

TNZ C22: 2005

SPECIFICATION FOR WINTER MAINTENANCE

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.

1.1 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 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).

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.

1.2 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.

1.3 Signs

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

2 RESPONSE TIMES

2.1 Mobilisation and Levels of Service

The Contractor shall provide the levels of service required by Section 9 and Table 1. Table 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 the Specific Contract Requirements.

Table 1: Pavement Levels of Service				
Level of Service	Road Availability	Service Level	Method	Monitoring (see also Cl. 3) 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			

Table 2 Pavement Levels of Service for Extreme Snow and Ice Events – required for short periods of times when services levels in Table 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 9.1)	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 Table 2 and the Operational Requirements.
3B	Extreme Snow and Ice Events – Rural 1 (includes Class R1 of table 9.1)	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 Table 2 and the Operational Requirements.
3C	Extreme Snow and Ice Events – Rural 2 (includes Classes R2, R3, R4 of table 9.1)	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 Table 2 and the Operational Requirements.

Where the weather does not allow the specified levels of service in Table 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 2. The decision shall be made in accordance with the specific contract conditions. The Engineer shall be notified immediately of any decision to close the road as well as those organisations specified in the Specific Contract requirements.

3 EVENT FORECASTING

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:
 - a. Accurate 24 hour forecast providing written description of forecast and expected temperatures relevant to the network

- b. 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.

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.

4 EVENT RESPONSE

4.1 Service Levels 1 and 2 (Table 1)

The Contractor is required to proactively respond to events as required to be forecast in 3 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, Automobile Association and Territorial Authorities as required in the Specific Contract 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.

The mobilisation decision shall be made in sufficient time to ensure that the required levels of service are met.

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.

4.2 Extreme Snow and Ice Events (Table 2)

Mobilisation shall be undertaken in Extreme Snow and Ice Events in accordance with Table 2 and the Operational Requirements.

5 TREATMENT

5.1 Snow Clearing

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.

5.2 Gritting

5.2.1 Grit Stockpiles

As a minimum grit stockpiles shall be located at the areas specified in 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 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.

5.2.2 Material

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 4 when tested to NZS4407 test 3.8.1 or 3.8.2.
- (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..

Transit New Zealand may approve local variant grading envelopes.

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

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

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.

5.3 Chemical Treatment

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

Where the use of CMA is included in the Specific Contract Requirements then the manufacturer's recommendations should be followed. CMA is effective down to -70°C .

5.3.1 Anti-icing

In the absence of any other information CMA will be applied 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, providing a specific gravity of 1.14 kg/l. CMA is 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.

30grams per square metre of a 25% solution requires a spray rate of 0.1litres per square metre.

5.3.2 De-Icing

Where light snow has fallen, or ice has formed, CMA as solid pellets will 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.

5.3.3 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.

5.3.4 CMA Operators

Operators should be trained in the use of CMA and safe mixing procedures. They should have records showing their training. Operator's skills should be refreshed each year.

5.4 Repair of 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 the contract. Any preventable damage, as judged by the engineer, caused to these facilities by the Contractor shall be made good at the contractor's expense unless agreed with the prior approval of the engineer.

All damage must be repaired within 24 hours from the time the damage occurred or within the timeframe agreed with the Engineer and detailed in the Quality Plan.

5.5 Other Contractors

If gritting is applied to a surface resealed under a P/17 contract, the Maintenance Contractor must advise the P/17 Contractor within one week of grit application.

6 FEEDBACK

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.

7 PERFORMANCE MEASURES

The performance measures applying to this specification are:-

- The road surface is maintained in a safe condition in accordance with Table 1, Pavement Levels of Service.
- The success rate in predicting and applying grit or chemical for ice conditions shall be at least 95%.

8 WINTER CONDITION MAINTENANCE PLANT

Indicative seasonal quantities for snow clearing and ice gritting (and/or chemical de-icing) shall be given in the Operational Requirements.

8.1 Snow Clearing 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 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.

8.2 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 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.

8.2.1 *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%.