	1
Ploughing	0.3
CMA	
Normal - 25ml/m2 - 7.5mg/m2	10
Ice 1 - 50ml/m2 - 15mg/m2	20
Ice 2 - 75ml/m2 - 22.5mg/m2	30



**Terms:**

**Black Ice.** A thin coating of clear, bubble-free homogeneous ice which forms on a pavement with a temperature at or slightly above 0C when the temperature of the air in contact with the ground is below freezing point and small slightly super-cooled water droplets deposit on the surface and flow together before freezing.

**Frost.** Ice crystals deposit on the road surface when the road surface temperature (RST) falls below 0C and below the dew point of the air.

**Snow.** Snow occurs when the layer of the atmosphere from the surface through to cloud level is entirely below freezing.

**Light snow.** Snow falling at the rate of less than 10mm/hour.

**Moderate or heavy snow.** Snow falling at a rate of more than 10mm/hour. Visibility may be reduced

**Freezing rain.** Occurs when there is a shallow layer of sub-freezing air at the surface underlying an above freezing layer of air above it. When it lands on a road surface with RST below freezing it will freeze on contact to form ice.

**Sleet.** Occurs when there is a warm layer of air above a relatively deep sub-freezing layer at the surface.

**Hail.** Forms as a by-product of strong updrafts as in thunderstorms with clouds at heights below freezing. The droplets of water rise upwards in the wind and collide with other droplets increasing in size. The droplets eventually freeze and when the hailstones grow too large to be suspended in the updraft, they fall to earth. Hail is usually not associated with winter storms.

# CMA Best Practice Guideline

**5/10/2012**

# CMA Best Practice Guideline

## Contents

1. Introduction .....	24
2. Background.....	24
2.1 General.....	24
3 Storage and Mixing.....	24
3.1 Storage .....	24
3.2 Mixing Liquid CMA.....	24
4 Role of Contractors.....	25
4.1 General.....	25
5 Application of CMA.....	25
5.1 General.....	25
5.2 Timing of Application .....	26
5.3 Application Rates.....	26
5.4 Monitoring the effectiveness of Application .....	26
5.5 Applicator Plant .....	27
5.6 Record Keeping.....	27
6 Operators and Training.....	28
7 Resources.....	29
8 Traffic Management .....	29
9 Consents and Environmental Management.....	29

# 1 Introduction

The purpose of this document is to provide guidelines for the effective application of Calcium Magnesium Acetate (CMA), a chemical deicer, to assist in minimising ice formation on roads and thereby reducing or eliminating this hazard.

All roads that are affected by snow and ice can benefit from the application of CMA when it is applied in accordance with these guidelines, thereby minimising ice formation and reducing the exposure of road users to the ice hazard.

It is intended to provide the framework for the Best Practice known at present.

## 2 Background

### 2.1 General

CMA is granulated calcium magnesium acetate, a combination of dolomitic lime and acetic acid. The product currently used in New Zealand is produced with a 3/7 Ca/Mg ratio. CMA is non-corrosive and biodegradable.

Because CMA is acetate based, it has unique performance characteristics that reduce ice formation and snow bonding to the road by interfering with the ability of particles to adhere to each other and to the road surface. It can prevent frosts from forming and allow traffic to break up light ice formation.

CMA chemically ties up the first moisture melted as water of hydration resulting in very little runoff. CMA keeps the snow 'dry' which prevents snow pack under vehicle action assisting in easy removal of the snow.

CMA can be used in both liquid and granular form depending on the road surface condition encountered. It is most effective when used prior to the formation of ice as an anti-icer and when road surface temperatures are above -7°C.

CMA is the preferred treatment for ice reduction on road surfaces in New Zealand. It is quick and easy to apply, safer than grit for motorists, and there are no clean-up costs. Furthermore wear and tear on road markings and RRPM's, and damage to vehicles is virtually eliminated.

## 3 Storage and Mixing

### 3.1 Storage

CMA is imported into New Zealand in solid (granular) form in either 1Tonne sacks or 25kg bags on wooden pallets and plastic shrink wrapped. These can be stored at Contractors depots where required throughout New Zealand. CMA needs to be kept dry and should be stored inside a covered building and on wooden pallets until required for use. Bags should not stacked on top of one another as this may cause the granules to bind together or 'cake' making mixing difficult or clogging dry applicator equipment. During transportation CMA must be kept covered to protect it from being affected by moisture.

Although the chemical is non-hazardous care must be taken when handling the material. Granular CMA should be handled with gloves and a dust mask should be worn by those involved. When handling liquid CMA rubber gloves should be worn.

### 3.2 Mixing Liquid CMA

A CMA solution is prepared by dissolving solid CMA granules in water. It is mixed to form a 25% solution. CMA tends to be stable at this concentration. If the concentration exceeds 28.5% the dissolved CMA will tend to recrystallise which will clog spray nozzles on a liquid spreader.

A 25% solution is prepared by mixing 1.36kg of CMA per 3.78l of water or one 1000kg (1 tonne) bag of CMA with 2780l of water will produce 3310l of a 25% solution.

CMA will go into solution relatively quickly if vigorously agitated and especially if warm water is used. Mixing can be carried out in stainless steel or polyethylene tanks fitted with a high volume, high pressure pump system to provide suitable vigorous agitation by recirculation of the water until the particles are completely dissolved. The return leg of the pumped water should be submerged to prevent air injection which will cause foaming and premature biodegradation.

Mixing should continue for a reasonable period of time, depending on the size of the tank this should be for at least 1 hr. after the last of the granular material has been added to the water.



If the material is allowed to sit for an extended period of time before it is used it should be re agitated to ensure a proper mixture is obtained and that the mixture is held in suspension. It is recommended that liquid CMA be agitated just prior to application and the applicator should be equipped to enable this to occur.



Figure 1 – CMA Mixing and Storage Facility

## 4 Role of Contractors

### 4.1 General

The product is very expensive and care should be exercised when deciding when and where to apply it so that the decision is made on the basis of not wasting the product and applying it at the right time and the right place when there is a clear opinion that ice is about the form.

The contractor is responsible for storage and mixing of CMA, monitoring conditions both remotely and onsite and applying CMA to the road surface prior to ice hazards developing. It is expected that the contractor will, through their own Contract Quality Plan, develop a decision support system that ensures that possible ice hazard areas are able to be identified in advance of ice forming and that CMA is applied to sites prior to them becoming hazardous. The contractor is responsible for keeping records of the location and rate of CMA application at any site.

## 5 Application of CMA

### 5.1 General

CMA can either be applied to the road surface in a granular form or a liquid form. CMA is most effective when applied as a pre-treatment (anti icing) just prior to the onset of freezing conditions. It can also be used as a de-icer to assist with the removal of ice or light snow packing into ice after it has formed.

In general treatment actions are:

	Weather Conditions	CMA Treatment Action	Road Status
1	Frost	Liquid CMA application	Open
2	Frost over several nights	Top-up liquid CMA application	Open
3	Light snow or ice	Dry CMA application	Open
4	Heavy snowfalls	Snow removal to commence immediately and continue throughout storm. Apply solid CMA when snow is removed to near road surface. Apply solid CMA if not too windy	Closed until storm reduces and road non-hazardous
5	Heavy ice formation or snow pack	Apply solid CMA/grit mixture, blade ice	Closed until ice hazard removed

During fine frosty weather, chemical is applied to the road to those areas where ice is predicted to form, to prevent its formation during the night and early morning. Chemical in this situation is generally applied in liquid form and completed as close as practical to the formation of frost/ice so as to have as little impact as possible on surface skid resistance.

However there are situations where an application of granular chemical is more appropriate such as a damp road where temperatures are expected to fall. It is expected that the Contractor has the ability to quickly change from applying liquid chemical to dry chemical as required.

When weather observations indicate that a storm is approaching, chemical should be applied in either solid or liquid form as a pre-treatment. This is done prior to the arrival of the storm. This is to prevent or reduce the bond between the snow pack or ice.

Weather conditions preceding a snowfall may mean that this pre-treatment application may be made ineffective. A wet road surface will dilute the effectiveness of liquid chemical or high traffic volumes and/or high winds combined with a dry road will limit the ability of the chemical in granular form to stay on the road. In this case careful thought should be given to which method of application is most appropriate by the Contractor to make the most efficient use of the chemical.

When temperatures are such that snow and ice does form on the pavement, the action of the chemical allows for a quicker thaw and easier removal of snow and ice by blades or brooming.

Chemical can be applied in solid form over top of a snowfall to assist with the prevention of snow particles bonding with each other. This will keep the snow 'dry' and may enable it to be safely trafficked. This also assists with easier removal by blading or brooming of the snow.

## **5.2 Timing of Application**

CMA application should be completed as close as possible to the event. The application of CMA shall only be done once there is a clear opinion that ice/snow formation is imminent or has already formed for the following obvious reasons: -

- Premature application may result in product loss from traffic moving the CMA off of the road surface
- Late application reduces effectiveness
- Unnecessary application, such as above freezing temperature, is a waste of product and may result in loss of friction, this is not recommended

Generally CMA should be applied no more than 2 hours in advance of freezing conditions occurring as often there is not enough certainty that a ice hazard will develop if the chemical is applied earlier. The optimum timing of application can be predicted from forecast and observation data from weather stations in conjunction with thermal map forecasts (refer to section 6).

## **5.3 Application Rates**

The recommended application rate for liquid or solid CMA is between 7.5 and 30 gm (residual) per m<sup>2</sup> of road surface. In light frosty weather 7.5 gm/ m<sup>2</sup> has proven effective. For heavier ice situations higher application rates are more effective. See appendix 1 for further guidance on application rates.

Granular CMA can be mixed with grit to improve surface friction usually under very wet ice conditions, or where thick ice has formed, or when the road surface temperature has dropped to below -7°C. Under these circumstances CMA alone is likely to have reduced effectiveness. Using a ratio of 6 parts CMA to 4 parts grit is recommended.

Application rates must be varied according to specific sites and local conditions.

## **5.4 Monitoring the effectiveness of Application**

The contractor should monitor the effectiveness of CMA treatment onsite through regular ice patrols. The product can remain effective against ice forming over many consecutive nights of freezing conditions. The effectiveness of the product can be reduced in areas of relative high humidity and the generation of a wet road surface in continued freeze-thaw-freeze conditions (consecutive frosty nights). In these circumstances 'top up' applications will be required, usually at a lower application rate than the initial application, to ensure that the product remains effective.

In areas of high humidity (where earlier/longer and heavier dewfall occurs) other than in lower humidity (drier air climates) it may be more effective to apply CMA in granular form.

Extra caution should be taken when applying CMA to a road surface after a lengthy dry spell (usually the first application for the winter). Under these circumstances CMA will act as a scrubber releasing oil and diluents deposited on the road surface temporarily reducing the skid resistance. In these circumstances combining the CMA application with grit and additional traffic control may be required to safe guard against this temporary reduction in surface friction.

## 5.5 Applicator Plant

Granular CMA is spread by means of a calibrated disc spreader. Liquid CMA is applied using a calibrated spray bar applicator.

The plant must be:

- Calibrated and certified annually prior to winter
- Capable of variable application rates and easily calibrated
- Able to traverse iced roads safely
- Provided with suitable communication equipment in case of emergency
- Highly visible and fitted with appropriate signage to satisfy the requirements of the Traffic control devices manual part 8 CoPTTM

Ideally the spraying vehicle should have the capability to vary the spray rate according to the vehicle speed.

All CMA applicator vehicles shall be fitted with a suitable recording device capable of capturing in real time, location, time and date of application. Further to this, applicator vehicles should be fitted with a suitable device capable of accurately recording air and road temperatures and humidity and the time, date and location of these readings.



Figure 2 – Solid CMA applicator



Figure 3 – Liquid CMA applicator

## 5.6 Record Keeping

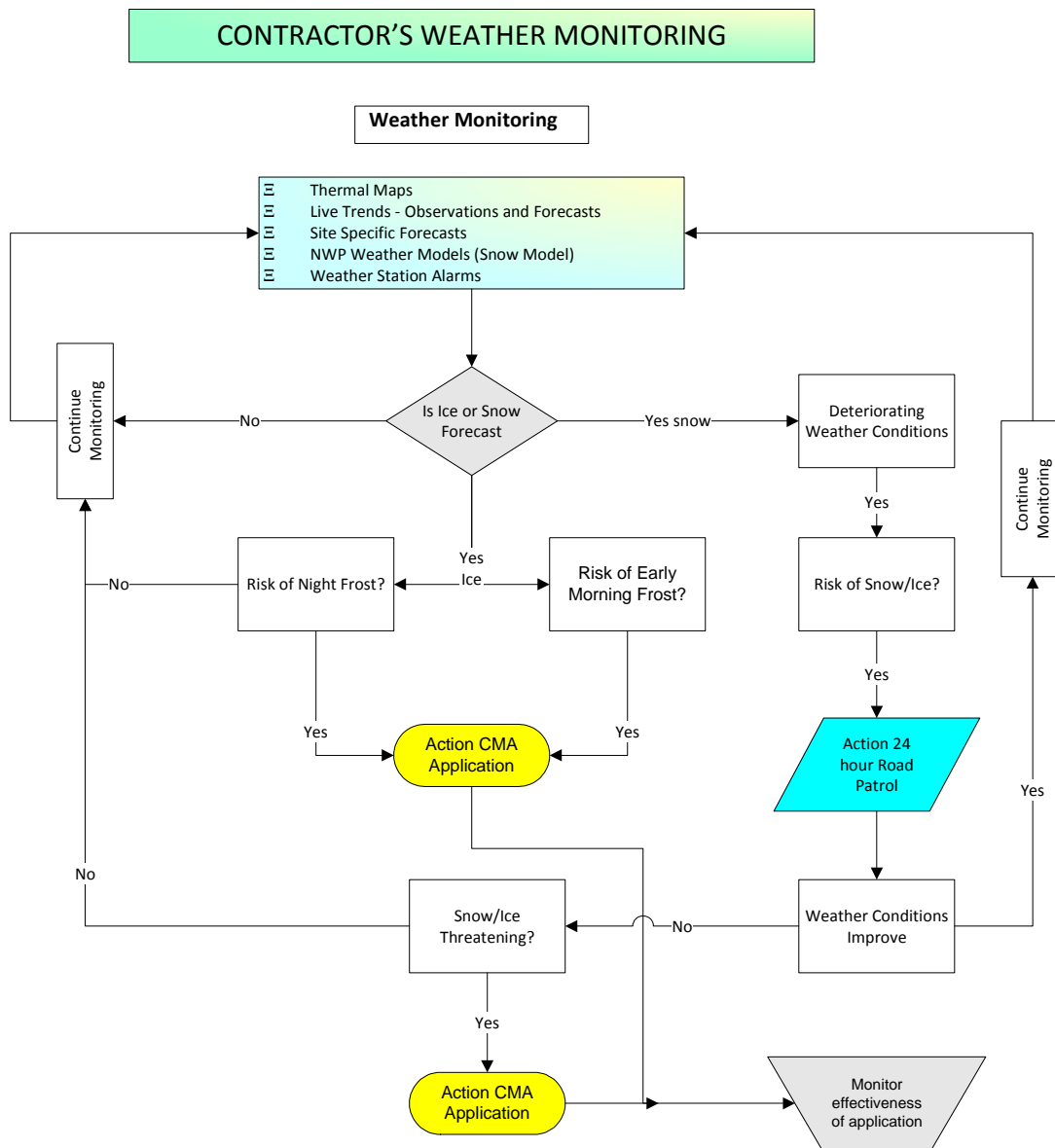
The Contractor shall maintain accurate records of location, date and time of application, to comply with resource consent conditions and to provide historical records if required in the event of an accident and to facilitate payment.

The records should show as a minimum:

- Date / time / location and temperature (both air and road) even if CMA or grit was not required. Recording of humidity is also desirable. This information may automatically be available through the NZTA MetService weather contract.
- Log printouts showing GPS or similar recordings of the monitoring carried out.
- Obvious operational efficiencies can be gained by Automatic Vehicle Location GPS systems which allow the ability operational management staff to be able to view in real time the location of plant. Automatic recording of spray rates and treatment locations enable a much more efficient operation for the plant operator and less administration time in record keeping.

### 5.7 Generic Decision Process

The following flowchart shows a suggested process for deciding when to apply CMA.



## 6 Operators and Training

Operators should be trained in the use of CMA and safe mixing procedures with refresher training given before the start of each winter period.

Training methods, content and procedures should be stipulated in the Contractor's Quality Plan, and training records kept in the Contractor's internal Training Records.

Training should cover as a minimum:

- Local site specific guidelines and local procedures
- Consent conditions and treatment of spills
- Safe mixing and recommended application rates
- Monitoring and record keeping
- Application location and time determination
- Signage and traffic management
- Use and care of equipment
- Dealing with the public

## **7 Resources**

Sufficient CMA supplies are ordered and stored at the beginning of each winter season and maintained at all times.

## **8 Traffic Management**

The temporary traffic management and signage requirements are detailed in the Traffic control devices manual part 8 CoPTTM.

Sites which are being or have been treated with CMA are signed as per gritted sites, with temporary ICE/GRIT warning signage.

Black on orange signs should be removed or closed if CMA is not present and ice is not expected within the next twelve hours.

The location and times of installing and removing signs should be recorded and available for scrutiny if required.

Locating warning signage for CMA treatment should take into account the fact that CMA can be trafficked by vehicle tyres some distance each side of application areas.

## **9 Consents and Environmental Management**

The approval to apply CMA to a road surface is granted, in each location, by a Resource Consent issued by the Regional Authority (Regional Council).

The Resource Consent may stipulate the Consenting Authorities requirements for record keeping, spill reporting and spill clean-up and in some cases maximum application rates and maximum allowable annual volumes of CMA application

The Contractors Quality Plan should include details of the procedures to be followed in the event of a spill, and list emergency equipment and personnel available to deal with the spill (including contact details).

Operator training should cover details of the Consenting Authorities' requirements and procedures to be followed in the event of a spill, and a copy of the Emergency Procedures to be followed should be kept in the application vehicle.

## Appendix E

### Annual Winter Summary Report Outline

Matters to be included in the Summary Report:

#### **Road Closures**

- a) Number of times closed, total hours closed, average closure length by year and for each corridor in tabular form.
- b) Average historic closure time per winter season and average historic winter period closure length

#### **Expenditure**

- c) Monthly total winter services expenditure and monthly CMA cost in graph form.

#### **Activities**

- d) Annual plant hours per plant type
- e) Annual gritting hours and length treated
- f) Annual CMA application hours and length treated
- g) Map of areas treated with CMA and grit and lengths where ploughing has occurred and frequency of occurrence.

#### **Weather Data**

- h) Hours per month and total winter period hours for road and air temperatures recorded below zero for each weather forecast and non-forecast station.
- i) Average network snow fall depths per month and total winter period snow fall.
- j) Total winter period hours and percentage of time for each road surface state for each forecast weather station.

#### **Performance Analysis**

- k) Summary of information from Daily Treatment Records indicating % success, risk or waste in both frost/ice and snow outcomes for each Winter Service Controller.

#### **Safety**

- l) Recorded crash locations, date, road closure time and severity for the winter period where snow and/or ice considered a factor.

#### **Summary**

- m) Overview of winter period noting significant events and issues.