

***City & Guilds***  
***Winter Service Operations***  
***6159- 09 to -15***

**Scheme Assessor/Candidate**

**Notes for Guidance**

**Winter Service Supervisor**

Version October 2021

General information about City & Guilds may be obtained from the Customer Relations

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This update includes the revised version of chapter 13 of Well Maintained Highways and associated Appendix H.

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## **Updates**

<b>Date</b>	<b>Updates</b>
<i>September 2010</i>	<i>1. Updates to include revised Chapter 13 – Well Maintained Highways</i>
<i>September 2010</i>  <i>Associated document updates</i>	<i>1. Appendix H included – Well Maintained Highways</i>
<i>July 2012</i>	<i>1. PoS amended on front page, page numbers added and contact details updated.</i>
<i>August 2013</i>	<i>1. Updated in line with revised edition of Section 13 and Appendix H, Well Maintained Highways Code of Practice 2. Add information on Driver Continuing Professional Competence.</i>
<i>October 2021</i>	<i>Amended Highways England to National Highways</i>

## **Introduction**

These notes for guidance are intended to assist you has a candidate undertaking assessment within the City & Guilds Award number 6159 for winter service operations of vehicles and equipment. This guidance document is not intended to replace or subsume any employer work practices or arrangements.

Under current UK and EU Legislation it is a requirement that employers ensure all employees have received adequate information, instruction, supervision and training for purposes of Health & Safety, including any information on the risks and precautions to be taken.

Training and assessment centre's are responsible for ensuring that information used is up to date with current Regulations, Codes of Practice and methods of work.

## **Training**

*If you or your employer requires information on training/assessment courses and training/assessment modules offered in winter service operations please contact your City & Guilds assessment centre offering the winter service awards or contact Customer Relations*

## **WINTER SERVICE - DE-ICING**

### **Introduction**

The de-icing of roads in wintry conditions is a matter of concern for every family in the country, as well as every business. Good Winter Maintenance is rarely noticed: only when things go wrong does it become a public issue. When sudden bouts of cold weather bring traffic chaos, icy roads receive high-profile coverage in the media and local authorities are criticised, often unfairly, for not affording greater protection.

Safe winter travel involves a partnership between the service provider and the road user. For that partnership to work, it is important for the partners to understand what they can expect from each other. Many authorities take pains to give residents information on winter maintenance in their area. However, policy differs between areas and this is a potential danger to the travelling public.

### **The Law**

#### Goodes v East Sussex County council

The Claimant brought a claim for damages following the death of her husband in a road traffic accident. He had died on 22<sup>nd</sup> December 1996 whilst travelling around a slight right hand bend at about 45-50 mph (a safe speed in the dry or wet). The road was however icy/frosty and he lost control.

At the time of the accident the relevant council believed that they had a duty to grit icy roads. The trial Judge effectively found that had the council's employees acted with due diligence the roads would have been salted prior to the accident. If the road had been salted then the deceased probably would not have crashed.

The Trial Judge, Mr Justice Newman however dismissed the Claimant's claim for damages holding that there was no duty of care under section 41 of the Highways Act nor was there any duty of care under common law. The Claimant was given leave to appeal to the Court of Appeal.

What does the law say about Winter Maintenance? The Railways and Transport Safety Act 2003 made it abundantly clear that local authorities have a legal responsibility to ensure, so far as is reasonably practicable, that safe passage along a highway is not endangered by snow and ice.

The problem is that there is no common view on what is 'reasonable and practicable' and, so far, there is limited case law on which to base judgments. It will always be difficult to define this precisely, but there is a wide variation in interpretation. A survey currently being undertaken on behalf of the Salt Manufacturers' Association indicates that adjoining local authorities often employ entirely different practices and criteria.

### **Economics**

The human and monetary cost of not keeping roads in a safe order during snow and ice conditions is enormous.

Research has shown that for every £1 expended on winter road maintenance, about £8 is saved in the economy as a whole, and this takes no account of the potential for human tragedy.

### **Defining Policy**

Different local authorities will have different priorities based on their local infrastructure, weather conditions and centres of population. However, here are some suggested guidelines.

- 1 Clearly prioritised gritting routes, established against a national assessment framework which reflects:

- traffic-flow;
  - time-to-treatment;
  - recommended spreading rates;
  - key routes;
  - access for essential services;
  - consistency with neighbouring authorities.
- 2 Widespread publication of those routes in local newspapers, local radio, television, leaflets and web sites.
  - 3 Nationally agreed schedule and technical specification for equipment maintenance and spreader calibration.
  - 4 Nationwide programme of operator training and assessment.
  - 5 Agreed performance measurements for sub-contractors and methods of monitoring them.
  - 6 Establishing sensible salting standards to minimise environmental damage.
  - 7 A campaign to encourage road users to play their part in keeping winter roads safer – a ‘Drivers Contract’.

#### **Codes of Practice (Well Maintained Highways)**

National Highways	<b>Trunk Road Maintenance Manual, Volume 2 – Routine &amp; Winter Maintenance Code</b>
Scottish Executive	<b>Code of Practice – Winter Maintenance for Trunk Roads</b>
Association of Metropolitan Authorities	<b>Northern Ireland Highway Maintenance – A code of Good Practice, Winter Maintenance Supplement</b>
Published by Institution of Highways & Transportation	<b>Delivering Best Value in Highways Maintenance</b>
The Institution of Civil Engineers	<b>ICE Design &amp; Practice guide to Highways Winter Maintenance</b>

#### **Environmental Issues**

De-icing salt is not only the cheapest form of de-icing material, it is also non-toxic and residual salt is gradually diluted and disposed of through natural processes.

However, there are some plants and trees that are not salt-tolerant and it is also advisable to avoid salt leaching into natural watercourses in large quantities. Sensible precautions should, therefore, be taken.

These include:

- covered storage of salt stocks;
- storing stocks away from water-courses;
- maintenance and calibration of spreaders;
- spreading at recommended levels;
- use of salt-resistant trees and plants.

## Glossary

Common terms	
Term	Definition
Abrasive, grit	Natural or artificial material (e.g. gravel, cinders or sand) used to increase the adhesion of a slippery surface
Anti-caking agent	Component added to spreading material to prevent coagulation
Barn	Structure built to cover the stored de-icing salt to protect from the effects of the weather
Bin	Receptacle for the storage of small quantities of spreading material, on steep inclines
Brine	Aqueous chloride solution, usually sodium, but can be calcium, magnesium or potassium
Brine production facility	System for the production of water based de-icing solutions
BS 3247: 1990	The British Standard for De-icing salt
De-icing, anti-icing agent	Granular material or solution used to lower the freezing point in order to remove ice or prevent it from forming
Depression of freezing point temperature	The lowering of the freezing point of a liquid by the addition of a solute. This is a fixed property of a given combination of liquid and solid and is the mode of action of de-icing agents
Eutectic point	Temperature below which salt will not melt ice (-21°C)
Grit	Natural mineral spreading medium consisting of particles of stone
Gritter	Vehicle with conveyor or auger conveyor for spreading salt onto the road surface
Gritting/ Spreading agent	Agent used to increase adhesion between tyres and the road surface, so preventing skidding
Marine salt, sea salt	Sodium chloride from solar evaporation of sea water. It contains associated impurities such as Calcium Sulphate and Magnesium Chloride
Mechanical shovel bucket loader	Wheeled loader for loading a spreader with spreading material
Open stockpile	Open storage on a thick base for groundwater protection
Precautionary treatment	Treating road surfaces with salt, prior to an expected snow or ice event
Pre-wetted salt	Salt which is wetted prior to spreading, usually using sodium chloride or calcium chloride brine solution. This improves adherence to the road, and may encourage rapid thawing action, especially in dry air conditions
Residual salt	Salt on the road surface
Rock salt, halite	Sodium chloride mined from natural salt beds. May contain impurities such as Calcium Sulphate and Silicates
Salt saturator	Specially designed vessel for continuous production of saturated sodium chloride brine
Sand	Natural mineral spreading medium (also "crushed" sand).
Silo	Raised storage vessel which allows direct filling of spreading vehicles
Spreading material	Material spread in order to counter slippery conditions (Sand, salt, grit, granulates, brine)
Tank storage	Reservoir for the storage of liquid de-icers
Thaw time	The time taken for the ice or snow to melt after treatment
Thawing component	Portion of spreading medium responsible for thawing
Vacuum salt	Pure sodium chloride prepared by the evaporation of brine under vacuum conditions. The brine is usually extracted by controlled solution mining of rock salt beds, but may be naturally occurring

## **Terminology used in Weather Reporting**

The following applies to the wording contained in weather forecasts and reports; it should not be inferred that where the same terminology is used elsewhere in the Winter Service Plan the meaning is necessarily the same.

### **Air Temperature**

The temperature of the air measured in the shade in a well-ventilated place (usually a Stevenson Screen - a 'louvered' timber surround which permits airflow) four feet above ground. NB any measurements made in direct sunlight are meaningless since the thermometer simply stores up the energy and gives a false high reading.

### **Air Frost**

Air temperature measured between 1 and 2 metres above ground less than 0 °C

### **Black Ice**

Frozen precipitation on roads which cannot easily be seen and through which the black road surface shows through thus giving it its name.

### **Dew Point**

The temperature to which the air would have to be cooled for it to become saturated i.e. the point at which relative humidity is 100%. Where the air temperature and dew point are identical fog will usually be present. When the road surface temperature is less than the dew point moisture will condense on the road, this condensate is called dew.

### **Freezing Fog**

Fog which forms when the air temperature is below freezing. May freeze when in contact with the road surface.

### **Freezing Rain**

A very dangerous condition when rain falling on sub-zero temperature roads turns immediately to ice. Rare in the UK and most likely following a prolonged period of cold weather.

### **Frequent showers**

Frequent showers means that most areas will have at least one shower and many areas will experience several.

### **Frost**

The word 'frost' simply means temperatures below 0 °C. It is usually qualified by the location of the frost i.e. 'air', 'ground' etc.

### **Ground Frost**

Sub-zero temperatures on grass or fields, often used in TV forecasts. Cars often cool down to similar temperatures and can thus have frost on them when air and road surface temperatures are above freezing.

### **Gusts**

Sudden burst of wind, typically 1 to 2 times the local average speed.

### **Hoar Frost**

The fine, slightly 'feathered' looking deposits of ice commonly occurring on grass and cars, and less commonly on roads. It can be caused by either dew freezing, or moisture from the air freezing directly onto the road surface. Heavy accumulations on roads may be compacted by traffic into ice and thus create a problem.

### **Isolated Showers**

Most places will stay dry but somewhere in the area a shower will occur.



**Precipitation**

A general term, which covers all water or ices which 'falls' from the sky. It includes rain, drizzle, snow, hail, sleet, dew, hoar frost, fog and freezing rain

**Prolonged**

A period of continuous precipitation usually lasting more than one hour and covering a relatively large area.

**Road Surface Temperature**

Temperature at the road surface. Usually colder than the air temperature in winter and warmer in summer. Can be as much as 4°C lower in the middle of winter.

**Wind Direction**

The direction from which the wind is blowing.

**Wind Speed**

Measured at 10 metres above ground on the 'Beaufort' Scale (Force Number.):

Force 2 6 mph-a light breeze

Force 4 15 mph-powdery snow may drift

Force 6 28 mph-lying snow will drift

Force 8 43 mph-gale force

**Drivers Hours and Working Time**

If drivers of a vehicle are subject to the GB domestic drivers 'hours' rules or are an occasional mobile worker, five provisions under the 1998 Working time Regulations affect you.

These are:

- weekly working time, which must not exceed an average of 48 hours per week over the reference
- period (although individuals can 'opt out' of this requirement if they want to);
- to 'an entitlement to 4.8 weeks' paid annual leave (increased to 5.6 weeks from 1 April 2009);
- health checks for night workers; and
- an entitlement to adequate rest.

**Adequate rest** means that workers should have regular rest periods. These rest periods should be sufficiently long and continuous to ensure that workers do not harm themselves, fellow workers or others and that they do not damage their health in the short or long term.

The reference period for calculating the 48-hour average week is normally a rolling 17-week period. However, this reference period can be extended up to 52 weeks, if this is permitted under a collective or workforce agreement.

The 1998 Regulations do not apply to self-employed drivers.

VOSA enforces the working time limits and the requirement for health checks for night workers under the 1998 Regulations for drivers operating under the GB domestic drivers hours rules (and occasional mobile workers).

Winter Service operators will fall into scope on the Regulations where work is planned in advance. Should the weather conditions prove that the situation becomes an emergency, the driver's hours and working time would not apply for the duration of the emergency. It is worth noting that this will be the subject of a legislative ruling yet to be made.

An employee may provide in writing the option to opt out of any restriction and in each case the employer

- (i) must identify each of the workers whom he employs who has agreed that the limit specified in the Regulations should not apply in his case;
- (ii) set out any terms on which the worker agreed that the limit should not apply; and
- (iii) specify the number of hours worked by him for the employer during each reference period since the agreement came into effect (excluding any period which ended more than two years before the most recent entry in the records);

A night worker shouldn't work more than an average of eight hours in each 24-hour period, (excluding overtime). This average is calculated over a 17 week period. There is no opt out of the night working limit.

If your night work involves special hazards or heavy physical or mental strain, you can't be made to work more than eight hours in any 24-hour period. This includes overtime.

### **Driver Continuing Professional Competence (D-CPC)**

Guidance on whether D-CPC applies to winter service operators is vague. The Driving Standards Agency will not provide interpretation of the Regulations and only suggest that legal advice is sought. At the time of the publication of this document there are no interpretations of the legal requirements and application towards winter service operations generally.

### **Vehicle uses where you don't need Driver CPC if the vehicle you drive is:**

- used for non-commercial carriage of passengers or goods for personal use
- used to carry material or equipment you use for your job - but driving the vehicle can't be the main part of your job
- used for driving lessons for anyone who wants to get a driving licence or a Driver CPC
- used by, or is under the control of, the armed forces, civil defence, the fire service and forces responsible for maintaining public order
- used in states of emergency or for rescue missions

### **Vehicles driven within 50 km of the driver's base and not carrying passengers or goods**

New rules will come into force later in 2013 which mean that you won't need to have Driver CPC if you're driving vehicles in the course of your work and:

- it's within 50 km of your base
- you're not carrying passengers
- you're not carrying goods, except for equipment that's incidental to the safe carriage of goods or passengers, or loading or unloading the vehicle, where that equipment is not being carried for hire or reward
- driving the vehicle is not your main activity

It is recommended that centres and employers take legal advice where there is any doubt on the application of D-CPC to winter service operations.

## Employees on Standby/Call out

On 3 October 2000 the European Court of Justice gave judgement in a case concerning the status of 'on-call' time. The judgement related to doctors employed in primary health care teams although the courts in other areas have taken a similar approach. It indicated that 'on-call' time would be working time when a worker is required to be at his place of work. When a worker is permitted to be away from the workplace when 'on-call' and accordingly free to pursue leisure activities, on-call time is not 'working time'.

The employer's duty of care in practice

All employers, whatever the size of the business, must:

- make the workplace safe
- prevent risks to health
- ensure that plant and machinery is safe to use, and that safe working practices are set up and followed
- make sure that all materials are handled, stored and used safely
- provide adequate first aid facilities
- tell you about any potential hazards from the work you do, chemicals and other substances used by the firm, and give you information, instructions, training and supervision as needed
- set up emergency plans
- make sure that ventilation, temperature, lighting, and toilet, washing and rest facilities all meet health, safety and welfare requirements
- check that the right work equipment is provided and is properly used and regularly maintained
- prevent or control exposure to substances that may damage your health
- take precautions against the risks caused by flammable or explosive hazards, electrical equipment, noise and radiation
- avoid potentially dangerous work involving manual handling (and if it can't be avoided, take precautions to reduce the risk of injury)
- provide health supervision as needed
- provide protective clothing or equipment free of charge (if risks can't be removed or adequately controlled by any other means)
- ensure that the right warning signs are provided and looked after
- report certain accidents, injuries, diseases and dangerous occurrences to either the Health and Safety Executive (HSE) or the local authority, depending on the type of business

# Section 13

## Winter Service

*Section Amended (centres to also check this section for any updates)*

Section 13 has been superseded with the revised Section below.

### 13.1 INTRODUCTION

#### Background

- 13.1.1 Although sometimes termed “Winter Maintenance”, the particular network management requirements during winter are not “maintenance”, in the traditional sense, but specialist operational services. The term “Winter Service” has been adopted by this Code.
- 13.1.2 Winter Service deals with regular, frequent and reasonably predictable occurrences like low temperatures, ice and snow, as well as with exceptional events. Whilst the effects of climate change are likely to result in an increased frequency and intensity of severe winter events, these can be taken into account in Winter Service planning. Therefore Winter Service can and should be subject to the same regime of plan, deliver, review and improve as other aspects of the highway maintenance regime.



- 13.1.3 Policies and plans developed for Winter Service are likely to have relevance in emergency planning for dealing with extreme weather conditions including flooding, high winds and high temperature, as discussed in Section 14 of this Code. The incidences of such events may be affected by climate change. They are also likely to have some relevance to the wide range of non-weather related emergencies that could affect the highway network.
- 13.1.4 Although a much specialised area, Winter Service is a significant aspect of network management both financially and in terms of its perceived importance to users. It can also have significant environmental effects. The organisation of the service is likely to have considerable implications for the overall procurement and management of other highway maintenance services. This Section of the Code should therefore be read in conjunction with other sections dealing with these issues and Appendix H.

## Objectives

- 13.1.5 Winter Service can contribute significantly to each of the core objectives set out in this Code as described below:

### **Customer**

- There are, in all parts of the UK, very considerable user needs and expectations and these can be a major influence on customer satisfaction through demonstrating an efficient, effective and proportionate response to winter conditions.

### **Safety**

- Safety is a consideration for Winter Service, even though statutory obligations and users needs vary in different parts of the UK.

### **Serviceability**

- Maintaining availability and reliability of the highway network is a key objective for Winter Service and one where user judgements of performance will be immediate rather than longer term.

### **Sustainability**

- Low temperatures and the formation of ice can cause serious damage to the fabric of running surfaces and accelerated damage of the network. Effective Winter Service can contribute to a reduction in whole life costs and minimise damage to the environment.

## Statutory Basis

- 13.1.6 The statutory basis for Winter Service varies in different parts of the UK. In England and Wales Section 41 (1A) of the Highways Act 1980 was modified on 31st October 2003, by Section 111 of the Railways and Transport Act 2003. The first part of Section 41 now reads:

“a) The authority who are for the time being the highway authority for a highway maintainable at the public expense are under a duty, subject to subsections (2) and (3) below, to maintain the highway.

b) (1) In particular, a highway authority are under a duty to ensure, so far as is reasonably practicable, that safe passage along a highway is not endangered by snow or ice.”

- 13.1.7 This is not an absolute duty, given the qualification of “reasonable practicability” but it does effectively overturn previous legal precedence, albeit not with retrospective affect. Section 150 of the Highways Act 1980 still imposes a duty upon authorities to remove any obstruction of the highway resulting from “*accumulation of snow or from the falling down of banks on the side of the highway, or from any other cause*”.

- 13.1.8 In addition, the Traffic Management Act 2004 placed a network management duty on all local traffic authorities in England. It requires authorities to do all that is reasonably practicable to manage the network effectively to keep traffic moving. In meeting the

- duty, authorities should establish contingency plans for dealing promptly and effectively with unplanned events, such as unforeseen weather conditions, as far as is reasonably practicable.
- 13.1.9 Given the scale of financial and other resources involved in delivering the Winter Service it is not reasonable either to:
- ☐ provide the service on all parts of the Network;
  - ☐ ensure running surfaces are kept free of ice or snow at all times, even on the treated parts of the network.
- 13.1.10 In Scotland statutory responsibilities are defined by Section 34 of the Roads (Scotland) Act 1984 which requires that *“a road authority shall take such steps as it considers reasonable to prevent snow and ice endangering the safe passage of pedestrians and vehicles over public roads”*.
- 13.1.11 In Northern Ireland, the Roads (NI) Order 1993 SI 1993/3160 (NI 15) provides, in Article 10, a duty for the Department of Regional Development to *“remove snow, soil etc which has fallen on a road”*. Section 9 of the Order also enables the authority to *“take such action as it considers reasonable to prevent snow or ice interfering with the safe passage of persons and vehicles using the road”*. However paragraph 7 of Article 110 provides protection from liability and states that *“Nothing in this Article operates to confer on any person a right of action in tort against the Department for failing to carry out any duty imposed on it under the Article”*.

## 13.2 WINTER SERVICE POLICY

- 13.2.1 Authorities should formally approve and adopt policies and priorities for Winter Service, which are coherent with wider objectives for transport, integration, accessibility and network management, including strategies for public transport, walking and cycling. They should also take into account the wider strategic objectives of the authority. **(Recommendation 1)**
- 13.2.2 Issues for consideration in developing policy should include:
- ☐ treatment of facilities for public transport users;
  - ☐ treatment of facilities for road users;
  - ☐ treatment of facilities for walking and cycling;
  - ☐ treatment of transport interchanges;
  - ☐ treatment of promoted facilities;
  - ☐ extent of priority for emergency services;
  - ☐ extent of priority for key public services and critical infrastructure;
  - ☐ extent of priority for vulnerable users;
  - ☐ level of service resilience required;

- ☐ other local circumstances.

- 13.2.3 Authorities should develop service standards for Winter Service which define the Overall Winter Period, the Core Winter Period, the level of resilience and treatment networks.
- 13.2.4 These policies and service standards should be developed as far as reasonably possible with users and key stakeholders and should also be based on a risk assessment to define the scope of the service. The documents should be designed and drafted to be used by staff at all levels. Authorities should utilise the time outside the winter season to put these policies and plans in place.

### **13.3 RESILIENCE**

- 13.3.1 Better planning will result in a more resilient Winter Service and reduce the risk in the delivery of the service during normal and severe winter conditions. It also has the potential to deliver the service in a more efficient way. This includes not only the management of salt stocks, but other resources such as fuel, plant and labour.
- 13.3.2 Winter service should be regarded as part of the authority's wider resilience planning. The same disciplines, systems and processes apply, bringing a degree of rigour and challenge to the preparation of plans for winter weather.
- 13.3.3 The first step towards providing a more resilient service is consideration of the threats and vulnerabilities of the service. This can be achieved through a detailed appraisal of the current situation based on plausible but stretching 'what-if' scenarios.
- 13.3.4 By considering these scenarios, potential areas for improvement in service resilience can be identified. These should be assessed, prioritised and mitigation measures considered. It is important when considering potential mitigation to think laterally, as this may identify more cost effective solutions.
- 13.3.5 An important part of resilience planning is to include a planned escalation procedure. Engagement with the authority's emergency planning department should be considered. The Winter Service Plan should be made available to the authority's emergency planning departments such that it can be integrated with other plans such as Business Continuity Plans, Evacuation Plans and Rest Centre Establishment Plans.

#### **Minimum Winter Networks**

- 13.3.6 As part of their contingency planning, authorities should define a minimum winter network. This resilience network may be a subset of their normal treatment network and should provide a minimum essential service to the public, including links to the strategic network, access to key facilities and other transport needs. It is important that there is continuity across boundaries. It is recognised that authorities will have difficulty in treating all bus routes. However, arrangements should be made to enable bus operators to run minimum services.
- 13.3.7 Issues to consider when defining a minimum winter network are:
- ☐ What is the key infrastructure access which should be maintained? To this end, the authority's emergency planning department should be consulted. Consideration should be given to a wide range of services, including consideration for private infrastructure. For example, water treatment works



may require chemical deliveries to ensure continuity of water supply but are unlikely to be on the primary treated road network.

- How will carriageways, cycle ways and footways be prioritised across the authority's network? Issues to be considered include treatment methods, resource requirements, type of network as a whole and alternative routes or modes of transport.
- How will the minimum winter network interface with other authorities? There is little point expending effort to keep a route open if it is snowbound in a neighbouring authority.

- 13.3.8 Treatment of the resilience network in practice should be considered, as the possibility of slower treatment speeds and potential congestion may create issues.
- 13.3.9 The trigger point and protocol for activating the minimum winter network should be agreed within the authority, documented and communicated as appropriate. In doing so agreement should be made with the emergency planning department and senior officers. The decision to activate the minimum winter network may also be made in conjunction with other authorities. The overall approach should be detailed within the Winter Service Plan.

### Winter Resilience Standard

- 13.3.10 Authorities should consider, consult on and formally adopt local service standards for resilience of their winter service in terms of number of day's continuous severe conditions salting on a defined Minimum Winter Network for the Overall Winter Period and for the Core Winter Period. **(Recommendation 2)**



- 13.3.11 A resilience benchmark of 12 days/48 runs should be adopted for full pre-season salt stockholding by 1 November for English local highway authorities. **(Recommendation 2a).**
- 13.3.12 In considering how to apply the benchmark, authorities should review their history of usage and mutual aid or other arrangements to consider: a) whether there is a case for increasing capacity towards 48 runs if it is currently less than this, in addition to filling the capacity they have; or b) at what level to stock – at or above the 48 runs level



– where the capacity exists to do so.

- 13.3.13 Establishing a winter service resilience standard requires consideration of the number of days' resilience to be adopted, definitions of the Overall Winter Period<sup>1</sup> and Core Winter Period<sup>2</sup>, whether it should refer to the normally salted network or to a smaller locally determined Minimum Winter Network<sup>3</sup>.
- 13.3.14 Delivery of the Winter Service relies on suitable resources being available, including salt, fuel and trained staff and operatives. Any one resource in short supply puts additional strain on service delivery.
- 13.3.15 It is suggested that at least 6 days resilience for salt and other resources, including equipment, drivers and fuel, would represent sensible good practice for determining the number of days' resilience during the Core Winter Period. This is based on a number of days' severe conditions plus replenishment time and taking into account weekends, and combinations of public holidays and weekends such as Christmas and the New Year.
- 13.3.16 This approach based on a reasonable number of days' resilience in the ability to deliver a defined winter service should ensure that highway authorities hold or have easy guaranteed access to sufficient salt, equipment and drivers and other essential resources to deal with severe winter weather conditions.
- 13.3.17 Some highway authorities may already have a good level of resilience, but if individual authorities decide they need to increase resources, they will need to consider the practical implications and a reasonable implementation period. Implications may include any new arrangements or facilities required and cost.
- 13.3.18 In developing their local service standards based on days' resilience, authorities should assess the risks that are faced in the delivery of the Winter Service. The assessment should cover all items of policy and management including:
- ☐ network for treatment;
  - ☐ adjoining highway networks;
  - ☐ salt management policies;
  - ☐ operational resources (including equipment, salt stocks and fuel);
  - ☐ access to Winter Service depots and salt storage areas;
  - ☐ staff training;
  - ☐ availability of operational staff.
- <sup>1</sup> Overall Winter Period – Locally defined since the winter period may vary according to climatic conditions, but usually at least the beginning of October to end of April.
- <sup>2</sup> Core Winter Period – Locally defined since the winter period may vary according to climatic conditions, but usually at least December to February inclusive.
- <sup>3</sup> Minimum Winter Network – That part of the carriageway network normally treated in winter which provides a minimum essential service to the public, including strategic routes, access to key facilities and other transport needs.
- 13.3.19 An example of how authorities may express and apply their Winter Service resilience standard is included in Appendix H.

- 13.3.20 The Department for Transport has put in place a year- round salt stock monitoring system to ensure optimum resilience of salt supply, through a nationally severe winter. Authorities should provide to the Department for Transport the information required for this system in a timely manner.

#### **13.4 CLIMATE CHANGE**

- 13.4.1 It is now acknowledged that the world is experiencing a rapidly changing climate. It is generally accepted that although weather is likely to be milder and wetter in winter, there may be more occurrences of severe weather events.
- 13.4.2 The effects of climate change make it difficult for highway authorities to anticipate winter conditions from year to year. Wide variation and extreme events as a consequence of climate change needs to be taken into account in winter service planning. The events of the 2008/09 winter provide evidence of what can happen and are reviewed in detail in the UKRLG report Lessons from the Severe Weather February 2009. The report may be downloaded from the following website:

**Website Amended**  
**27 April 2012**

<http://www.ukroadsliaisongroup.org/en/utilities/document-summary.cfm?docid=7E330478-F948-42A3-93F8B3A4862AA655>

- 13.4.3 In 2009/10 the UK was hit by the coldest and most extended winter for thirty years. An independent review has been carried out of the resilience of England's transport systems to severe winter weather. The final report has been published, making recommendations for improving transport systems' resilience to severe winter events. The UKRLG supports the recommendations of this report. The final report may be downloaded from the following website:

<http://transportwinterresilience.independent.gov.uk/docs/final-report/>

- 13.4.4 The Secretary of State for Transport responded to the final report. The response may be found in the following website:

**Website Amended**  
**27 April 2012**

<http://www.dft.gov.uk/news/statements/hammond-20101022/>

- 13.4.5 The Transport Select Committee published a report in April 2011 entitled; Keeping the UK moving: The impact on transport of the winter weather in December 2010. The document can be downloaded from the following website:

<http://www.publications.parliament.uk/pa/cm201012/cmselect/cmtran/794/79402.htm>

- 13.4.6 Authorities should review their approach to climate change and in particular their resilience to prolonged cold weather. **(Recommendation 3)**

13.4.7 Climate change is dealt with in more detail in Section 14.1.

## 13.5 CO-ORDINATION AND COLLABORATION

13.5.1 Authorities should consider whether collaborative arrangements such as shared services, lead authority arrangements, collaborative service procurement, and sharing depots and salt stock, would provide an effective and value for money approach to increasing winter service resilience. **(Recommendation 4)**

13.5.2 Co-ordination and co-operation between authorities in winter service planning including defining treatment routes, response, and treatment times is of crucial importance. This should be a formal process between the adjoining local authorities and with the authority responsible for the strategic network. The intention should be to negotiate effective service integration across administrative boundaries and to enable operation of the plant and vehicles required to achieve adequate resilience.



13.5.3 In these circumstances close liaison both with public transport operators and local authority transport co-ordinators is essential, at the annual review, on an ongoing basis throughout the season and on a continual basis in severe weather conditions. This is particularly important as, although changes to public transport routes and frequencies will be made throughout the season, it will not usually be practical or desirable for consequent changes to the treated network during the season. This may influence the nature and timing of changes to public transport routes.

13.5.4 The efficient operation of many essential services may be dependent upon ice or snow removal from key areas of private land, which is fundamentally the responsibility of land owners.

13.5.5 Authorities should determine critical areas and infrastructure in conjunction with key public services and other stakeholders and seek to ensure that appropriate winter treatment has been considered by the appropriate party. **(Recommendation 5)**

13.5.6 Authorities should explore the potential for sharing depots as this may provide opportunities for efficiencies. Other areas where collaboration should be considered include decision support services for weather particularly where authorities have

similar climatic conditions.

## **13.6 WINTER SERVICE PLANNING**

- 13.6.1 Planning and preparation is fundamental to delivering a successful Winter Service. Careful planning in advance of the winter season will greatly assist in adequate resources and contingency arrangements being put in place by authorities to improve their overall resilience.

### **Communication**

- 13.6.2 It is good practice to communicate effectively with the public, key public services, stakeholders and other highway authorities. However, communication within the authority is also critical. Preparation and planning of communication in advance will assist in the effective delivery of the service.

### **Setting Expectations**

- 13.6.3 It is important to ensure that the public, elected members and senior management are engaged in the Winter Service. The Department for Transport (DfT) has produced a leaflet titled “Are You Ready for Winter?” with important information for councillors and senior officers about preparation for winter. Public leaflets, websites and briefing notes all contribute to setting expectations with a low associated cost and time requirement.
- 13.6.4 Clearly setting out what will and will not be done as part of the delivery of Winter Service can reduce the number of complaints and questions raised by the public and stakeholders. Improved communication and understanding may therefore improve time available for the Winter Service delivery team to focus on delivery of the service.

### **Collaboration and Liaison with Stakeholders**

- 13.6.5 It is important to remember that members of public will travel across boundaries of several different authorities. It is therefore important that treatment regimes align across boundaries to provide a seamless service. Simple measures such as comparing treatment routes and decision making criteria between authorities will assist with this, especially within urban areas.
- 13.6.6** Authorities should ensure that there is appropriate consultation and communication with other highway authorities, key public services and other stakeholders to ensure improved service for the public. **(Recommendation 7)**
- 13.6.7 It is important to provide information directly to key stakeholders, including adjacent highway authorities, all emergency services, public transport operators, motoring organisations, the education authority, schools, their bus operators, and key local organisations. This information could include:
- ☐ Sharing Winter Service Plans;
  - ☐ A non-technical summary of the Winter Service Plan;
  - ☐ Maps of treatment routes;
  - ☐ Operational decisions on a timely basis.
  - ☐ Salt stock information via the Salt Portal

- 13.6.8 Liaison between highway authorities should be routine throughout the winter season. Communication of treatment decisions provides useful information that may inform future decision making, promotes seamless service and can potentially generate efficiency savings.
- 13.6.9 Collaboration with other authorities can be as simple as arranging an informal meeting to discuss the respective Winter Service policies and plans on an annual basis. Other topics could include resource availability, mutual aid or joint training and exercising.
- 13.6.10 It is good practice to liaise with the relevant trunk road and motorway operator (where appropriate) to confirm current route planning. This will minimise duplication of treatments where the two networks cross and avoid sections being missed at complex intersections.
- 13.6.11 There are many examples of good practice where authorities have worked together in preparation for the winter season. In London, for example, all highway authorities and other stakeholders have collaborated to produce a contingency plan, agree a resilience network, and put in place a strategic stockpile of salt.

#### **Contact Information**

- 13.6.12 Staff contact details and other stakeholders involved in the Winter Service need to be updated before the start of the winter season. A contact check is a simple and effective means of ensuring that staff can be contacted when required. The contact check also facilitates a refresh of communications with other authorities and stakeholders.

#### **Media Information**

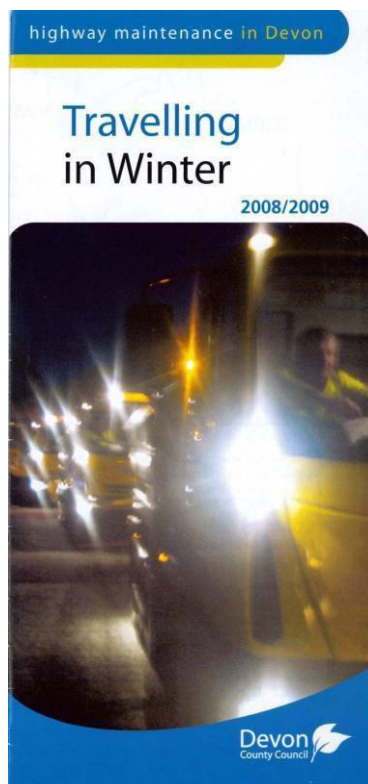
- 13.6.13 Authorities should establish effective working arrangements with local press and broadcast media. This should enable the presentation of timely and accurate information and advice on network condition and use. Information could include travel information, network availability and risk of severe conditions such as snow and black ice. These arrangements should include in-season proactive media output to engage the public with the Winter Service. This is especially important during prolonged cold weather and is likely to involve television, radio and the internet. Local radio in particular considers this to be a most important aspect of their service to the community and it therefore provides the opportunity to build good working relationships over wider issues. Many authorities have specialist press and public relations personnel and it will be important to clarify and agree respective service and specialist responsibilities.
- 13.6.14 Whilst every severe weather event poses its own unique issues, the baseline media information required remains relatively constant. Statistics such as the number of spreaders, ploughs and salt stored are popular requests. The structure of messages to be relayed is generally similar.
- 13.6.15 Robust processes should be in place to ensure a rapid and accurate issue of media information is possible. It is suggested that pre-prepared media briefs are developed in advance of the winter season for use during times of severe weather.
- 13.6.16 It is important to define and agree key contacts with press and broadcast media and also establish a clear understanding of the most effective timings for information to be provided, in order to reach necessary audiences and broadcast schedules. It may be helpful to arrange joint workshops or training sessions to build understandings and relationships. Advance compilation of commonly requested information will reduce the media workload during a severe weather event.

- 13.6.17 There may also be a need in more widespread and extreme conditions to provide information to the public using national press and broadcast. This may be undertaken either directly or by arrangement with local media, and arrangements should be discussed with them. It may also be possible to utilise variable message signs.
- 13.6.18 Where possible authorities should use their media relations staff to prepare generic statements and press releases for rapid issue at the onset of winter conditions. These can be pre-approved for use during periods of severe conditions, when both Winter Service delivery teams and the press team will be busy. Consequently authorities may identify the need to provide media training to winter staff. This will help to ensure that the right message is put across in the correct manner at all times.
- 13.6.19 When severe weather is forecast the media rapidly start requesting information and it is important that correct and accurate information is available to them. If information is not provided by an authority the media will attempt to source it from elsewhere, which may not be accurate.
- 13.6.20 Recent experience has shown that some individuals will take heed of advice issued to the public for or avoiding travelling during severe conditions. If sufficient advanced warning is provided, drivers will be able to change their plans.

#### **Information for the Public**

- 13.6.21 Authorities should ensure effective communication of information for the public before and during both normal and severe winter conditions. **(Recommendation 6)**
- 13.6.22 Authorities should make widely available for users and the community a non-technical summary of the Winter Service Plan, including plans of the treated network, together with guidance on safe use of the network. They should also establish arrangements for local radio and web based information.
- 13.6.23 Section 6 of this Code deals with arrangements for community involvement in highway maintenance and the importance of information and publicity. This provides opportunities and challenges, which should be positively addressed by authorities and provide an important opportunity to demonstrate understanding of users' needs, and a strong service commitment.
- 13.6.24 It is of crucial importance that policies and standards of Winter Service provided by authorities are widely available and understood by users and the community. As far as possible highway users should be made familiar with treatment routes, particularly in severe weather conditions. This will help in ensuring that expectations are realistic and consistent with the resources available as well as maintaining public safety.
- 13.6.25 Many authorities provide leaflets summarising policies and service standards, including maps showing routes treated, contact information and advice on safe network use. The leaflets should be reviewed annually and made available through the internet, libraries, information centres, schools and a wide range of outlets. Further details on the content and use of leaflets are included in Appendix H.





### Public Self Help

- 13.6.26 Guidance to the public has been published by DfT on how they can assist their communities in clearing snow and ice without fear of litigation.

[http://www.direct.gov.uk/en/N11/Newsroom/DG\\_191868](http://www.direct.gov.uk/en/N11/Newsroom/DG_191868)

- 13.6.27 Many authorities have provided salt bins and shovels to parish councils and other stakeholders in order to help them keep local areas free of ice and snow. Ensuring suitable risk assessments and method statements are in existence will minimise the risk of accidents occurring.
- 13.6.28 Local volunteer groups may provide support to local communities and the vulnerable for clearing footways. This needs careful management to ensure the safety and welfare of all involved. This is an area that emergency planning departments are likely to have experience of, either directly or through involvement with Local Resilience Forums.
- 13.6.29 One means by which authorities can assist the local community in areas not on priority routes or at known trouble spots, including gradients and sharp bends is by the provision of public access salt bins. Where these are provided authorities should make arrangements for their replenishment as necessary and to ensure that they do not become unsightly or used for the unauthorised disposal of waste.

### Winter Service Plan

- 13.6.30 It is important that the Winter Service Plan is designed to be used by staff at all levels and that those that require it have ready access to the document.
- 13.6.31 Authorities should formally approve, adopt, and publish, in consultation with users and key stakeholders, a Winter Service Plan based on the principles of this Code. **(Recommendation 8)**

- 13.6.32 Once the policy and plan documents are complete, it is important that those involved in delivering the Winter Service are aware of the current approach. Ideally, a briefing should take place at the start or early in the season to disseminate this information to staff involved in the delivery of the Winter Service. The briefing should also remind staff of the critical role they play in mitigating the impact of winter weather on the road network.
- 13.6.33 The Winter Service Plan should be reviewed annually in consultation with a wide range of stakeholders.
- 13.6.34 It is good practice to monitor compliance with the Winter Service Plan throughout the season. Simple audits on decisions made and short debriefs of snow events will achieve this. These audits should be regular and clearly documented to ensure maximum benefit can be achieved.
- 13.6.35 Suggested contents of the Winter Service Plan are detailed in Appendix H. The Plan should recognise the fundamental differences between the main components of Winter Service for carriageways, cycle routes, footways and any critical areas and infrastructure as follows:
- ☐ pre-treatment - “precautionary” salting;
  - ☐ post-treatment - continuing salting following the formation of ice;
  - ☐ clearance of ice and snow;
  - ☐ dealing with continuous severe conditions.

#### **Treatment Routes**

- 13.6.36 Authorities should define treatment route plans for carriageways, cycle routes and footways for pre-treatment and snow conditions, based upon the general maintenance hierarchy, but adapted to take into account the factors identified by this Code.

#### **(Recommendation 9)**

- 13.6.37 The treatment routes for Winter Service should take as a starting point the hierarchy developed for other maintenance purposes but this is likely to require extensive modification to consider:
- wider transport and other policy priorities referred to above;
  - special requirements of carriageways, footways and cycle routes;
  - safe and reliable access to emergency facilities including Fire and Rescue, Police, Ambulance Services and hospitals;
  - other public services access needs and critical infrastructure where the maintenance of access may be critical;
  - public transport routes and access to stations, bus garages and depots;
  - safe and reliable access to main industrial and business centres of key importance to the local and regional economy;
  - any significant variation between summer and winter traffic;
  - accessibility dependencies of remote communities for example Scotland’s island and peninsular communities;



- the special needs of disabled people or older people particularly where these can be effectively targeted;
- known problems, including significant gradients, exposed areas and other topological factors;
- climatic and thermal capacity differences within the area;
- co-ordination and co-operation with other authorities.

Consideration of these issues is likely to suggest differences in networks adopted for each element of Winter Service. Such decisions will usually not be clear cut. For example treatment of footways will differ from carriageways and for low traffic roads it may be difficult to justify high priority for service provision.

Risk assessments should be undertaken to establish which routes should be included in a programme of treatment during winter. In particular, the treatment of carriageways, footways and cycle routes must be considered taking account of risk to all highway users and consideration of the available resources.

Where the authority is actively promoting facilities, or there are clear trends of increasing use, a more proactive approach to Winter Service may send an important message.

Transport interchanges perform a key role in the delivery of integrated transport, which should be reflected in Winter Service policies and priorities. These include airports, rail and bus stations and the means of access to them whether by main routes for walking, cycling, public transport or car. Parts of the interchange may be subject to differing management regimes and it will be important to agree common standards and ensure effective co-ordination of resources.



- 13.6.42 It should be recognised that many authorities will have difficulty treating all bus routes as part of their precautionary salting routes. The treatment of bus routes should be based on risk assessment of local circumstances such as service frequency and their importance to integrated transport services. It is important that treatment routes include the access roads to bus garages.
- 13.6.43 Similar considerations apply to school bus routes where, although authorities should endeavour to provide Winter Service support, there may be practical difficulties in wide spread treatment of such a diverse network.
- 13.6.44 In general salting should not be undertaken between the stop lines of level crossings, even when covered with snow. Before ploughing over a level crossing

the driver must stop and telephone the signalman for permission to proceed and then inform the signalman when past the crossing. Snow blowers must not be used on level crossings.

- 13.6.45 Consideration should be given in certain circumstances for the temporary erection of snow fencing to reduce the effect of drifting snow. The legal powers to provide snow fences in England and Wales are contained in Section 102 of the Highways Act 1980.
- Where no agreement can be reached with the landowner, Sections 239, 240 and 250 of the Act provide for compulsory powers. The power to provide snow fences in Scotland is in Section 30 of the Roads (Scotland) Act 1984. There is no equivalent of these specific powers in Northern Ireland but Article 100 of the Roads Order, which deals with the acquisition of land, could be used in these circumstances.
- 13.6.46 In periods of especially severe weather in certain parts of the UK, temporary road closures may be necessary. Where roads are known to be particularly vulnerable consideration should be given to the installation of permanent flap down or variable message signs. These signs should be located well in advance of any anticipated obstruction and should be operated in conjunction with the Police. In determining the optimum location consideration should be given to the availability of alternative routes and, if necessary, holding areas. With manually operated signs, and in more remote areas, it is essential that the signs are easily accessible and can be quickly operated by authority or police to give timely information. Consideration should be given to the merits of remotely controlled matrix signing.

### **Contingency Planning**

- 13.6.47 Winter Service procedures should be designed to provide a planned response during even exceptionally severe weather. Through careful planning it is possible to reduce the need for reactive response. It is important to ensure that the Winter Service Plan contains details of the escalation procedures, alternative resources and minimum winter (resilience) networks.
- 13.6.48 The delivery of a more resilient Winter Service should enable local communities, business, public transport and emergency services to function in more severe conditions prior to the need to implement contingency arrangements. Effective contingency planning is therefore a key element of delivering a more resilient service.
- 13.6.49 Authorities should prepare contingency Winter Service Plans for severe weather conditions which include possibilities such as salting a Minimum Winter Network. Authorities should seek agreement on plans in advance with other highway authorities and key public services such as hospitals and public transport providers. There should be a co-ordinated approach to implementing Minimum Winter Networks across adjacent highway authorities. **(Recommendation 10)**
- 13.6.50 When weather is sufficiently severe, a contingency plan should be activated. The success of this plan is dependent on advance planning and co-ordination, including treatment routes, resource needs, mutual aid and communications.
- 13.6.51 With improved resilience of Winter Service the normal response is likely to cope with more severe conditions before the need for escalation. Once escalated, the response will then be likely to mitigate the effects of more extreme conditions. Providing winter decision makers with well-designed contingency arrangements allows them to escalate an issue before it becomes a significant threat to continuity of service and to have the tools available to best manage the situation.

- 13.6.52 When resilience measures and processes have been developed and incorporated into the Winter Service Plan, relevant staff and stakeholders will need to be trained. Resilience planning should be tested through exercises. This will resolve any potential problems in the approach prior to it being used operationally.
- 13.6.53 Local authorities, as Category 1 responders under the Civil Contingencies Act 2004, will already have emergency plans in place. Authorities should benefit from these plans in developing a more resilient approach to Winter Service. Business continuity planning with respect of severe conditions is also important to ensure that winter service can be delivered and other critical functions can be adequately supported.
- 13.6.54 As part of their contingency planning, authorities should define a Minimum Winter Network, see recommendation 2. This may be a subset of their normal treatment network and should provide a minimum essential service to the public, including links to the strategic network, access to key facilities and other transport needs. It is important that Minimum Winter Networks ensure continuity across boundaries. It is recognised that authorities will have difficulty in treating all bus routes as part of their minimum network. Minimum Winter Networks should however enable bus operators to run minimum services, as appropriate.
- 13.6.55 Resources such as salt, fuel, spreaders, depots and labour are finite. Plans therefore need to demonstrate how the service will be delivered if one or more of these resources is in short supply. Shortages of fuel, spreaders or operators may not coincide with severe weather.
- 13.6.56 Where practicable, authorities should make arrangements for obtaining reserve supplies of key resources to support their minimum resilience standard. This should include salt, fuel, power and labour.
- 13.6.57 Mutual aid is a pre-agreement between one or more organisations to assist each other, as far as practicable, to overcome disruptive challenges. Mutual aid between authorities is often used in the response to “wide” area emergencies, as the impact on the local authorities, emergency services and other resources can be overwhelmed. Sharing, e.g. depots and salt stocks, through mutual aid may be helpful. Where planning to do so authorities should make contingency arrangements in advance.

Mutual aid can be an informal or formal process having written agreements. Arrangements are usually between organisations that work closely together on a regular basis or as part of local resilience forums. Both approaches work well if they are flexible enough to change in response to the dynamics of a situation. Guidance on mutual aid may be found at:

<http://www.cabinetoffice.gov.uk/resource-library/short-guide-local-authority-mutual-aid>

- 13.6.58 Authorities should explore the potential for mutual aid in salt supply and other aspects of winter service and should make contingency arrangements in advance. **(Recommendation 11)**
- 13.6.59 During a salt shortage there may be various potential mechanisms to reduce salt consumption bearing in mind the issues discussed in Appendix H. Each has its own implications which the authority must carefully consider prior to implementation.
- 13.6.60 In 2009 CSS (now ADEPT) published advice for its members on how to help preserve salt stocks during periods of severe winter weather, in order to ensure

that essential services can be maintained. The advice may be downloaded from the following website:

<http://www.lga.gov.uk/lga/aio/1584225>

- 13.6.61 During a severe weather event increased levels of communication are likely to be required. Communication during a 'crisis' is not simply about media output. Proactive internal communication and keeping the numerous stakeholders informed is also critical. It is important to ensure that good communication is achieved both with internal staff and external stakeholders. Media liaison is relatively straightforward task once suitable contacts are made. The use of authority websites is a good way to get accurate information to the public without reliance on the media.

## **13.7 WINTER SERVICE DELIVERY**

### **Decisions and Management Information**

- 13.7.1 Authorities should take full advantage of decision support systems and services to enable timely, efficient and accurate decision making. **(Recommendation 12)**
- 13.7.2 Decision support systems and management information are the basis of effective Winter Service delivery. More details are given in the *ICE Design and Practice Guide, Highway Winter Maintenance* published in 2000.
- 13.7.3 Systems will use current information and trends in conjunction with relevant software to extrapolate and display predicted conditions over a range of periods.
- 13.7.4 The decision support information will be used by the authority's designated Winter Service controller, or similar, together with local experience, and against the background of a range of pre-determined scenarios, in deciding the action to be taken. The decision should usually be delegated to a single person, although in larger authorities with varying climatic conditions the role may be delegated to two or more persons. Controllers will of course need to maintain close consultation with others both within and adjoining the authority and also those dealing with the strategic network.
- 13.7.5 Information to aid decision making is included in Appendix H.
- 13.7.6 The quality of decisions made by the controller will be the key factor in determining both the effectiveness of the Winter Service and also how it is perceived by users and the community. Instigating a decision check process ensures high quality decisions are acted upon and is good practice.

### **Information Recording and Monitoring**

- 13.7.7 Authorities should continually monitor performance during service delivery and respond effectively to changing conditions or network incidents. **(Recommendation 13)**
- 13.7.8 Comprehensive and accurate records should be kept of the all Winter Service activity, including timing and nature of all decisions, the information on which they were based, and the nature and timing of all treatment. Note that time taken running dead mileage at end of salting run is not included in treatment time. It is preferable to record both the time at the end of actual salting and the time of return to depot. Where the dead mileage at the end of a salting run is significant this should be considered when planning for severe conditions as it will prevent rapid redeployment of resource.

- 13.7.9 Authorities should make use wherever possible of electronic vehicle locationsystems together with automatic recording of salt spreading. This will simplify and improve the accuracy of records as well as provide corroboration of service delivery in cases where failure to salt is alleged.
- 13.7.10 The condition of routes should be monitored following treatment in order to confirm that the treatment has been effective. If it has not been fully effective, contingency treatments should be considered to achieve the required condition. It should be noted that both active and passive road weather sensor systems require the presence of moisture to determine either the concentration of an anti-icing chemical on the road or the freezing point temperature of the solution present on the road sensor.

### **Resources**

- 13.7.11 Winter Service requires numerous staff, a significant amount of plant and large volumes of consumables such as salt for de-icing and fuel. It is important that supplies and suppliers are planned and managed to ensure these resources are available when required. Sufficient trained and experienced staff are required for the delivery of an effective Winter Service. This includes winter managers, decision makers, supervisors, spreader drivers and other equipment operators.
- 13.7.12 Authorities provide Winter Service through combinations of their own resources and those of service providers contracted to them. There is a wide variety of approaches. Many highway authorities provide some of their own facilities with others provided by the private sector. In all cases, service providers' activities are governed by their contract with the highway authority.
- 13.7.13 In some authorities refuse collection, street cleansing and grounds maintenance services often provide support to the Winter Service, especially in times of prolonged ice and snow. Arrangements should be made and documented well before the commencement of the season.
- 13.7.14 Detailed route planning and for each aspect of Winter Service will need to be optimised to ensure economic, efficient and effective resource allocation. This will depend on:
- ☐ spreading vehicle characteristics and capacity;
  - ☐ depot and salt location;
  - ☐ Response times (the period between decisions being taken to begin treatment and vehicles leaving the depot. It is suggested that authorities should adopt a target response time of no more than one hour. This should apply both within and outside normal working hours);
  - ☐ Treatment times (the period between vehicles leaving the depot and the completion of treatment on all priority routes. Authorities should adopt target treatment times based on risk assessment of local circumstances that provide for the completion of pre-treatment before ice forming. They should however recognise however that treatment times might vary in different weather conditions).
  - ☐ Turnaround times (the period between a vehicle completing salting on its route and being ready to recommence salting having reloaded at the depot)
- 13.7.15 A key factor in ensuring that response and treatment times are met once a decision has been taken to treat is the availability of appropriately trained personnel. Identifying the extent of resources needed under various scenarios and the potential source of these will be an important aspect of pre-season planning. This planning should cover the whole range of requirements and conditions likely to be encountered, including:
- ☐ Pre-season preparation;
  - ☐
  - ☐



- Precautionary treatment;
  - Footway and cycle route treatment;
  - ☐ Post treatment;
  - ☐ Snow clearance;
  - ☐ Continuous severe conditions;
  - ☐ Post snow emergencies (flooding etc).
- 13.7.16 Planning of resources should cover the entire workforce involved in the Winter Service. It is particularly important not to overlook:
- ☐ the need for staff to be available throughout defined risk periods;
  - ☐ the need for the treatment operations to be co-ordinated and supervised;
  - ☐ resources and equipment for treating carriageways, footways and cycle routes;
  - ☐ resources for dealing with vehicle breakdowns, problems with fuel supply and communications failure;
  - ☐ resources for the storage, delivery and loading of salt.
- 13.7.17 In planning resources the following issues regarding personnel also need to be addressed:
- ☐ implications of Drivers' Hours Regulations;
  - ☐ extent and nature of double manning and driver support;
  - ☐ shift system arrangements;
  - ☐ provision for holidays and sickness.
- 13.7.18 It is important that a realistic assessment of the resources required has been made to ensure the continued treatment of the Minimum Winter Network during exceptional conditions. Authorities in planning their resources should ensure that they are compatible with the wider resilience standards adopted by the authority.
- 13.7.19 Authorities often place reliance in times of prolonged ice and snow on temporary contracts with contractors, farmers and others to supplement resources for snow clearing. Arrangements should be documented and it is important to ensure that the necessary insurance cover is in place.
- 13.7.20 In rural areas, authorities should examine the potential for using local council snow wardens, who may have an effective role in gathering information and providing Winter Service Managers with details of specific local problems. If snow warden schemes are adopted clear terms of reference should be established.

### **Training and Development**

- 13.7.21 Ensuring adequately trained and experienced staff is key to successful delivery of Winter Service.
- 13.7.22** To ensure appropriate level of competence, training and development needs of all personnel should be established and reviewed annually, including health and safety and appropriate vocational qualifications. Training should then be provided where appropriate before the Winter Service season.  
**(Recommendation 14)**

### **Training**

- 13.7.23 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 of the staff and operatives involved.
- 13.7.24 To ensure appropriate level of competence, the training and development

needs of all personnel should be established and reviewed annually, including health and safety and appropriate vocational qualifications. Training should then be provided where appropriate before the Winter Service season.

- 13.7.25 Issues where training is required are described below. This is not an exhaustive list and will largely be based on local circumstances:
- ☐ the content and operation of the Winter Service Plan;
  - ☐ route familiarisation (as appropriate);
  - ☐ driving in difficult and hazardous road conditions including duty of care to other road users;
  - ☐ circumstances where special safety considerations apply;
  - ☐ snow ploughing, in particular around rail level crossings, tramways, partially segregated areas,
  - ☐ dealing with emergencies;
  - ☐ dealing with post ice and snow emergencies especially flooding.
- 13.7.26 In addition to such specific training it will be necessary to ensure that all personnel are provided with information during operational periods on current network characteristics and constraints, including:
- ☐ nature and location of highway works, including statutory undertakers;
  - ☐ temporary and permanent barriers;
  - ☐ nature and location of any traffic diversions;
  - ☐ nature and timing of any events likely to affect network use.
- 13.7.27 Authorities should prepare specific health and safety policies, guidance, and risk assessments with their service provider. These should be issued and discussed with all personnel, including temporary contractors, and should form the basis of further training as necessary.
- 13.7.28 Training provided to service delivery personnel should also include specific reference to the health and safety needs of users, including:
- ☐ avoidance of spraying pedestrians, cyclists and vehicles where practicable with salt or slush when salting or ploughing;
  - ☐ avoidance of risks to pedestrians and cyclists when using vehicles in segregated or partially segregated areas and in treating footways;
  - ☐ ploughing and manoeuvring in restricted circumstances;
  - ☐ other road vehicles that may not be under proper control.
- 13.7.29 Authorities should consider both qualifications (e.g. City and Guilds) and practical experience training. Some authorities have found it useful for those personnel involved in Winter Service management and decisions to undertake training in familiarisation and interpretation of weather forecast information.
- 13.7.30 Authorities are encouraged to have a system to plan and record all winter service related training. This may form part of a wider training management system. This system can then be checked prior to winter to ensure any necessary refresher training is undertaken.
- 13.7.31 There are several groups of individuals that comprise an authority's resources to deliver the Winter Service. These individuals require training to fulfil their duties within an authority's Winter Service. These are listed below:

### ***Winter Decision Maker and Manager***

- 13.7.32 Currently there is no formal winter decision maker or winter manager qualification, however most authorities follow a similar approach. Road weather forecasting and systems training (such as for Road Weather Information Systems) are commonly used indicators of a decision maker's competence, combined with proven experience.

However, the appropriate experience required to deliver the service can only be gained 'on the job' over a number of years. Good practice suggests that novice decision makers should undergo an internal training programme. This should include briefings on the Winter Service Plan, meteorological training, experience of operational delivery and mentoring by more experienced staff. This should continue until their experience and competence is proven. It is essential that such training should be well documented to ensure that competence can be demonstrated. Weather forecast providers are able to provide training on meteorology and providers of weather sensors often provide training on how the weather affects the road surface. Exercises delivered via independent organisations can provide decision makers with experience of the management of severe conditions.

### ***Drivers and Operators***

- 13.7.33 Those operating spreading equipment are well served with vocational qualifications such as the City & Guild's 6159 modules. It is essential that any operative involved in the use or operation of any plant or machinery has received relevant formal training to do so. Where reserve drivers are available as part of an authority's contingency plans it is essential that they are trained to an equal standard of competence.

### ***Winter Supervisors***

- 13.7.34 Under City & Guilds 6159, there is a specific module for winter maintenance supervisors which ensures that the first tier of management is aware of their duties and sufficiently competent to fulfil them. It is essential that appropriate staff within an authority's organisation undergo this training.

### ***Senior Management and other Key Stakeholders***

- 13.7.35 Authorities may benefit in providing basic training to senior management and certain key stakeholders in delivery of Winter Service. This can be valuable in managing the expectations in delivering the service during both normal and severe winter conditions. A short training programme will provide a basic understanding of the Winter Service, its limitations and pressures. This may be delivered efficiently as an electronic package or briefing note to minimise staff time in the delivery of it to the multitude of stakeholders.

### ***Training Plan and Records***

- 13.7.36 Authorities are encouraged to ensure they have a system of formal training records. The purpose of the system is to record and monitor the training and competence of each individual involved in Winter Service. The system should use the data within it to help identify those people whose training requires refreshing and renewing. Where authorities contract out Winter Service they should require their suppliers to maintain similar records.
- 13.7.37 The system should comprise a development action plan for each individual and record progress in meeting that plan. This will enable training sessions to be targeted, planned and executed in a cost efficient manner.



- 13.7.38 Before commencement of the winter season training records should be checked to identify whether out of season training has occurred and individual training records have been updated. Additionally any mentoring schemes or similar experience-based learning should also be consulted to avoid any issues later in the season.

### ***Route and Equipment Familiarisation***

- 13.7.39 Relevant staff and operatives should undertake familiarisation training with winter arrangements, treatment routes and equipment. This is especially important for operational staff that may be new to the authority's Winter Service. Tool box talks and dry runs of treatment routes are useful approaches to deliver this training. Records of this training should be recorded on the training management system as described above.

### **Exercising**

- 13.7.40 Planning and preparing for a winter season are essential activities, but often the measures implemented are only tested in a live situation. Exercising and testing aims to confirm that the plans and procedures are suitably robust to cope with conditions in a safe and non-consequence environment. It is recommended that authorities and relevant organisations should provide training and conduct periodic exercising to test plans for responding to severe weather events.
- 13.7.41** Authorities and relevant organisations should provide training and conduct periodic exercising to test plans for responding to severe weather events.  
**(Recommendation 15)**
- 13.7.42 The Civil Contingencies Act 2004 requires Category 1 responders to exercise their plans to validate and test them. Although winter planning does not necessarily fall into the plans that must be exercised it is clear from recent winter events that severe snowfall will result in the invoking of various other emergency plans via local and regional resilience fora.
- 13.7.43 It would be beneficial for authorities to build severe weather conditions into regional or local training exercises or to develop specific Winter Service exercises involving adjacent authorities and relevant partners. Such testing of plans and personnel associated with the Winter Service would ensure authorities are fully prepared. It would also assist with ensuring that resilience of Winter Service is addressed and communication networks developed and improved. Appendix H contains further guidance regarding the design and delivery of winter exercises.
- 13.7.44 *Case study.* National Highways has been running Snow Desk adverse weather exercises for several years. The exercises are based on resilience guidelines using real networks, realistic scenarios and weather forecasts to ensure that effective and realistic assessments are achieved.

### **Plant and Vehicles**

- 13.7.45 A range of vehicles, plant and equipment is used to deliver Winter Service. It is important that this equipment is well maintained, calibrated and reliable. This Code does not deal in detail with the equipment used for Winter Service, but refers to certain more strategic issues relating to procurement and sustainability.
- 13.7.46 In assessing the required plant and vehicles authorities should ensure that sufficient resources are available for the delivery of the Winter Service during

severe and prolonged ice and snow. This should be compatible with the resilience standards adopted by the authority.

- 13.7.47 It is unlikely that, with the level of investment involved, authorities will be able to make frequent changes to the fleet, other than replacement or renewal. It is important however, that opportunities are taken when overall service procurement changes are being contemplated to thoroughly review Winter Service and equipment procurement.
- 13.7.48 There have been significant advances in the equipment available on the market in recent years. Vehicles are now capable of delivering a range of treatment types and can have sophisticated technology. The procurement of such technology potentially allows a more targeted and effective approach to treatment of the road network and an improved audit trail of where treatments have been undertaken.
- 13.7.49 It is often extremely difficult and inefficient to remove significant depths of snow using only salt and therefore consideration should be given to the use of snow ploughs mounted on spreaders or other suitable vehicles. Snow ploughs are durable, require little maintenance and should therefore prove very cost effective. However, in urban areas there may be considerable difficulties in utilising snow ploughs and in this situation any consideration should be on a risk based approach.
- 13.7.50 It is also important to consider equipment requirements for dealing with footways and cycle routes. Specialist equipment, such as footway ploughs and footway salt spreaders may be necessary for this purpose.
- 13.7.51 The location of depots should be kept under review and specifically addressed when consideration is being given to procurement arrangements. It would be unlikely if all present depots from which authorities undertake Winter Services are ideally located, and significant financial and operational savings can often be achieved from re-location.
- 13.7.52 The environmental effects of highway maintenance depots and operations are dealt with in Section 15 of this Code, and these can be particularly significant in the case of the Winter Service, where operations will inevitably involve unusual hours of working. Every effort should be made to minimise the environmental intrusion of depots and so far as is practicable the effect of Winter Service operations.
- 13.7.53 A significant contribution to minimising environmental effects can be made by providing covered storage for all vehicles, equipment and materials, which can also reduce waste and maintenance problems.
- 13.7.54 Purchase and ownership of vehicles and equipment will also be a key issue for consideration in relation to the procurement of services. Private sector partners may be able to assist with financing arrangements and authorities will need to balance the financial advantages of this against the contractual and operational risks involved.
- 13.7.55 The need to ensure vehicles are correctly calibrated, well maintained and repaired quickly is essential to the delivery of the service. Whatever arrangements are used the response time, speed of repair, availability of spare parts, quality of repair and audit trail should be carefully established and documented.

#### **Precautionary treatments**

- 13.7.56 These are the application of de-icers to road surfaces before the onset of freezing

conditions (i.e. frost, snow or freezing rain). The purpose of precautionary treatments is to prevent the formation of ice, or to weaken or prevent the bond of freezing rain or snow to road surfaces.

13.7.57 It is usually impractical to spread sufficient salt to melt freezing rain or more than a few millimetres of snow. Therefore, in advance of forecast snow or freezing rain, salt is spread to provide a debonding layer so that:

- ☐ snow is more readily removed by ploughing
- ☐ compacted snow and ice are more easily dispersed by traffic

13.7.58 It is very difficult to remove a layer of compacted snow or ice that is bonded to the road surface, so precautionary treatments are essential before heavy snowfall.

### **Salt and De-icing Materials**

13.7.59 Rock salt is the prime material for dealing with ice and snow on roads but can have environmental consequences. It can adversely affect vegetation, pollute watercourses and leave a residue on footways. It can also damage the road structure, bridges and structures, utility apparatus and vehicles. However, used responsibly it can have minimal environmental impact. In the interests of sustainability therefore authorities should ensure that only the minimum of salt is used to deal with the prevailing conditions. Suggested rates of spread are given in Appendix H.

13.7.60 Appendix H lists a number of alternative materials that authorities could consider using in place of rock salt in particular circumstances. The costs of some of these are extremely high and particular materials also have some environmental consequences. They may prove, however, to be cost effective in specific locations, such as the treatment of footways, where the need for additional sweeping can be avoided, and bridges, where the damage caused by the use of salt can be avoided.

13.7.61 As rock salt requires the passage of traffic to improve effectiveness, it may be necessary to use brine in some cases for example some cycle routes.

### **Salt management**

13.7.62 Salt is a finite resource and UK suppliers are constrained by mining operations amongst other factors as to how much may be produced and supplied. Supply can therefore be outstripped by demand during severe weather. It is therefore important to make optimum use of salt for de-icing and make every effort to store and use it efficiently, regardless of the weather conditions, in order to minimise consumption. In addition there can be significant financial benefits to be gained adopting such an approach.

13.7.63 Salt is consumed in significant quantities during the winter season, so even small percentage savings in salt use through accurate calibration of spreaders, considered decision making and appropriate treatments is important. These measures will help to minimise the overall consumption of salt on a national basis. Appendix H contains further information regarding spreader calibration. Ultimately, authorities should consider ways of reducing overall salt consumption while maintaining agreed levels of service on their network. Considerable savings can be made in the amount of salt used to treat carriageways if the salt is maintained in good condition and spreaders are correctly calibrated.

13.7.64 Many authorities award salt supply contracts to a single supplier on a call-off basis. Contracts are often awarded on a balance of quality and price, with price

usually being the driving consideration. This approach has resulted in a price driven market where salt supply is often treated as a commodity purchase. Authorities carry the risk of being able to obtain the salt they require when they require it. Suppliers carry the risks involved in producing and stock piling salt before sale. Commodity purchase arrangements do not necessarily embrace the service relationships between authorities and their salt suppliers which should lead to improved reliability, and knowledge and anticipation through good communications, and which are facilitated by contemporary procurement arrangements.

- 13.7.65** Authorities and salt suppliers should treat the supply of salt as a service rather than a simple commodity purchase. **(Recommendation 16)**
- 13.7.66 Authorities should place orders for summer restocking, and make arrangements for in-season restocking. It may be beneficial to consider the option of changing de-icing material to minimise consumption and improve resilience.
- 13.7.67 It has become common to restock at intervals during the winter season using salt management systems based upon predicted use of salt and delivery times. The salt shortage in winter 2008/09 demonstrated that it is difficult for salt supply arrangements to accommodate significantly increased short term demand. Authorities should therefore ensure sufficient resilience in their salt stocks.



- 13.7.68 Authorities should develop close working relationships with salt suppliers and ensure that initial salt quantities and reorder triggers are set to achieve their local resilience standard.
- 13.7.69 It may not be easy for some authorities to achieve an appropriate level of resilience through storing salt at their own depots. Salt suppliers may be able to hold dedicated stock at locations around the UK and authorities should consider whether such an approach is possible.
- 13.7.70 Communications and relationships with salt suppliers may be improved by the development of supplier user groups and authorities should consider participation in such groups.
- 13.7.71 The salt shortages in winter 2008/09, 2009/10 and 2010/11 prompted various local, regional and national salt stockpiling arrangements. This has significantly increased salt stockholding nationally and therefore added resilience. However it is important that Authorities do not routinely rely upon these stockpiles as they are intended only for use during sustained severe winter weather. The Department for Transport Salt Portal plays a key role in managing reserve stocks as it allows early visibility of potential salt supply issues and also enables continual assessment of current stockholding across England.

## Salt storage

- 13.7.72 There are two principle reasons to ensure that salt is stored carefully and in accordance with the good practice described below, namely ensure a consistent product for spreading and to reduce losses due to leaching.
- 13.7.73 Moisture content can have a significant impact on spreader calibration with over or under spreading possible. Authorities may therefore achieve more consistent spreading of salt through maintaining a constant moisture content in the salt throughout the entire season. Appendix H contains further details regarding the moisture content of salt.
- 13.7.74 As part of pre-season preparation, authorities should review how their salt is stored in order to identify how greater efficiency may be attained in its use. This may include developing the business case for salt barns or covering open storage facilities. Moisture content of salt is a critical factor in determining spreading rates and distribution.
- 13.7.75 The correct storage of salt is essential to minimise environment damage and storage in salt barns helps to prevent leaching, eases handling, helps in maintaining low salt moisture content, and is strongly recommended where additives are used. Detailed advice is available on alternative types and construction methods available. Where open stockpiles are used these should be covered with sheeting, or spraying with bituminous emulsion which provide an effective alternative.
- 13.7.76 Both permanent and temporary salt storage areas should be sited and managed in accordance with requirements of the Local Planning Authority and the Environment Agency. In particular they should not be sited where they could cause damage to landscape or nature conservation or have the potential to pollute watercourses or groundwater. Authorities should be aware of the deterioration in the quality of salt stored for long periods and the need for effective stock rotation. Appendix H contains further details regarding salt storage options.
- 13.7.77 Where grit is used for treatment, for example in the more extreme conditions applying in Scotland, storage requirements may be less stringent and local advice should be sought.
- 13.7.78** As a means of enhancing local salt storage capacity, authorities and salt suppliers should jointly consider supplier owned salt stocks held on a short or long term basis in a number of widely distributed locations around the country. A joint approach may include agreements such as purchase of some or all stock by the end of a season or provision of land. **(Recommendation 17)**

## Reserve Stockpiles

- 13.7.79 In addition to operational stock, local authorities and strategic road operators have created reserve stockpiles. These stockpiles can be categorised into three different types:
- ☐ Local reserves – held by a single authority for its own use during times of limited operational salt stocks;
  - ☐ Regional reserves – held on a regional / consortium basis whereby reserve stocks have been made available for use by more than one authority;
  - ☐ National reserves – stockpiles held across the UK for use by any



authority during times of shortage. In England this is currently being delivered via National Highways and is likely to have certain conditions of use. Transport Scotland and Transport for London have their own arrangements.

- 13.7.80 These stockpiles are not used during normal Winter Service but will be available if salt suppliers are unable to maintain operational stocks at an acceptable level. Release of salt should be subject to agreed protocols with the relevant operators. Authorities should put these arrangements in place before the start of the winter season.
- 13.7.81 Identifying the size, location and storage type of these stockpiles is important. Salt is a bulk commodity, but a reserve stockpile is still a significant investment. It should be stored in a location to allow convenient access to the area it serves and of course remain accessible during times of severe weather. The site should be secure to avoid trespass and theft of salt. Provision should be made in planning for loading facilities although there is unlikely to be a need for permanent on site plant.
- 13.7.82 Reserve stocks are unlikely to be barn stored. However they should be well covered to prevent leaching and deterioration of the salt. To avoid any gaps in planning any jointly held reserve stocks should have a salt stock management plan specific to that stockholding.

### **Salt Procurement**

- 13.7.83 Authorities should seek a broad approach to salt supply, for example establishing framework contracts with more than one supplier. **(Recommendation 18)**
- 13.7.84 Ideally, the suppliers should be geographically separated to reduce the risk of them being impacted by the same high demand situation.
- 13.7.85 *Case Study.* Devon County Council has adopted a framework contract which specifies the supply of different types of salt, including rock and marine salt from different UK and overseas suppliers. The Council can specify the quantity of salt and has options for different salt for different purposes e.g. pre-wetting or normal salting.
- 13.7.86 Authorities should consider whether efficiency benefits can be obtained from collaborative salt procurement and should also consider ways to improve the balance of risk between salt suppliers and themselves, e.g. longer contracts, performance contracts with minimum guaranteed purchase and supply, and contracts that include supply of salt and investment in facilities. **(Recommendation 19)**
- 13.7.87 *Case study.* The Illinois Department of Transport performance contract adopts purchase arrangements based on a contracted range of supply between minimum and maximum levels. Illinois guarantees to purchase 80% of its estimated salt need and the supplier guarantees to supply up to 120% if required. This provides the State with security and the supplier with guaranteed business.

### **Post Snow Inspection and Maintenance**

- 13.7.88 Immediately following the completion of snow clearance operations priority should be given to the clearance of gullies and offlets to ensure that melt water from snow on verges and island or central reservations can quickly drain away. However, it may be especially difficult to prevent melt water which is running across the carriageway from freezing and several applications of salt may be

necessary.

13.7.89 It will also be necessary to inspect the network to ensure that any damage is dealt with either as a Category 1 defect or as programmed maintenance as appropriate. The inspection should be treated as a special safety inspection and deal with the items usually included. Special attention should be given to the routes treated and the following items:

- removal of accumulations of grit from running surfaces and drainage channels;
- inspection and clearance of all bridges, culverts and drainage systems liable to flooding;
- inspection for frost effects and any damage caused by Winter Service equipment;
- check and replenish salt stocks in depots and grit bins;
- inspect, clean, lubricate, check and repair all vehicles and plant.

13.7.90 In addition it will be important to debrief all personnel involved to ensure that their experience and observations are recorded. These should be used to inform the Annual Service Review and contribute to the process of continuous improvement. It will also be useful in a less formal way to invite observations from parish and town council snow wardens and others that may have also contributed to the operations.

## **13.8 REVIEW**

13.8.1 All aspects of the Winter Service Plan, including service delivery arrangements, should be reviewed annually in consultation with key stakeholders to take account of changing circumstances. **(Recommendation 20)**

13.8.2 All vehicles, plant, fuel provision, equipment and maintenance arrangements should be checked annually and in accordance with manufacturers' requirements to ensure that any necessary action can be taken to ensure full operational service status prior to the Winter Service season. This should include checking the calibration of all de-icing equipment and spreaders.

13.8.3 Authorities should review the administrative and management arrangements for Winter Service annually. This should include the role of the private sector in delivering highway services, and the use of support services such as refuse collection, street cleansing and grounds maintenance services.

13.8.4 As part of the Annual Review authorities should consult with bus operators regarding changes to routes. In doing so and where practicable bus operators should be encouraged not to change routes throughout the winter season where there would be an effect on treatment routes.

13.8.5 The Annual Review should include an analysis on whether service delivery meets the Winter Service policy and plan. It should also include a review of the current thinking with regards to the impact of climate change. Service efficiency improvements such as route optimisation should also be considered.

13.8.6 Following any significant winter weather event, a formal review involving representatives from all levels of the management and delivery of Winter Service should be carried out. The review should specifically identify the successful elements of the service as well as potential improvements and actions to be taken. Where applicable, other stakeholders should be involved. The review process should be documented to ensure all learning is captured, considered and actioned. This should feed into the Annual Review.

## RECOMMENDATIONS FOR SECTION 13

- R13.1** Authorities should formally approve and adopt policies and priorities for Winter Service, which are coherent with wider objectives for transport, integration, accessibility and network management, including strategies for public transport, walking and cycling. They should also take into account the wider strategic objectives of the authority.
- R13.2** Authorities should consider, consult on and formally adopt local service standards for resilience of their winter service in terms of number of days continuous severe conditions salting on a defined Minimum Winter Network for the Overall Winter Period and for the Core Winter Period.
- R13.2a** A resilience benchmark of 12 days/48 runs should be adopted for full pre-season salt stockholding by 1 November for English local highway authorities.
- R13.3** Authorities should review their approach to climate change and in particular their resilience to prolonged cold weather.
- R13.4** Authorities should consider whether collaborative arrangements such as shared services, lead authority arrangements, collaborative service procurement, and sharing depots and salt stock, would provide an effective and value for money approach to increasing winter service resilience.
- R13.5** Authorities should determine critical areas and infrastructure in conjunction with key public services and other stakeholders and seek to ensure that appropriate winter treatment has been considered by the appropriate party.
- R13.6** Authorities should ensure effective communication of information for the public before and during both normal and severe winter conditions.
- R13.7** Authorities should ensure that there is appropriate consultation and communication with other highway authorities, key public services and other stakeholders to ensure improved service for the public.
- R13.8** Authorities should formally approve, adopt, and publish, in consultation with users and key stakeholders, a Winter Service Plan based on the principles of this Code.
- R13.9** Authorities should define treatment route plans for carriageways, cycle routes and footways for pre-treatment and snow conditions, based upon the general maintenance hierarchy, but adapted to take into account the factors identified by this Code.
- R13.10** Authorities should prepare contingency Winter Service Plans for severe weather conditions which include possibilities such as salting a Minimum Winter Network. Authorities should seek agreement on plans in advance with other highway authorities and key public services such as hospitals and public transport providers. There should be a co-ordinated approach to implementing Minimum Winter Networks across adjacent highway authorities.
- R13.11** Authorities should explore the potential for mutual aid in salt supply and other aspects of winter service and should make contingency arrangements in advance.
- R13.12** Authorities should take full advantage of decision support systems and services to enable timely, efficient and accurate decision making.
- R13.13** Authorities should continually monitor performance during service delivery and



respond effectively to changing conditions or network incidents.

- R13.14** To ensure appropriate level of competence, training and development needs of all personnel should be established and reviewed annually, including health and safety and appropriate vocational qualifications. Training should then be provided where appropriate before the Winter Service season.
- R13.15** Authorities and relevant organisations should provide training and conduct periodic exercising to test plans for responding to severe weather events.
- R13.16** Authorities and salt suppliers should treat the supply of salt as a service rather than a simple commodity purchase.
- R13.17** As a means of enhancing local salt storage capacity, authorities and salt suppliers should jointly consider supplier owned salt stocks held on a short or long term basis in a number of widely distributed locations around the country. A joint approach may include agreements such as purchase of some or all stock by the end of a season or provision of land.
- R13.18** Authorities should seek a broad approach to salt supply, for example establishing framework contracts with more than one supplier.
- R13.19** Authorities should consider whether efficiency benefits can be obtained from collaborative salt procurement and should also consider ways to improve the balance of risk between salt suppliers and themselves, e.g. longer contracts, performance contracts with minimum guaranteed purchase and supply, and contracts that include supply of salt and investment in facilities.
- R13.20** All aspects of the Winter Service Plan, including service delivery arrangements, should be reviewed annually in consultation with key stakeholders to take account of changing circumstances.

# Appendix H

## Winter Service Issues

### **Appendix Amended**

***This section is amended 2011, centres to check for updates***

Appendix H has been superseded with the revised Appendix below.

#### **H1 GENERAL**

- H1.1 The document ICE Design and Practice Guides “Highway Winter Maintenance”, Thomas Telford 2000, provides additional information on Winter Service.

#### **H2 WINTER SERVICE PLAN**

- H2.1 This section provides guidance in what is considered to be the desirable content for an authority’s Winter Service Plan. The Winter Service Plan should be a “Controlled Document” within the Quality Management Regime.

#### **Statement of Policies and Responsibilities**

- Policies and objectives;
- Client and Service Provider risks and responsibilities;
- Partnership or shared risks and responsibilities;
- Decision making process and responsibilities;
- Liaison and communication arrangements with other authorities and other public services;
- Winter risk period;
- Resilience standard;
- Legislative background.

#### **Route Planning for Carriageways, Footways and Cycle Routes**

- Carriageway routes by risk level;
- Response and treatment times for all carriageway treatments;
- Routes for footbridges, subways and other high risk pedestrian areas;
- Response and treatment times for footway and cycle route treatments;
- Routes for other footway and cycle route treatment by risk level;
- Allocation of plant, vehicles, equipment and materials to routes;
- Location and maintenance of salt bins and grit heaps;
- Special sites or features (e.g. near railways or traffic calming).

#### **Weather Prediction and Information**

- The decision making process;
- Road weather information bureau service;
- Road weather stations;
- Timing and circulation of information;

- Road weather forecast
- Reporting procedure;
- Thermal mapping;
- Maintenance of ice detection equipment;
- Information to be provided.

### **Organisational Arrangements and Personnel**

- Command, control and operational organisation;
- Arrangements with other authorities;
- Arrangements with other public services;
- Decision making;
- Operational record keeping and reporting;
- Plant and vehicle manning arrangements;
- management of drivers' hours regulations;
- Materials management;
- Training and development arrangements;
- Schedules of Contract and Voluntary Personnel (CVP);
- Employee roles and responsibilities;
- Contact and commissioning arrangements for CVP;
- Employee duty schedules, rotas and standby arrangements;
- Winter Service exercising arrangements;
- Standard operating procedures;
- Escalation and emergency operating procedures;
- Operational monitoring;
- Health and safety procedures;
- Contingency arrangements.

### **Facilities, Plant, Vehicles and Equipment**

- Winter Service compounds and facilities;
- Calibration procedures;
- Fleet inventory including licence requirements and capacity;
- Fuel stocks and locations;
- Location of plant, vehicles, snow-blowers and other equipment;
- Contingency arrangements;
- Garaging, servicing and maintenance arrangements;
- Contact and hire arrangements for contract plant.

### **Salt and Other De-Icing Materials**

- Location and capacity of stocks for salt and other materials;
- Contacts and purchasing arrangements for supplies;
- Minimum pre-season and in-season stock levels;
- In season re-stocking arrangements;
- Testing arrangements;
- Stock level monitoring and forecasting procedures;
- Loading arrangements;
- Treatment requirements including spread rates.

### **Operational Communications**

- Technical systems information;
- Reporting arrangements and protocols;
- Inventory and allocation, including back up.

### **Contingency Plan**

- Contingency arrangements for Winter Service delivery such as salt supply, drivers, fuel vehicles etc;
- Arrangements for implementing minimum winter networks;
- Mutual Aid e.g. resources available from adjacent authorities;
- Liaison with Category 1 and Category 2 responders (reference Civil Contingencies Act 2004).

### **Information and Publicity**

- Local press and broadcast contact information;
- Public information leaflets;
- Other key local and national contact information;
- Thermal mapping;
- Responsibilities and guidance for providing information;
- The decision making process;
- Road weather stations;
- Information to be provided;
- Road weather information bureau service;
- Timing and circulation of information;
- Road weather forecast;
- Notification arrangements for failure to maintain the published network;
- Reporting procedure;
- Maintenance of ice detection equipment.

### **Quality Management**

- Quality management regime including regular service audits;
- Document control procedures;
- Distribution of documents;
- Information recording and analysis;
- arrangements for performance monitoring, audit and updating;
- Procedure for deviation from the Winter Service Plan;
- Service review following significant events and at the end of season.

## **H3 PUBLIC INFORMATION LEAFLETS**

H3.1 Public information leaflets provide a useful means of providing information to drivers on travelling in winter conditions and roles and responsibilities of an authority in delivering Winter Service. Authorities should consider emphasising key messages in their leaflets. Typical contents of such a leaflet could include the following:

H3.2 Winter travelling advice to address issues, such as:

- The need to travel;
- Using public transport;
- Drivers should never assume a road has been salted;
- Adding extra time to journeys;
- Reducing speed;
- Hazards of black ice;
- Using lights in poor visibility;
- Extra care for cyclists pedestrians and horse riders;
- Giving snow ploughs and gritters plenty of room;
- Parking where it may block a salting route;
- Skidding and stopping distances;
- Condition of vehicle and appropriate personal provisions and equipment.

### H3.3 Information on network treatments, such as:

- Map of normal treatment network;
- Map of Minimum Winter Network;
- When salting takes place;
- Showers or rain may wash salt off roads;
- Salting will not stop ice forming in very cold weather;
- Times to treat the network;
- Snow clearance;
- Salt bins.

### H3.4 Further advice and contacts

- Telephone and email and website details.

H3.5 Authorities should consider as wide a distribution of the leaflets as possible through public and private outlets such as council offices, shops, petrol stations and service areas. Leaflets should also be available from authorities' websites.

## H4 SERVICE RESILIENCE

### Expressing the Winter Service Standard

H4.1 An example is provided below on how authorities could express and apply their Winter Service resilience standard.

Overall Winter Period	1st October to 30th April
Core Winter Period	1st November to 1st March
Days Resilience (Overall Winter Period)	3 days
Days Resilience (Core Winter Period)	6 days

## Determination of minimum salt stocks by depot

H4.2 For the purpose of this example it has been assumed that in heavy snow conditions there would be 6 successive treatments at 20g/m<sup>2</sup> each day.

**Table H1 – Minimum Salt Stocks**

Routes	Normal Salting Network (tonnes/ run)	Minimum Winter Network (tonnes/ run)	Minimum Stock		
			Full Pre season stock (12 days/ 48 runs)	Core Winter Period Minimum Network (6 days/ 36 runs)	Overall Winter Period Minimum Network (3 days/ 18 runs)
Carriageways	200	120	9600	4320	2160
Footways, cycle routes & salt bins (1 per day)	16	16	192	96	48
<b>Total</b>			9792	4416	2208

The minimum salt stock is therefore (to nearest 5 tonnes):

1 October to 30 October = 2210 tonnes (at all times)

1 November = 9790 tonnes

1 November to 1 March = 4416 tonnes (at all times)

1 March to 30 April = 2210 tonnes (at all times)

Notes.

1. The minimum in season stocks are the minimum to which stocks should be allowed to fall, i.e. restocking should take place well before the minimum is likely to be reached.

2. The early season and end of season minimum resilience stock should not be confused with the stocks likely to be required to ensure full pre-season stocks are achieved for the current or for the subsequent winter season.

### Other Arrangements

H4.3 Minimum numbers of staff should be established for each of the roles identified for delivery of the service. Section 13 advises that all resources should be subject to a minimum resilience standard. When establishing shift patterns for all staff it is important to consider building in resilience for staff absence in addition to the requirements of the working time directive and drivers' hour's regulations.

The drivers' hours regulations are in place to contribute to road safety. Pushing drivers to the limit, in difficult driving conditions, should be avoided wherever possible. VOSA has produced guidance on drivers' hours which can be found at the below weblink:

***Website Amended 27 April 2012 (centres to check for any updates)***

<http://assets.dft.gov.uk/publications/drivers-hours-passenger-vehicles/report.pdf>

- H4.4 Reserve drivers can be sourced from any pool of HGV qualified drivers, although they should be trained to the relevant Winter Service modules. Some authorities have written the requirement to supply reserve spreader drivers into other, non-winter contracts. For example, domestic refuse collection drivers would be suitable candidates for training as reserve spreader drivers.
- H4.5 Through multi-skilling other operators, it is possible to provide sufficient resilience for activities such as loading. Reserve driver's mates for snow ploughing, where used, can be sourced through similar multi-skilling of other operatives.
- H4.6 Winter decision makers, supervisors and managers have specific tasks to complete during both normal and severe conditions. As with spreader drivers, it is important to ensure that when combined with other daily duties, the hours worked by individuals remain acceptable.
- H4.7 Trained decision makers should be available to support contingency arrangements. Training additional reserve staff should be considered. It is important that these reserve staff are routinely exposed to operational decision making to ensure their knowledge is current and they have sufficient experience to meet the requirements of the winter plan.
- H4.8 Where practicable, authorities should make arrangements for obtaining reserve supplies of key resources to support their minimum resilience standard. This should include salt, fuel, power and labour
- H4.9 Authorities should ensure that they have sufficient fuel to meet the resilience standard. This should be either bunkered in the depot or guaranteed from other easily accessible sources.
- H4.10 Fuel supply has not historically been a widespread threat to the delivery of the Winter Service. However, lessons must be learnt from the recent shortages of salt. At a local level, there have been cases of localised fuel contamination and even a simple pump failure at a depot is sufficient to put strain on the service. Meeting the resilience standard for fuel stocks locally will lessen the impact of fuel supply interruptions at a national or regional level.
- H4.11 Additional reserve stocks of fuel and salt can be obtained to give surety of supply. Recent winters have shown that supply guarantees need to be well defined and enforceable within contracts, if they are to be effective.



- H4.12 A relatively low cost way of increasing the number of vehicles available for snow clearance is to consider fitting snow plough mounts to non-winter vehicles and procuring additional ploughs to suit. This allows, in authorities where ploughing is appropriate, for two way ploughing whilst maintaining salting in a single pass.
- H4.13 Depots can be unavailable for a range of reasons but the most common is closure of the access road or loss of power. Both can be mitigated at minimal cost. If feasible a depot should have two gates onto different routes. The secondary access would only be used in times of crisis but would enable access and egress from the depot. Power outages should not stop the operation as backup generation is a one option. However, it is important to assess the need for power. Lighting in the yard can be achieved with temporary lighting towers and heating for the depot staff can be achieved with portable gas appliances. Not having full IT systems for operational and decision making purposes may or may not be an issue for a short term outage. A business impact analysis would determine this. Communication links are a bigger issue although mobile phones, as long as they are charged, are a good backup to landlines.

### **Crisis Communications**

- H4.14 In November 2009, when Cumbria was hit by severe flooding, the local authority used mapping on its website to great effect to inform the public which routes were available to traffic. This could be replicated for a snow event to direct traffic to the treated and passable sections of the network.
- H4.15 Other departments within an authority may benefit from accurate updates on the condition of the network and likely future conditions. If decision makers realise that safe access to a school, for example, cannot be maintained then those responsible for the school need to be made aware as early as possible. This will allow the school to be closed in a planned manner.
- H4.16 All staff attempting to get into work may benefit from advance information and reminders to allow longer for their journeys to work. Text messages to staff phones or telephone trees are effective ways to deliver the message. These types of arrangements may already exist in the authority's Business Continuity Plan.
- H4.17 Providing information to staff is particularly important for Winter Service staff. It will reduce the risk of drivers / operators arriving late and disrupting the treatment effort. However, many drivers / operators will sleep in the depots to eliminate the risk entirely.

## **H5 CONSIDERATIONS FOR VARIOUS SURFACE COURSES**

- H5.1 Some surfacing materials, including "negative texture" thin surfacings, multiple surface dressings and micro surfacings, exhibit different texture, drainage and thermal characteristics from conventional positively textured surfacings such as Hot Rolled Asphalt.
- H5.2 However, evidence has been found that the effect of residual salt on the carriageway is reduced, particularly in areas of low traffic and should

therefore not be relied upon. As a consequence routes with such surfacing may require more frequent treatments.

## **H6 DE-ICING MATERIALS**

- H6.1 Rock salt is the most commonly used material for de-icing. A number of other materials are available which could be considered for particular circumstances. Cost and environmental characteristics differ widely and should be compared before adoption. The main materials available for de-icing treatment are:

### **Salt**

- H6.2 Rock salt is the most commonly used salt; however marine salt is also available. All rock salt should comply with BS3247:1991.
- H6.3 Commonly used in its dry condition, where it has a natural moisture content of about 4%. It melts ice and snow at temperatures as low as -21°C, but below -5°C the effectiveness of the salt is reduced and below -10°C the amount needed increases to become environmentally and economically undesirable.
- H6.4 The moisture content of the salt can be a critical factor in de-icing, as melting only occurs after the dry rock salt forms a solution by absorbing moisture from the road surface and atmosphere. Pre-wetting of salt with brine is used by some authorities and can improve the effectiveness of treatment in dry running surface conditions by reducing particle distribution, increasing adherence to the surface and increasing the speed of anti-icing or de-icing action. Additional equipment and saturators are required to deliver the service.

### ***Paragraph Amended 13 August 2012 (centres to check for any updates)***

- H6.5 Domestic producers can provide both 6mm and 10mm graded rock salt to BS 3247:2011. The larger particle size requires less processing and can therefore be produced faster. Thus significantly more 10mm salt than 6mm salt can be produced in the same period of time. If more orders are placed for 10mm than 6mm then the pressure on UK production has the potential to be lessened. However, smaller particles go into solution much more rapidly than larger particles; particularly in situations of low humidity. A 6mm particle size is suggested for precautionary salting, giving a faster reaction time and better opportunities for salt rate reduction, whereas 10mm is more effective for ice and hard-packed snow.
- H6.6 It is important for authorities to note that a move from 6mm salt to 10mm salt will require different spreader calibration settings to deliver satisfactory spread coverage. Due to increased bounce of the larger particles, 10mm salt tends to spread less evenly and can result in more salt being put on the carriageway to achieve the minimum spread rate across the spread width. Use of 10mm salt has also been linked to claims for damage to vehicles, especially vehicle windscreens.
- H6.7 Salt coated with proprietary agricultural by-products is used by some

authorities. This can improve the effectiveness of treatment by reducing particle distribution and increasing adherence to the surface.

- H6.8 Authorities using treated salt (coated, treated with agricultural by-products – ABPs) have reported finding significant savings in salt usage, with experienced users claiming greater savings. This anecdotal evidence suggests benefits include prolonged retention of residual salt on the carriageway in many weather conditions. All major domestic suppliers can supply treated salt and a choice of treatment is available. The treatment process does not add any significant delay to the production and distribution process. Conventional spreading machinery needs no modification save for calibration for the new stock. Authorities should draw on the experience of current users if considering a change of de-icing material. The Environment Agency has asked potential users to notify them before using treated salt.
- H6.9 Some authorities have changed from dry salting to pre-wetted salting. This uses less dry salt but involves investment in the additional plant required. Consequently, this option does not present itself as one which can be considered for quick and low-cost implementation.

### **Brine**

- H6.10 Brine solution is effective in some conditions for example, certain cycle routes, where the volume and weight of traffic may be insufficient to activate dry salt.

### **Grit (Salt Sand mix)**

- H6.11 Where hard-packed snow and ice have formed and cannot be removed by ploughing, a salt/sand mixture can be used in successive treatments at a spread rate of 20 to 40 g/m<sup>2</sup>. This aids vehicular traction and acts to break up the snow and ice. There are, however, issues such as costs of clearing the grit / sand from surfaces and drainage infrastructure.
- H6.12 Sand for use in mixtures shall be single sized abrasive of particle size 1-6mm or 5mm sand having low fines content. The particles should be angular in shape and suitable to create an abrasive surface. The sand can be added to salt at a ratio of 1:1 by weight.
- H6.13 If authorities do use a grit mix then after snow melt they should ensure that drains are checked and cleaned as necessary.
- H6.14 Grit/salt can be used as an alternative to salt for filling grit bins. Whilst grit bins are often provided for footways, such mixes can, in some cases, also be applied on minor roads.

### **Calcium Chloride**

- H6.15 Acts at a lower temperature than salt but is more corrosive and more expensive. It absorbs moisture freely and special requirements are needed for storage. The only use in UK is likely to be in blending with salt or as a pre-wetting agent in water.

## **Urea**

- H6.16 No more effect on steel than water alone but is less effective than salt for equivalent weight and ceases to be effective at about -6°C. Used in certain specialist locations because of its less corrosive effect. Supplied in pellets and needs special attention to storage. Conventional spreading equipment requires modification to obtain satisfactory results. Considerably more expensive than salt.

## **Glycol**

- H6.17 Liquid supplied in bulk or in drums. Used on airfields and other specific locations. May have a slight adverse effect on skidding resistance. Considerably more expensive than salt.

## **Calcium Magnesium Acetate**

- H6.18 Supplied in the form of spherical pellets, does not corrode bare steel but may be comparable to salt in the corrosion of reinforcement bars in concrete. Considerably more expensive than salt.

## **Potassium or Sodium Acetate (Liquid Acetate)**

- H6.19 Liquid supplied in bulk or in drums. Fast acting and used on some airfields. There is some laboratory evidence that acetates may adversely affect the durability of concrete that has not been air entrained but the significance of this has not yet been proven. Considerably more expensive than salt.

## **H7 EFFECTIVE MANAGEMENT OF SALT FOR WINTER SERVICE**

### **Reducing Waste**

- H7.1 It may help to emphasise to spreader drivers and loader operators, how to minimise salt wastage when loading, off-loading, washing spreaders and when carrying out treatments.
- H7.2 Some authorities have found on-board weighing or vehicle tracking systems useful tools to secure salt savings by ensuring that excess salt is not spun off inappropriately. Authorities should determine whether these systems offer benefits to their own service. The practice of 'spinning-off' surplus salt on the way back to the depot should be eliminated as this is a wasteful practice. It also makes proving full network treatment difficult.
- H7.3 Extremely low temperatures pose the issue that salt becomes less effective and would be required in uneconomical doses. Alternative de-icers can be used, although the practicalities of sourcing, calibrating for and using these would need careful consideration. Use of grit-salt mixes as above can assist with traction. During periods of extreme cold it is likely that the humidity would also be very low which also impacts on the effectiveness of salt.

- H7.4 Spreading salt with calibrated vehicles and ensuring the salt has a moisture

content within the target range will allow reduced spread rates and therefore minimise salt usage.

### **Moisture Content for Salt**

H7.5 The target range for the moisture content of salt is dependent on the type of salt used, such as UK rock salt, imported rock salt, marine salt and whether salt is pre-treated or modified.

#### ***Paragraph Amended 16 January 2012 (centres to check for any updates)***

- H7.6 For dry salting, the optimum moisture content for fine and coarse rock salt graded to be compliant with BS 3247:1991 is in the range 2 to 3.5%. The risk of the salt 'tunnelling' within the spreader hopper and affecting spreading increases significantly when the moisture content exceeds 4.5%. This can result in large areas of road being left untreated. Losses during and after spreading become higher when the salt moisture content is lower, particularly when the moisture content is less than 1% and especially when treating a dry road.
- H7.7 For pre-wetted salting with rock salt graded to be compliant with BS 3247:1991, the upper limits for dry salting apply. However, the moisture content can be less than 2% because the pre-wetting agent helps to prevent the loss of the finer particles during and after spreading.
- H7.8 For treated rock salt, the upper limits for dry salt apply. The minimum moisture content of coated rock salt is typically 2% or greater; the additive helps to prevent loss of the finer particles during and after spreading.
- H7.9 Marine salt tends to have lower fines content than UK rock salt. For dry salting, the optimum moisture content for 6 to 8mm marine salt or 6 to 10mm rock salt with a low fines content is in the range 1.5 to 4.0%.
- H7.10 Moisture content can be tested by a UKAS accredited laboratory in accordance with BS3427:1991. However a simple test can be undertaken using a standard oven and a suitable set of weighing scales.

### **Storage Options**

- H7.11 There are a number of storage options available for salt. More detailed guidance is given on these approaches to storage below:

#### **Salt Barn**

- H7.12 The condition of salt in a salt barn should remain fairly constant, although the parts of a stockpile near an open door may increase in moisture content if there is ingress of precipitation or decrease in sun and wind.
- H7.13 It should not be necessary to turn or agitate the stockpile however the stock may harden if left untouched for multiple seasons. The mixing of materials with different moisture contents to achieve the target range may be beneficial. Excessive turning should be avoided because this can change the grading of the salt and make it finer. Marine salt tends to be softer than rock salt, which is beneficial for dissolution and reduces

bounce on the carriageway, but excessive handling will produce finer particles.

### **Outside Protected**

- H7.14 Sheet piling systems are available to protect stockpiles from the weather. Salt stored outside should be on a suitable hard standing to prevent ingress of water from the ground, contamination and facilitate loading. The hard standing should have a slight cross-fall and drainage to disperse precipitation quickly and prevent water accumulation at the base of the stockpile. Drainage provision must consider the potential of damage to the environment and comply with relevant legislation and Environment Agency requirements.
- H7.15 Whenever possible, outdoor stockpiles should be protected by waterproof sheeting or suitable alternatives. This should prevent or limit the ingress of water and prevent erosion due to the wind. Covers should be positioned to prevent precipitation from reaching any part of the stockpile, including the base.
- H7.16 Outside stockpiles should take the form of an extended pyramid with the working face at one end. It is likely to be impractical to cover the working face of a stockpile during frequent use, hence the need to reduce the size of the working face which is exposed to the elements.
- H7.17 UK rock salt has been stored outside under waterproof covers and remained in good condition without turning or agitation for periods up to three years. However, it should not be assumed that salt stored outside but protected will remain in good condition indefinitely.
- H7.18 Covers should be handled carefully and inspected on a regular basis for damage, especially after high winds, heavy rainfall and heavy snow. Covers may be prone to deterioration by ultra-violet radiation and this should be considered at the point of purchase. Damage should be repaired promptly to prevent the ingress of water.  
Water ingress may be significant and 'swallow holes' may form.
- H7.19 Walking on covers should never be allowed for safety reasons. Apart from the potential for slips and falls, a 'swallow-hole' in the stockpile may entrap anyone walking on the cover.

### ***Paragraph Amended 6 January 2012 (centres to check for any updates)***

- H7.20 The turning and agitation of protected stockpiles is not recommended when this may damage the protection and allow the ingress of water. However, the opportunity should be taken to check the condition of the salt in different parts of the stockpile when this can be done safely. If necessary, salt should be used immediately to prevent its moisture content falling outside the target range. Alternatively, mixing with salt, with that of different moisture content could be considered.

### **Outside Unprotected**

- H7.21 Pre-treatment spread rates should be higher for salt stored outside and unprotected compared to salt stored under cover. Unprotected stockpiles should also be avoided because salt and anti-caking agents are lost through leaching, and the moisture content of the salt cannot be maintained at optimum levels. Results from a test programme in the 1960s suggest that losses of salt of the order of 0.01%/mm of rainfall can be expected from an undisturbed stockpile of UK rock salt that is not treated, i.e. 60 tonnes from a 1,000 tonne stockpile with annual rainfall of 600mm.
- H7.22 UK rock salt contains insolubles that range from about 2.5 to 5.5% by weight. The insolubles are mostly marl. When stored outside a thatch or crust is formed on the surface of the stockpile from the marl and recrystallised salt as the sodium chloride at the surface is dissolved by precipitation. The thatch helps to prevent large amounts of water from entering the stockpile.
- H7.23 Other rock salts and marine salts can have a very low insoluble content. When stored outside, thatch is formed as the salt on the surface of the stockpile dissolves and recrystallises. The potential for water ingress is greater with purer salts because the thatch can take longer to form.
- H7.24 The advantages of using some types of treated salt may be compromised if it is stored in unprotected stockpiles and exposed to the elements. It is suggested that before storing treated salt unprotected, authorities should satisfy themselves as to the suitability for future use as part of delivering the Winter Service.
- H7.25 As mentioned above, outside stockpiles should take the form of an extended pyramid with the working face at one end in order to limit the ingress of water to the stockpile. The opportunity should be taken to check the condition of the salt at different parts of the stockpile when this can be done safely.
- H7.26 Once thatch has formed, the stockpile should be disturbed as little as possible. If the thatch is broken up, the ingress of water will increase until new thatch has formed.
- H7.27 The thatch on UK rock salt should be not used because it has a very low sodium chloride content. The thatch on a stockpile of salt with high purity can be used if it is thoroughly broken up. If large particles from the thatch are spread, the discharge rate of the salt from spreader may be affected, wastage may increase, and target spread rates may not be achieved. Also, there is an increased risk of damage to car windscreens.

### **Stockpile Rotation**

- H7.28 A stockpile rotation plan should be developed by authorities to ensure that the salt being used is in good condition, the salt in storage is not deteriorating and no salt deteriorates so much that it cannot be used. For each type of storage, there should be a principle of first in first out. Stocking to meet the resilience standard may leave surplus salt in store at the end of a mild winter. Reserve stockpiles, once established, should be part of the rotation plan.



- H7.29 As a general rule, salt should not be stored outside unprotected for more than one season. Where salt is protected it should not be stored for more than three years unless it can be confirmed that the salt is in good condition. Based on current information, it may be necessary for authorities to consider replacing strategic stocks on a rotating basis every three years.
- H7.30 Old salt stocks left in a barn should remain in good condition for a number of seasons. However, they should be moved forward and used before they can deteriorate beyond the required condition.

## **Effective Use of Salt**

### **Calibration of Spreaders**

- H7.31 The purpose of calibration is to ensure that each spreader in a fleet is spreading the salt uniformly over the target area, at the correct rate of application and with as little wastage as possible.
- H7.32 Salt spreaders require calibration and set-up for the specific salt type, grading and moisture content being used. Even though salts may be compliant with BS 3247: 1991, the spreader settings for salt from one source are unlikely to be the optimum settings for salt from another source. The amount of salt discharged could vary from the expected amount by as much as  $\pm 50\%$ .
- H7.33 Calibration should always involve a direct measurement of the salt being discharged and where it is being spread. An indirect check of the spreader settings, such as the belt speed, gate height and spinner speed is not sufficient. Before any calibration is carried out, the salts, spread widths and spread rates for which calibration is required must be clearly identified.
- H7.34 Every spreader should be calibrated before each winter, however undertaking and additional mid-winter calibration is also good practice. Calibration should be carried out whenever required throughout the season, for example following a change of salt or monitoring highlighting a potential issue. The objective is to ensure that the intended spread rates are achieved.
- H7.35 It cannot be relied upon that the spreader performance will remain unchanged after calibration. There are numerous variables that impact on calibration. Performance needs to be monitored and recorded so that recalibration of spreaders can be carried out where necessary. Monitoring of the salt tonnage used provides a quick and easy method of checking the spreader performance in terms of discharge rate.
- H7.36 Driver training is important in monitoring the performance, as any non-routine actions (such as operating the spreader in burst mode) should be recorded and allowed for. Driver training is discussed in Section 13.
- H7.37 An effective calibration procedure will involve carrying out checks in the following order:

#### **A. Pre-calibration Checks**

- Check and record the salt moisture content ensuring that it is in an acceptable range.
- Check the condition of the spreader, particularly the hopper, chute and salt distribution mechanism and controls.

### ***B. Discharge Tests***

- The discharge test should check that the spreader is discharging salt (and brine for pre-wetted salting) at the correct rate. The target amount (g) = spread width (m) x spread rate (g/m<sup>2</sup>) x spread length (m).
- The salt discharge rate can be measured most accurately by completing a trial spreading run. This will require the use of a weighbridge, an accurate on-board weighing system or weigh pads to measure the amount of salt and brine discharged during the run.
- Weighbridges and weigh pads should be calibrated and the resolution (the smallest increment in weight) should be considered. For example, if the weighbridge measures to the nearest 10kg, and the amount of salt discharged is 100kg, there would be a potential error of 10%. For accuracy, sufficient salt should be discharged such that the resolution does not result in a measurement error greater than 3%.
- If using weighbridges or weigh pads and the spreader has completed a full treatment run then it is important to ensure the fuel tank is full during weighing both before and after treatment.
- The discharge rate may vary with the hopper load, with experience indicating that a full hopper is more likely to result in a reduced rate of spread. This is considered more of an issue for older spreaders, with more modern equipment able to continuously adjust the output once calibrated through closed loop control.
- Alternatively, for some spreaders it is possible to carry out a discharge test with the spreader stationary, simulating spreading at the normal spreading speed. The salt (and brine when spreading pre-wetted salt), can be collected in a bag or bucket and weighed using scales. This method will be less accurate than a trial spreading run because less salt is discharged.
- Checks should be made that the calibration is valid at two significantly different spread rates using a typical spread width on the routes treated by that spreader.
- The amount of salt (and brine where applicable) discharged should be adjusted in accordance with the spreader manufacturer's recommendations so they are within  $\pm 10\%$  of the target.
- For more modern spreaders, with closed loop control of the amount discharged, more stringent limits of  $\pm 6\%$  should apply.

- The dry salt to brine mix proportions for pre-wetted salting should be within the range 64:36% to 76:24%.

### **C. Distribution Check**

- A visual check of the salt distribution should be made to check the salt is being spread to the target area. This should be carried out by an experienced person who has the competence to relate the visual check to actual performance.
- For some spreaders the check can be carried out with the spreader stationary and operated for a few seconds to simulate spreading at normal speed. The bounce of salt across the road surface will be affected by accumulations of salt, so the salt should be cleared as necessary. Cones can be placed as markers to define the correct spread width.
- Alternatively, the salt distribution may be observed from a vehicle following the spreader while performing a trial spreading run. While this will demonstrate the distribution at speed, with the extra bouncing of the salt particles due to their forward momentum and the snaking caused by turbulence generated by the spreader, it is harder to assess the uniformity of the distribution and the wastage than from a static assessment.
- The spread pattern should be observed and, if necessary, the spinner speed and symmetry should be adjusted to optimise the salt distribution profile and reduce wastage.

### **D. Certification**

Following successful completion of the discharge tests and distribution check, a calibration certificate should be issued by an appropriately experienced person. The calibration certificate should give details of the:

- spreader being tested;
- type and moisture content of the salt;
- amount of de-icer discharged at each spread setting;
- spread settings at which the salt distribution profile was assessed;
- approximate hopper load.

## **H8 DECISION MAKING**

- H8.1 Some authorities operate over a network that covers more than one climatic domain. By using domain-based forecasting, consideration can be given to partial network treatment. Route-based forecasting can also help assist in the route design and decision making for such an approach. Such an approach may assist in reducing the amount of salt used by the authority.
- H8.2 In circumstances where roads may be dry in places, but have areas of moisture through snow melting or seepage on the carriageway, spot salting could be considered rather than full precautionary runs. Route assessment with drivers can identify areas where the carriageway suffers from run-off

from beyond the highway boundary. Such causes can include changes in agricultural practice. Problem locations can be identified and further actions such as mitigation or enforcement considered.

- H8.3 Use should be made of all available sensor / camera information. Sensor information can assist with the evaluation of residual salt on the network, although appropriate care should be taken to verify the accuracy.
- H8.4 Patrols to direct treatment decisions could be introduced. These can allow focused treatments and the best use of salt stocks, by avoiding the possibility of unnecessary treatments on “marginal” forecasts. Such patrols can also check that the spreaders are functioning correctly. Through training, patrols or scouts can be competent at on-site decision making as to when not to treat. In addition, they can allow last minute ratification of the need to treat and when.
- H8.5 In conducting the annual review recommended in Section 13 it can be useful to focus on “marginal” forecasts experienced during previous seasons and to consider whether decision making and the data provided for that decision making could be improved in future.
- H8.6 A suggested process for decision making, taking into account various operational scenarios is provided in this section. This may be modified as necessary to suit local circumstances.

### **Road Surface Wetness**

- H8.7 For the purpose of allocating treatments a distinction is made between dry, damp and wet road surfaces. Definitions for use when making treatment decisions are given in Table H2.

**Table H2 – Road Surface Wetness**

Dry road	A road that shows no signs of water or dampness at the surface but may be just detectably darker (however it may have moisture contained in pores below the surface that is not 'pumped' to the surface by traffic)
Damp road	A road which is clearly dark but traffic does not generate any spray. This would be typical of a well drained road when there has been no rainfall after 6 hours before the treatment time.
Wet road	A road on which traffic produces spray but not small water droplets. This would be typical of a well drained road when there has been rainfall up to 3 hours before the treatment time.

### **Traffic Levels**

- H8.8 Traffic levels are also an important part of the treatment decision. Two levels of trafficking have been defined: heavily trafficked roads and medium/light trafficked roads.
- H8.9 Table H3 show that heavily trafficked roads are those defined as Categories 1 and 2 in Well-maintained Highways and medium/light trafficked roads are those defined as Category 3.

**Table H3 – Carriageway Hierarchy**

Category	Hierarchy Description	Traffic Level
1	Motorway	Heavy
2	Strategic Route	Heavy
3a	Main Distributor	Medium/Light
3b	Secondary Distributor	Medium/Light

### Precautionary Treatment Decision Matrix

H8.10 A sample decision matrix for precautionary treatments based on road surface conditions and predicted weather conditions is given in Table H4.

**Table H4 – Sample Precautionary Treatment Decision Matrix Guide**

Table H11 – Example of Conditional Treatment Matrix Cards				
Road Surface Temperature	Precipitation	Predicted Road Conditions		
		Wet	Wet Patches	Dry
May fall below 1°C	<u>No</u> rain <u>No</u> hoar frost <u>No</u> fog	Salt before frost	Salt before frost (see note a)	No action likely, monitor weather (see note a)
Expected to fall below 1°C	<u>No</u> rain <u>No</u> hoar frost <u>No</u> fog			
	<u>Expected</u> hoar frost <u>Expected</u> fog		Salt before frost (see note b)	
	<u>Expected</u> rain <u>BEFORE</u> freezing	Salt after rain stops (see note c)		
	<u>Expected</u> rain <u>DURING</u> freezing	Salt before frost, as required during rain and after rain stops (see note d)		
	<u>Possible</u> rain <u>Possible</u> hoar frost <u>Possible</u> fog	Salt before frost	Monitor weather conditions	
	<u>Expected</u> snow (See H10)		Salt before snow fall	

The decision to undertake precautionary treatments should be, if appropriate, adjusted to take account of residual salt or surface moisture.

All decisions should be evidence based, recorded and require continuous monitoring and review.

### Notes:

- (a) Particular attention should be given to the possibility of water running across carriageways and other running surfaces e.g. off adjacent fields after heavy

rains, washing off salt previously deposited. Such locations should be closely monitored and may require treating in the evening and morning and possible other occasions.

- (b) When a weather warning contains reference to expected hoarfrost, considerable deposits of frost are likely to occur. Hoarfrost usually occurs in the early morning and is difficult to cater for because of the probability that any salt deposited on a dry road too soon before its onset, may be dispersed before it can become effective. Close monitoring is required under this forecast condition which should ideally be treated just as the hoarfrost is forming. Such action is usually not practicable and salt may have to be deposited on a dry road prior to and as close as possible to the expected time of the condition. Hoarfrost may be forecast at other times in which case the timing of salting operations should be adjusted accordingly.
- (c) If, under these conditions, rain has not ceased by early morning, crews should be called out and action initiated as rain ceases.
- (d) Under these circumstances rain will freeze on contact with running surfaces and full pre-treatment should be provided even on dry roads. This is a most serious condition and should be monitored closely and continuously throughout the danger period.
- (e) Weather warnings are often qualified by altitudes in which case differing action may be required from each depot.
- (f) Where there is any hint of moisture being present, a pessimistic view of the forecast should be taken when considering treatment to negatively textured surfaces.

### **Determining Spreading Capability**

H8.12 For precautionary treatments, the spread rates to be used depend upon the spreading capability. A decision process diagram to determine this capability is given below, and the spread rates are given in Section H9.

#### ***Paragraph Amended***

***16 January 2012 (centres to check for any updates)***

H8.13 The decision matrix is based on the condition of the salt and the spreader performance, as well as the calibration of the spreader. Table H5 provides the definition of reasonable and modest spreading capability. The flow chart (Figure H1) below provides a simple method of determining whether the spreading capability can be considered reasonable or modest. It asks a number of questions relating to the condition of the salt and the calibration and performance of the spreader.

#### ***Paragraph Amended***

***16 January 2012 (centres to check for any updates)***

H8.14 The suggested spread rates provided within Section H9 are only applicable to systems demonstrating 'reasonable' and/or 'modest'

spreading rate capabilities. It is strongly advised that systems not able to demonstrate such capabilities are improved

**Table H5 – Spreading Capability**

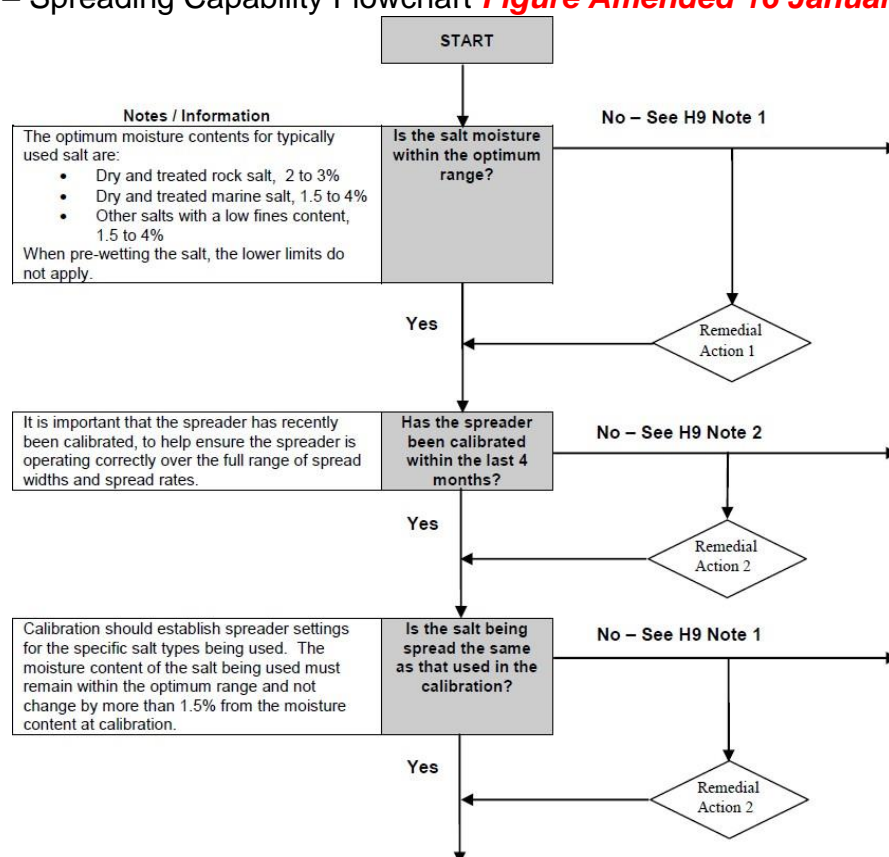
Spreading Capability	Description
Reasonable	Where an Authority has all of the following: new or reasonably good technology spreaders, the salt being spread is in good condition (because it has been stored in good condition) and there is a reasonably good level of calibration. Lower spread rates (provided in Section H9) can be used
Modest	Where an Authority has old or relatively low technology spreaders, the salt has been stored in less than optimal conditions, or where an accurate calibration cannot be achieved. Higher spread rates provided in Section H9 should be adopted.

The flow chart in this section provides a simple method of determining whether the spreading capability can be considered to be 'reasonable' or 'modest'. It asks a number of questions relating to the condition of the salt and the calibration and performance of the spreader.

- If the answer to all of the questions is 'Yes', the spreading capability is 'reasonable'.
- If the answer to any of the questions is 'No', the spreading capability is 'modest', providing that the minimum requirements set out in Paragraph H9.3 are met.

Where a minimum requirement in Paragraph H9.3 is not met, Paragraph H8.15 gives remedial actions which, if undertaken, may allow a 'reasonable' or 'modest' spreading capability (as appropriate) to be obtained.

**Figure H1 – Spreading Capability Flowchart** *Figure Amended 16 January 2012*





- H8.15 An authority can improve its spreading capability by considering the remedial actions below.

Action1

Mix the salt with drier or wetter salt (as appropriate to decrease or increase the moisture content). Use salt from the stockpile or from new deliveries.

A simple test for moisture can be undertaken using a standard oven and a suitable set of weighing scales. A 500g sample of UK rock salt placed in an oven at no more than 65°C until completely dry will show a weight loss of between 7.5g (if its moisture content is 1.5%) and 20g (if its moisture content is 4%).

Action 2

Calibrate the spreader using the salt being spread.

## **H9 TARGET SPREAD RATES OF SALT FOR PRECAUTIONARY TREATMENT**

### **General**

- H9.1 The majority of winter service treatments (and salt spread) in the UK are precautionary treatments in response to predicted frost conditions. In these, commonly marginal conditions, significant salt savings can be achieved using the rates given in this guidance when using salt which has been stored in good conditions, and using good equipment which has been properly calibrated. The use of pre-wetted or treated salt can also provide salt savings compared to dry salting.
- H9.2 Spread rates for precautionary treatments are given in Tables H6 & H7. The tables provide recommended spread rates for dry, pre-wetted and treated salting for a range of weather and road surface conditions. Table H6 provides spread rates for a reasonable spreading capability. Table H7 provides spread rates for a modest spreading capability.

### ***Bullet points renumbered 16 January 2012 (centres to check for any updates)***

- H9.3 The following points must be considered when using the spread rate tables. If the minimum requirements set out below are not met then the service provider must take remedial action or otherwise ensure that the salt being spread is meeting 80% of the target amount across the entire carriageway(s) being treated. The maximum moisture content for the salt (before adding brine for pre-wet spreading) must not exceed 6%. The service provider must make adequate checks to ensure salt distribution is within 65 % of target for pre-wet spreading and 55% for dry salt, across the carriageway(s) for the spread rate used and that there is no tunnelling in the spreader preventing salt reaching the discharge mechanism.
1. Spreaders must be properly calibrated for each winter season. If spreaders have not been calibrated, or if they have suffered damage or malfunction which may have affected the spreading capability, or if records from the

previous spreading run differ by more than 10% between the actual salt spread and that calculated for the route, remedial action should be taken.

2. Spread rates given in Tables H6 & H7 are only appropriate when spreading takes place at temperatures that ensure the salt is fully dissolved before lower temperatures are reached. Generally this is at temperatures above - 5°C in low humidity conditions (below 80%) and above -7°C in normal UK winter humidity conditions (80% and above). Salt on the road can be effective at temperatures significantly below these values but it is important that spreading operations are undertaken before temperatures fall to these levels. Indeed, when temperatures are forecast to fall below these minima, spreading should be completed at least 2 hours before they are reached.
3. The spread rates are for sections of well drained roads without ponding or runoff from adjacent areas. Spread rates must be adjusted accordingly or other measures taken where appropriate
4. The rates may be adjusted to take account of variations occurring along routes such as temperature, surface moisture, road alignment and traffic density. When single spread rates are used for each route/network (which is currently typical practice) the rates should reflect the expected conditions on all sections of that route/network.
5. The rates may be adjusted to take account of residual salt levels. However, it should be noted that residual salt levels will tend to be lower if lower spread rates are introduced. Residual salt levels are most likely to be significant on marginal nights after treatments on two or three successive days without precipitation in the intervening period.
6. On porous asphalt and on dense surfacing for 1km after a change from porous asphalt, spread rates should be increased by 50 per cent on roads with medium traffic levels and by 25 per cent on heavily trafficked roads.
7. Spread rates should be increased to a rate appropriate for the particular situation where negatively textured thin surfacings are poorly drained such that water can accumulate within the surface texture.
8. When the rates in Tables H6 and H7 are significantly lower than those used previously, it is recommended that the reduction should be introduced in stages and the performance of spreaders monitored. In particular, checks should be made that the amount of salt discharged is within 10 per cent of the target and that treatments are effective.
9. All decisions should be evidence based, recorded and require appropriate monitoring and review.
10. During periods of sustained freezing and provided that surfaces are well drained and there is neither seepage (from melt water) nor ice present, rates of spread for treatments carried out within

six hours of previous treatments may be 50% of the rates stated in the appropriate table.

**Table H6 – Spread Rates For Reasonable Spreading Capability (De-icer Spread Rates in g/m<sup>2</sup>)**

<b>Frost or forecast frost Road Surface Temperature (RST) and Road Surface Wetness</b>	<b>Dry salt</b>	<b>Pre-wetted salt (see Note 1)</b>	<b>Treated salt (see Note 2)</b>
RST at or above -2°C and dry or damp road conditions	8	8 (de-icer) 6 (salt)	7
RST at or above -2°C and wet road conditions	8	8 (de-icer) 6 (salt)	7
RST below -2°C and above -5°C and dry or damp road conditions	12	12 (de-icer) 9 (salt)	9
RST below -2°C and above -5°C and wet road conditions	20	21 (de-icer) 16 (salt)	16
RST at or below -5°C and above -10°C and dry or damp road conditions *	20	21 (de-icer) 16 (salt)	16
RST at or below -5°C and above -10°C and wet road conditions *	2 x 20	2 x 21 (de-icer) 2 x 16 (salt)	32 or 2 x 16

Note 1: Spread rates for pre-wetted salting are the combined weight of dry salt and brine combined in proportion 70:30 by weight with brine of concentration 20 to 23%.

Note 2: Weight of salt and additive (approx 3% by weight).

\* Relates to RST after the spreading operation was undertaken at a higher temperature - See Note 3 at the start of this section

**Table H7 – Spread Rates For Modest Spreading Capability (De-icer Spread Rates in g/m<sup>2</sup>)**

<b>Frost or forecast frost Road Surface Temperature (RST) and Road Surface Wetness</b>	<b>Dry salt</b>	<b>Pre-wetted salt (see Note 1)</b>	<b>Treated salt (see Note 2)</b>
RST at or above -2°C and dry or damp road conditions	8	8 (de-icer) 6 (salt)	7
RST at or above -2°C and wet road conditions	11	9 (de-icer) 7 (salt)	8
RST below - 2°C and above -5°C and dry or damp road conditions	15	13 (de-icer) 10 (salt)	10
RST below - 2°C and above -5°C and wet road conditions	27	25 (de-icer) 19 (salt)	19
RST at or below - 5°C and above - 10°C and dry or damp road conditions *	27	25 (de-icer) 19 (salt)	19
RST at or below - 5°C and above - 10°C and wet road conditions *	2 x 25	2 x 24 (de-icer) 2 x 18 (salt)	36 or 2 x 18

Note 1: Spread rates for pre-wetted salting are the combined weight of dry salt and brine combined in proportion 70:30 by weight with brine of concentration 20 to 23%.

Note 2: Weight of salt and additive (approx 3% by weight).

\* Relates to RST after the spreading operation was undertaken at a higher temperature - See Note 3 at the start of this section

- H9.4 The rates for dry salt in the three more extreme conditions shown in the above table are higher than given in the previous Well-maintained Highways guidance. It should be noted that evidence indicates that many Authorities were spreading at rates far higher than the Well-maintained Highways suggested. It is expected that all authorities should have full confidence in using the suggested new rates provided in this guidance, which have been based on recent research and evidence.

## **H10 TREATMENTS FOR SNOW AND ICE**

### **General**

- H10.1 It is impractical to spread sufficient salt to melt more than very thin layers of snow and ice. Ploughing is the only economical, efficient, effective and environmentally acceptable way to deal with all but light snow.
- H10.2 Ploughing down to the road surface is preferable as it minimises salt usage however the ploughs should be set to avoid risk of damage to the plough, the road surface, street furniture and level crossings.
- H10.3 Drainage should not be obstructed when ploughing snow. Windrows or piles of snow should be positioned to allow drainage system to function or be removed. Where necessary snow should be removed to prevent melt water overloading of drainage systems or running back into the carriageway.
- H10.4 Providing space for ploughing of further snowfalls is important and may require windrows to be removed or ploughed further off the carriageway.
- H10.5 Consideration should also be given to not continuously salting when ploughing. After a full route ploughing treatment, consider instructing drivers to salt only as and when required (spot salting).

### **Preparation before ice and snow**

- H10.6 When snow is forecast, ploughs and snow blowers should be prepared and positioned in order that snow clearance can start without delay as and when required.
- H10.7 To facilitate the breakup and dispersal of ice and snow by trafficking, treatments must be made before snowfall or freezing rain. This ensures that there is de-icer present on the surface to provide a debonding layer.
- H10.8 Although it will increase salt usage, before snowfall and where practicable, consideration should be given to spreading salt on as much of the network as possible (ie beyond the normal precautionary salting network). This will provide a debonding layer and facilitate the breakup and dispersal of snow by traffic where subsequent treatments will not take place for a considerable time or at all.

## Depths of snow (light, moderate to heavy snow)

**Paragraph Amended 16 January 2012 (centres to check for any updates)**

H10.9 This guidance defines two main snowfall categories – light snow and moderate/heavy snow. The differentiation is the snow that a 40g/m<sup>2</sup> treatment of dry salt would adequately treat. This relates to dilution amongst other factors and it is suggested that light snow relates to a snow depth with an equivalent depth of water of 1mm. Depending on the type of snow the depth varies. Figure H2 defines light and moderate/heavy snow

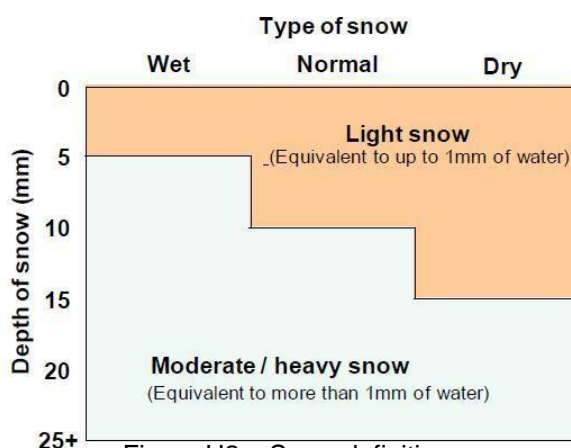


Figure H2 – Snow definitions

## Precautionary treatments before snow or freezing rain

H10.10 Spread rates for precautionary treatments before snow or freezing rain are given in Table H8

**Table H8 – Precautionary Treatments Before Snow Or Freezing Rain**

Weather conditions	Light or medium traffic (Category 3)	Heavy traffic (Categories 1 and 2)
<b>Light snow forecast</b>	Spread: <ul style="list-style-type: none"> <li>• 40g/m<sup>2</sup> of dry salt, or</li> <li>• 40g/m<sup>2</sup> of pre-wetted salt, or</li> <li>• 30g/m<sup>2</sup> of treated salt</li> </ul>	Spread: <ul style="list-style-type: none"> <li>• 20g/m<sup>2</sup> of dry salt, or</li> <li>• 20g/m<sup>2</sup> of pre-wetted salt, or</li> <li>• 15g/m<sup>2</sup> of treated salt</li> </ul>
<b>Moderate/Heavy snow forecast</b>	Spread: <ul style="list-style-type: none"> <li>• 20-40g/m<sup>2</sup> of dry salt</li> <li>• 20-40 g/m<sup>2</sup> of pre-wetted salt</li> <li>• 15-30 g/m<sup>2</sup> of treated salt (see Note 1)</li> </ul>	Spread: <ul style="list-style-type: none"> <li>• 40g/m<sup>2</sup> of dry salt, or</li> <li>• 40g/m<sup>2</sup> of pre-wetted salt, or</li> <li>• 30g/m<sup>2</sup> of treated salt</li> </ul>
<b>Freezing rain forecast</b>	<ul style="list-style-type: none"> <li>• 40 or 2x20g/m<sup>2</sup> of dry salt, or</li> </ul>	

Note 1: The lower rates (e.g. 20g/m<sup>2</sup> for dry salt) can be used if the snow is likely to settle quickly, e.g. when the road surface temperature is below zero, the road surface is not wet and the snow is not wet. and/or there is little traffic after snowfall begins and settles.

- 40 or 2x20g/m<sup>2</sup> of pre-wetted salt, or
- 30 or 2x15g/m<sup>2</sup> of treated salt

## Treatments during snowfall

H10.11 Ploughing should start promptly and, where practicable, be continuous to prevent a build up of snow. On heavily trafficked roads it is preferable to prevent a build up of more than 10mm depth of snow. Where there is risk of compaction by traffic the aim should be to limit build up to 50mm snow depth.

H10.12 Table H9 provides guidance on how to treat during snowfall.

**Table H9 – Treatments During Snowfall**

Plough to remove as much material as possible (e.g. slush, snow, compacted snow) (ploughing should be as near as possible to the level of the road surface)

No ice or compacted snow on surface	Ice or compacted snow on surface (see Note 2)	
To provide a debonding layer, spread: <ul style="list-style-type: none"> <li>• 20g/m<sup>2</sup> of dry salt, or</li> <li>• 18g/m<sup>2</sup> of treated salt or</li> <li>• 24g/m<sup>2</sup> of pre-wetted salt</li> </ul> (See Note 1)	Is traffic likely to compact subsequent snowfall before further ploughing is possible?	
	YES	NO
	To provide a debonding layer, spread: <ul style="list-style-type: none"> <li>• 20g/m<sup>2</sup> of dry salt, or</li> <li>• 18g/m<sup>2</sup> of treated salt, or</li> <li>• 24g/m<sup>2</sup> of pre-wetted salt</li> </ul> (See Note 1)	No de-icer should be spread

Note 1: During and after snowfall, only the ploughed lane should be treated if other lanes have still to be ploughed. The spread width settings should be adjusted accordingly.

Note 2: A de-icer should not be spread alone without abrasives to anything other than a thin layer of ice or compacted snow when snowfall has ceased or future snowfall will be less than 10mm. Applying salt alone to compacted snow and ice can produce dangerously slippery conditions if a weak brine film is formed on top of the ice/snow layer.

## Treatment of slush on the carriageway

H10.13 It is important to remove as much slush as possible by ploughing to reduce the amount of material available to form ice when temperatures drop, as well as to reduce the amount of salt required for subsequent treatments

H10.14 Spreaders must be capable of delivering at 100% of the spread rate and at least 80% of the target distribution over the full spread width. If not, spread rates or number of treatments must be increased.



Table H10 provides guidance on how to treat slush.

### Table H10 – Treatment For Slush When Freezing Conditions Are Forecast

Plough to remove as much slush as possible (ploughing should be as near as possible to the level of the road surface).

After removing slush, spread:

- 40g/m<sup>2</sup> of dry salt, or
- 36g/m<sup>2</sup> of treated salt, or
- 48g/m<sup>2</sup> of pre-wetted salt (See Note 1)

Note 1: After snowfall, and when there will be no further ploughing but some slush remains on the road surface, it may be necessary to change the settings normally used for precautionary treatment to ensure a satisfactory distribution is achieved over the target spread width.

### Treatment of thin layers of ice (up to approximately 1mm)

H10.15 Should a thin layer of ice form, including after an instance of freezing rain the guidance in Table H11 provides guidance on how to treat.

**Table H11 – Treatment For Thin Layers Of Ice (Less Than 1mm Thick)**

Forecast weather and road surface conditions	Medium/Light Traffic	Heavy traffic
Lower of air or road surface temperature higher than -5°C	Spread: <ul style="list-style-type: none"> <li>• 40g/m<sup>2</sup> of dry salt, or</li> <li>• 36g/m<sup>2</sup> of treated salt or</li> <li>• 48g/m<sup>2</sup> of pre-wetted salt</li> <li>• 40g/m<sup>2</sup> of salt/abrasive mix (see Notes 1 and 2)</li> </ul>	Spread: <ul style="list-style-type: none"> <li>• 20g/m<sup>2</sup> of dry salt, or</li> <li>• 18g/m<sup>2</sup> of treated salt or</li> <li>• 24g/m<sup>2</sup> of pre-wetted salt</li> </ul>
Lower of air or road surface temperature less than -5°C	Spread: <ul style="list-style-type: none"> <li>• 40g/m<sup>2</sup> of salt/abrasive mix (50:50) (see Notes 1 and 2)</li> </ul>	Spread: <ul style="list-style-type: none"> <li>• 40g/m<sup>2</sup> of salt/abrasive mix (50:50) (see Notes 1 and 2)</li> </ul>

Note 1: Abrasives should ideally be 5-6mm and angular, but gradings down to 1-5mm should be reasonably effective. After abrasives have been used, drainage systems should be checked and cleared if necessary. Recovered material, which will be contaminated with road oil, must be disposed of safely.

Note 2: Care is needed when salt is mixed with abrasives with a high moisture content. Checks should be made that the mixture remains free flowing, does not clump and can be spread effectively.

## Treatments of thick ice (including compacted snow)

H10.16 Where thick (greater than 1mm thickness) has formed or snow has compacted to form ice the treatments suggested in Table H12 should be considered.

**Table H12 – Treatment For Layers Of Compacted Snow And Ice**

Plough to remove as much material (e.g. slush, snow, compacted snow) as possible from the top of the compacted layer

Medium Layer Thickness (1 to 5 mm)	High Layer Thickness (greater than 5mm)
<p>For initial treatment, spread:</p> <ul style="list-style-type: none"> <li>• 40g/m<sup>2</sup> of salt/abrasive mix (50:50) (see Notes 1, 3, 4 and 5)</li> </ul> <p>For successive treatments, spread:</p> <ul style="list-style-type: none"> <li>• 20g/m<sup>2</sup> of salt/abrasive mix (50:50) (see Notes 1, 3, 4 and 5)</li> </ul>	<p>For initial treatment, spread:</p> <ul style="list-style-type: none"> <li>• 40g/m<sup>2</sup> of abrasives only (see Notes 2, 3, 5 and 6)</li> </ul> <p>For successive treatments, spread:</p> <ul style="list-style-type: none"> <li>• 20g/m<sup>2</sup> of abrasives only (see Notes 2, 3, 5 and 6)</li> </ul> <p>After traffic has started breaking up the layer, spread:</p> <ul style="list-style-type: none"> <li>• 20g/m<sup>2</sup> of salt/abrasive mix (50:50) so salt can penetrate the layer and reach the road surface (see Notes 1, 3, 4 and 5)</li> </ul>

Note 1: For medium thicknesses of compacted snow and ice, treatments without abrasives should only be used when earlier precautionary treatments have successfully established a debonding layer, and there is sufficient traffic to break up the layer of ice quickly.

Note 2: For high thickness of compacted snow and ice (greater than 5mm), treatments with a significant amount of salt should not be considered because they may leave the surface uneven. Any brine formed on the surface may collect in hollows and deepen them further, which can lead to a very uneven surface.

Note 3: Abrasives should ideally be 5-6mm and angular, but gradings down to 1-5mm should be reasonably effective. After abrasives have been used, drainage systems should be checked and cleared if necessary. Recovered material, which will be contaminated with road oil, must be disposed of safely.

Note 4: Care is needed when salt is mixed with abrasives with a high moisture content. Checks should be made that the mixture remains free flowing, does not clump and can be spread effectively.

Note 5: When there are layers of snow, compacted snow, or ice of medium or high thickness on the road surface, it may be necessary to change the settings normally used for precautionary treatment to ensure a satisfactory distribution is achieved over the target spread width.

Note 6: A small amount of salt should be added to the abrasive to prevent freezing of the water within it. If the moisture content of the abrasive is 7%, 25g of salt per tonne of abrasive is sufficient to prevent freezing if thoroughly mixed.

## **H11 EXERCISING**

### **Purpose and Types of Exercise**

- H11.1 Exercises should be carried out in advance of the winter season. Exercises vary in scale and complexity but fundamentally serve to test arrangements in an environment where lessons can be safely identified and subsequent improvements made. Simple examples of exercises include fire drills, which ensure that the equipment and process work and give those involved experience of evacuation from a building. A Winter Service exercise aims to achieve similar outcomes.
- H11.2 When developing an exercise programme authorities should aim to target at all levels of the Winter Service from senior management and decision makers through to operatives delivering the service. It is vitally important to regularly test the decision making and escalation approach, particularly given that this is a subjective matter and that there is no formal qualification for decision makers. It is good practice to carry out some form of exercise in advance of each winter season. The structure of these exercises can vary significantly and the delivery of these need not be costly.
- H11.3 The Cabinet Office's Exercise Planners Guide provides further information regarding the types of exercises and their respective merits.
- <http://www.cabinetoffice.gov.uk/ukresilience/preparedness/exercises/plannersguide.aspx>
- H11.4 The guidance identifies four types of exercise and these can be applied to Winter Service as follows:
- Table-top Exercise
    - This is generally the most cost effective method of delivering an exercise and can be delivered to a small number of staff (5-10) in the authority's own premises. These can be run to a larger number of participants, particularly where multiple authorities are participating.
    - The approach is generally to lead participants through a developing scenario over a period of time with added complications developing throughout the event.
  - Seminar
    - A seminar exercise tends to be less realistic than other types of exercise. However, it promotes liaison with a range of stakeholders and organisations. The costs of running a seminar exercise will depend heavily on the number of people attending and the venue used. Significant planning can be required as the

number of attendees at events like this can be in excess of 100 with wider stakeholders such as Police and Emergency Planning Teams included.

- The scenario for an event like this will generally be delivered in a smaller number of elements and is aimed to promote discussion rather than detailed operational planning. An event like this can be particularly useful in the development of a multi- agency response to severe weather conditions.

- **Control Post**

- A control post exercise is much the same as a table-top exercise, but with staff undertaking the role in their normal place of work. In Winter Service delivery this approach may not offer any significant benefit over a table-top exercise, however it will require a significant amount of prior planning, can be disruptive to other operations and will often cost significantly more to run.

- **Live**

- A live exercise in Winter Service terms would generally be much the same as a control post, but extended to include operations on the road network. This would be an expensive event to undertake in its entirety with little benefit, however two cost effective live tests can be employed:

H11.5 A phone contact check is a good and cost effective approach to ensure that contact can be made with staff on duty out of hours and is a very basic form of live exercise. This approach could be expanded to involve a multitude of stakeholders and test relationships, communication and technical knowledge.

H11.6 A more comprehensive operational, live exercise is to undertake a dry treatment run during the early part of the season. This can be used to check the communication, routes undertaken, information recorded and actions undertaken in the event of a failure such as a spreader breakdown.

### **Delivery of Exercises**

H11.7 Delivering exercises need not necessarily be a costly task. The Cabinet Office guidance provides useful information regarding the development and delivery of exercises. It is designed to allow exercises of any scale to be delivered, so it would not be wholly applicable for a small scale operational test.

H11.8 The Cabinet Office guidance advises that those involved in planning the exercise should not participate directly. Some smaller organisations may seek help from external organisations in running the exercise. In addition, advice on the delivery of the exercise can be sought from organisations such as forecast suppliers, contractors, neighbouring authorities and the emergency services.

- H11.9 Exercise development should always start with the agreement of the aim and objectives. These will shape the scenario and delivery method to be employed.  
An example could be to satisfy the aim of “confirming communication links are functional”. The exercise could be developed to make check calls to various staff / stakeholders to confirm the arrangements in place are adequate.
- H11.10 A structured approach to any exercise should be adopted to lead staff through a realistic, but challenging, scenario that tests as many elements of the Winter Service as possible. This should include decision making, communication and delivery of the service during difficult conditions. Factors to consider should extend beyond the weather itself to include scenarios that impact on operation of the road network such as congestion and traffic incidents.
- H11.11 To develop a complete test of arrangements, the planning process is more involved. It is important to consider scenarios to test specific elements of the plan whilst attempting to keep the situation plausible and realistic. Keeping the scenario aligned to events that have happened in the past will assist in retaining realism.
- H11.12 Recent experience suggests that delivery of a simple table-top exercise based around discussion will deliver a holistic test of a plan. If a specific element requires testing, then a concentrated test to mimic a live event will push staff members to perform as they would in a real situation.
- H11.13 To minimise costs and also to increase the opportunity for learning, authorities could consider collaborating to deliver joint exercises. The scenario should then be written to test cross boundary issues in addition to the standard response within each respective authority’s boundary.
- H11.14 Collaborative approaches will also increase the credibility of the exercise through increased independence. If planning an exercise “in house” it is important that the participants do not have sight of the scenario before the event. This will ensure that the test is realistic and delivers accurate learning points. Two authorities could write scenarios for each other to show independence or a third party organisation could be employed.
- H11.15 It is essential that the resulting learning and good practice is recorded, acted upon and disseminated. Following an exercise it is important that a report is written and is circulated to attendees.
- H11.16 Staff training should also be considered by authorities for testing through exercising. Once staff training has been delivered, this should be tested to ensure it is adequate and that any shortcomings or good practice influences future winter and training plans.