10 Winter Maintenance

10.1 Scope

This section sets out the requirements for maintenance of a road **network** that is at risk of snow and **ice** events to ensure the required road availability and levels of service are achieved during winter.

The objective is to pro-actively react to predicted snow and **ice** events that may affect the highway **network** in order to keep roads open and maintained in a safe condition for motorists as far as is reasonably possible during winter in terms of the defined levels of service.

In the case of **Extreme Snow and Ice Events** where the required level of service cannot be maintained then the road shall be either closed or temporarily sign posted to restrict vehicle use until the required level of service is returned. The work required by this Section must be completed according to the following requirements.

10.2 Definitions

Terms defined in Table 3.2, Definitions appear in **bold.**

10.3 Response Times

10.3.1. Mobilisation and Levels of Service

The Contractor shall provide the levels of service required in Table 10.1. Table 10.2 explains the levels of service and states the response times for identifying the need for and establishing resources on site in **Extreme Snow and Ice Events**. The required levels of service for specific locations are given in Appendix 10.1, and the Operational Requirements.

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Table 10.1: Pavement Levels of Service				
Level of Service	**Road Availability**	**Service Level**	**Method**	**Monitoring (see also Cl. 10.4.2) Regime – Leads to Decision Making**
1A	Open to all vehicles	**Treatment** 24 hours a day to maintain the road in a safe winter driving condition	Mobilisation to ensure: all sites undergo **treatment** before **ice** forms snow is continually cleared from the road. **Ice** undergoes **treatment** during an event	Use tools available – "observations" hourly supplied tools (e.g. **weather monitoring** services) Documented process for decision making Time of predicted **ice**/snow Location of predicted **ice**/snow **Treatment** "Just in time". Ongoing **treatment**
1B	Open with some restrictions being sign posted appropriately (some roads only) e.g. - Open to non-towing vehicles - Open to vehicles with chains - Open with speed restriction			
1C	Closed			.
2A	Open	**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.	As for Level of Service 1 (above), but **Treatment** 7 am to 7 pm and pro-active **treatment** before 7 am if an overnight **ice** or snow event is predicted.	As for Level of Service 1 (above), but, **treatment** "Just in time" within specified hours Review overnight forecast and take appropriate pro-active action by 7am.
2B	As for Level of Service 1B (above)			
2C	Closed			

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Table 10.2 Pavement Levels of Service for Extreme Snow and Ice Events – required for short periods of times when services levels in Table 10.1 cannot be maintained.				
Level of Service (Extreme Snow and Ice Events only)	**Location**	**Service Level**	**Method**	**Response Times**
3A	**Extreme Snow and Ice Events** – Urban (includes Class M and U of table 1.1)	React to **Extreme Snow and Ice Events** within specified response times.	Close road until Able to **make safe**	Mobilise, establish and start work on site within ½ hour, in accordance with this table and the Operational Requirements.
3B	**Extreme Snow and Ice Events** – Rural 1 (includes Class R1 of table 1.1)	React to **Extreme Snow and Ice Events** within specified response times.	Close road until able to **make safe**	As per table 9.1, and in accordance with this table and the Operational Requirements.
3C	**Extreme Snow and Ice Events** – Rural 2 (includes Classes R2, R3, R4 of table 1.1)	React to **Extreme Snow and Ice Events** within specified response times.	Close road until Able to **make safe**	As per table 9.1, and in accordance with this table and the Operational Requirements.

Where the weather does not allow the specified levels of service in Table 10.1 to be maintained the road may need to be temporally changed to a lower level of service and in some cases the level of service changed to an **Extreme Snow and Ice Event** as per Table 10.2. The decision shall be made in accordance with the Operational Requirements. The Engineer shall be notified immediately of any decision to close the road as well as those organisations specified in table 4.2 of the Operational Requirements.

10.4 Specific Requirements

10.4.1. Quality Plan

The Contractor shall submit to the Engineer for acceptance a Quality Plan detailing the procedures to be followed to ensure the specified levels of service are obtained. All activities of the contractor carried out under this specification, including but not limited to **network** and **weather monitoring, patrolling, gritting, chemical** application, **snow clearance** and sweeping, shall be documented at the time of the activity and reported regularly to the consultant in accordance with the Contractors Quality Plan. All activities carried out under this specification shall be documented on forms whose format is to be agreed between the parties to the contract and included in the Contractors Quality Plan. Example forms are included in the Appendix.

The contractor will be required to display the appropriate signage in accordance with COPTTM, the approved TMP and for any restrictions relating to level of service.

10.4.2. Event Forecasting (Weather Monitoring)

The Contractor must proactively determine when and where **pavement gritting, chemical** application and/or **snow clearance** may be required and place the appropriate resources on stand by. This will be achieved through **network monitoring** including the following:

a) **weather monitoring** throughout the contract period, including using a weather forecasting system that provides as a minimum the following information:

   i) accurate 24 hour forecast providing written description of forecast and expected temperatures relevant to the **network**

   ii) predicted 2 to 5 day forecast indicating likely conditions (e.g. rain, frost, snow, etc) and confidence levels of condition occurring within the **network**

b) recording the forecasts, observations and the daily decisions on the agreed form.

c) communicating regularly with the Engineer when there is a risk of frost, **ice** or snow or adverse weather to ensure, as far as possible, hazards are anticipated.

d) providing a written confirmation of 24 hour forecast, 2 to 5 day forecast and the 24 hour decision by 14:00 of each day during the **winter period** to the Engineer and when requested by the Engineer.

Event management on the **network** includes opening and closing the permanent and temporary **ice**/frost **grit** warning signs located on the **network**. Payment for placement and management of signs is included in the **gritting** rate.

10.4.3. Event Response

The Contractor is required to proactively respond to events forecast in accordance with 10.4.2 the Event Forecasting Clause by determining when and where **pavement gritting, chemical** application and/or **snow clearance** is required and then:

- mobilising appropriate resources as required
- liaising with the Engineer, Police, 0800 4 Highways /Automobile Association and Territorial Authorities as required in Table 4.2 of the Operational Requirements
- maintaining the road information signs including opening and closing the permanent and temporary **ice**/frost **grit** warning signs located on the **network**.
- providing sufficient information to the Engineer, as specified, so the Engineer can update the road information report.
- It is the contractor's responsibility to check and validate that the published road information is current and accurate.

Patrolling shall continue until the **ice** or snow event ends. **Patrolling** shall also be **programmed** to check on sites outside those identified for **treatment** and those areas undergoing **treatment** during the event to ensure that the **network** is maintained in a safe condition.

Should other previously unidentified areas be found to be affected by **ice** or snow the areas shall immediately undergo **treatment** in accordance with the required level of service.

10.4.4. Information Supplied by the Engineer

Appendix 10.1 details the Sites that have historically posed a potential frost, **ice** or snow problem.

10.5 Treatment

10.5.1. Snow Clearance

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 accessways, sideroads 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.

10.5.2. Pavement Gritting

10.5.2.1. Grit Stockpiles

As a minimum **grit** stockpiles shall be located at the areas specified in Appendix 3.5 and the Operational Requirements. They 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 encroach 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.

The contractor is to advise the Engineer which of the Transit stockpile sites will be used to stockpile **grit** for winter maintenance operations.

10.5.2.2. Grit Material Properties

Grit shall:

a) be sharp, angular aggregate.

b) have a crushing resistance of at least 100kN when tested to NZS4407 Test 3.10.

c) have a grading complying with the grading envelopes in Table 10.3 when tested to NZS4407 test 3.8.1 or 3.8.2. Transit may approve local variant grading envelopes.

d) 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.

Table 10.3 – Grit Grading	
Sieve Aperture	**Percentage Passing**
9.5mm	100
4.75 mm	80-100
2.36mm	40-80
1.18mm	25-60
75 µm	0-2

10.5.2.3. Application of Grit

Grit shall be applied evenly across the traffic lanes so that the surface is covered to such an extent that sufficient surface friction is maintained for traffic to travel safely in winter driving conditions.

10.5.2.4. Removal of Grit

The **grit** shall be removed if:

a) it obstructs water draining from the road surface

b) build up of **grit** becomes a traffic hazard

c) it is not required because **ice** or regular frosting is not occurring and there is no immediate threat of **ice**.

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.

10.5.2.5. Other Contractors

If **gritting** is applied to a surface **resealed** under a TNZ P/17 contract, the Maintenance Contractor must advise the TNZ P/17 Contractor within one week of **grit** application. Refer to Table 4.2 of the Operational Requirements for information on TNZ P/17 contracts.

10.5.3. Chemical Treatment

10.5.3.1. CMA Material Properties

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

The details of the Resource Consent for CMA, if part of this contract, is listed in Appendix 7.2.

10.5.3.2. CMA Application

Where the use of CMA is included in the Operational Requirements then the manufacturer's recommendations should be followed with a general concentration of 25 percent solution. This mixture is equal to mixing CMA at a rate of 0.38 kg/l of fresh water.

In the absence of any other information CMA will be applied at an application rate to achieve 30 grams per square metre of CMA as an initial application and can be 'topped up' depending on weather conditions at application rates of between 15 and 20 grams per square metre of CMA.(30 grams per square metre of a 25% solution (providing a density of 1.14 kg/l) requires a spray rate of 0.1litres per square metre).

10.5.3.3. De-icing

Where light snow has fallen, or **ice** has formed, CMA as solid pellets may be applied at 25 to 30 grams per square metre.

At times the CMA may be combined with **grit** helping to improve surface friction and to stop the **ice** sheets from binding together again.

10.5.3.4. CMA Equipment and Calibration

The contractor is responsible for the application equipment, which must meet the following conditions:

- calibrated each year
- capable of variable application rates which are also speed controlled
- able to traverse **iced** roads safely
- provided with suitable communication equipment in case of emergency

All calibration measurements should be recorded along with the name of the person responsible for calibration.

Storage and mixing equipment must be operated to ensure that spillages are contained within the site and are environmentally and operationally safe.

10.5.4. Plant

Indicative seasonal quantities for **snow clearance** and **ice gritting** (and/or **chemical de-icing** and/or **anti-icing**) are given in Appendix 10.1 and the Operational Requirements. Minimum requirements for plant to be provided is as specified in Appendix 10.2.

10.5.4.1. Snow Clearance Plant

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 all sections of the **network**.

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 all sections of the **network**.

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 all sections of the **network**. The plant must also be able to move between sites at least at 15 kilometres per hour.

10.5.4.2. Gritting Plant

Type 4 Plant (**grit** spreading plant) shall be capable of spreading **grit** at rates between 1 and 5 cubic metres per lane kilometre. The plant shall be capable of operating on **ice** affected sections on the **network**. 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.

Type 5 Plant (**grit** removal plant), operated in accordance with clause 10.5.3.4, shall be capable of uplifting for transport all **detritus** and **ice grit** from sealed **carriageway** 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 normal operating road speeds, on straight flat sections of road.

10.5.4.3. Chemical Application Plant

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 (which ever 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%.

10.6 Performance Criteria

The performance measures applying to this specification are:-

a) the road surface is maintained in a safe condition in accordance with Table 10.1, **Pavement** Levels of Service.

b) inspections are completed on time and inspection records are available when requested by the engineer.

c) the success rate in predicting and applying **grit** or **chemical** for **ice** conditions shall be at least 95%.

d) providing a written confirmation of 24 hour forecast, 2 to 5 day forecast and the 24 hour decision by 14:00 of each day during the **winter period** to the Engineer.

e) completion of forms documenting all monitoring and activities carried out under this contract and delivery of the forms to the Engineer at the agreed timeframes. Details of all monitoring and activities on the **network** shall be available if requested by the engineer.

f) the Contractor shall cooperate with the Engineer in supplying data on the prediction success rate and response times. The Contractor shall assist the Engineer in refining the prediction system to improve its performance.