Highways England

Winter Fleet Specification 2020

Version 1.2

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CONTENTS

1 INTRODUCTION

This document details the requirements for the Vehicle, Snow Plough and additional services.

Capitalised terms used within this document are defined in section 2 Definitions.

The Purchaser is responsible for the safe operation of the trunk roads in England. A map showing the Purchaser's road network management arrangements can be viewed online at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/639205/s170085_Network_Manangement_Map.pdf

The Purchaser and its partners take steps to mitigate the impacts of snow or ice on the network through the application of De-Icing Agent to the Traffic Areas along with the ploughing of any significant snow.

For the purposes of this specification, 'shall' indicates a mandatory requirement.

1.1 Contract and Service Periods

For the purposes of this document;

- Contract period is for 5 years and is defined as the start of the contract to design and deliver the vehicles following contract award and contract standstill periods.
- Service Period (e.g. provision of data logging and driver check application) will be for a period of 5 years and commence following the Contractor delivery and acceptance of the 1st vehicle to Highways England.

2 DEFINITIONS

Term	Definition
Cab	The separate front part of the Vehicle where the driver sits.
Combination + Vehicle	Also referred to as a "Combi+" Vehicle capable of distributing dry, pre-wet (varying ratio treatments) or liquid De-icing Agent and simultaneously snow ploughing.
C&U	Road Vehicles (Construction and Use) Regulations 1986 (As amended)
De-Icing Agent	Solid and/or liquid agent applied to traffic areas to maintain or improve the skid resistance of the pavement. Agents include dry and pre-wetted salt (at varying ratios) to BS 3247:2011+A1:2016; Agricultural By-Product (ABP) treated salt; Potassium Acetate; Calcium Chloride; and, Magnesium Chloride
Driver	The qualified person operating the Vehicle.
EC Type Approval	The procedure whereby an authority of an EU member state certifies that a type of vehicle, system, component or separate

	technical unit satisfies relevant technical requirements and administrative provisions listed in the Directive.
FS30	De-icing agent with a mixed ratio of 70% solid and 30% liquid by weight
FS50	De-icing agent with a mixed ratio of 50% solid and 50% liquid by weight
FS100	De-icing agent which is 100% liquid by weight
Gross Vehicle Weight (GVW)	Also known as the Maximum Authorised Mass (MAM) meaning the weight of a vehicle including the maximum load that can be carried safely when it's being used on a public road.
Liquid Only	Vehicle capable of only distributing liquid de-icing agent
Operate/ Operation / Operating	The operational use of the Vehicle whilst being prepared, performing winter service duties, stored or being maintained which includes the repair of any faults. These include but are not limited to the activities described in section 4.22
Pre-Delivery Inspection	Often referred to as PDI - Procedure carried out by the Supplier to verify that the Vehicle is built to the agreed functional and quality standard, meets the technical requirements and is ready for delivery.
Pre-Wet Vehicle	Vehicle capable of distributing dry or pre-wet De-icing Agent and simultaneously snow ploughing.
Service Provider	Organisations, appointed by the Purchaser, that have a responsibility to operate and maintain the Vehicle.
Severe Weather	Severe Weather refers to any meteorological phenomena with the potential to endanger safe passage or cause disruption on the Strategic Road Network and includes snow, ice, heavy rain, high winds, fog and high temperatures.
Snow Plough	Implement with which snow can be cleared from Traffic Areas by pushing aside with a plough blade
Spreader	Machine for defined application of De-Icing Agent to traffic areas to maintain or improve the skid resistance of the pavement.
SRN	Strategic Road Network – Road network for which Highways England is responsible for
Traffic Areas	Paved areas on which there is vehicular and/or pedestrian traffic.
USB	Universal Serial Bus
Vehicle	Refers to the completed vehicle as supplied by the Supplier
Vehicle Logging Data	The data items identified in section 7
Vehicle Data-logging Solution	The system provided with each Vehicle to detect, measure, store and transmit the Vehicle Logging Data
Winter Service Environment	Consists of severe winter weather conditions including snow, ice, freezing rain, high winds, fog and low temperatures down to minus fifteen degrees Celsius. The working environment is typically laden with highly corrosive De-Icing Agent.

3 VEHICLE TYPES

This specification describes Vehicles of the following types:

- **Pre-Wet Vehicle (P)**This Vehicle shall be capable of distributing dry or pre-wet De-icing Agent and snow ploughing.
- **The Combination+ or Combi+ Vehicle (C+)** This Vehicle shall be capable of distributing dry, pre-wet or liquid De-icing Agent and snow ploughing. The Vehicle shall have flexibility to undertake higher brine ratio treatments such as FS50 by utilising the additional de-icing material tank to provide added brine capacity alongside the main brine tanks.
- **Liquid Only Vehicle (L)** This Vehicles shall be capable of distributing liquid only De-icing Agent and snow ploughing

4 VEHICLE

4.1 Chassis Derivatives

The Gross Vehicle Weight (GVW), wheel plan, number of driving wheels, minimum fuel tank size and maximum dimensions (including all parts of the spreader and the plough mounting plate) for each Vehicle type shall be in line with the chassis derivatives as detailed in **Error! Reference source not found.**.

Dimension	Chassis derivative (either type pre-wet or combi+)	
Gross Vehicle Weight (GVW)	18000 kg[1]	26000 kg[1]
Wheel Plan x Driving Wheels	4 x 4	6 x 4
Fuel Tank size (minimum)	227 litres	227 litres
Length (max)	8m	9m
Width (max) (excluding rear view mirrors)	2.5m	2.5m
Height (max)	3.375m	3.375m

Table 1 - Chassis Derivatives

R: 4.1.1 **Note** All chassis derivatives will be based on 'Road Friendly' suspension as defined under Road Vehicles (Construction and Use) Regulations 1986 (As amended). Air suspension may be used as an alternative to conventional steel suspension if it is suitable for the Vehicle's operation and Winter Service Environment.

R: 4.1.2 All chassis and cab derivatives, shall be from the same manufacturer and model across all vehicle types unless otherwise agreed with the Purchaser. The Supplier shall identify any model year changes between the identified delivery periods (Tranches) as outlined in the Tender documents.

4.2 Operation

R: 4.2.1 The Vehicle is required for winter service duties primarily on Motorways and All Purpose Trunk Roads in England between October and April each year. The duties typically involve the Vehicle travelling short journeys (approx. 60miles) that result in a relatively low annual mileage of circa 8000 miles per Vehicle.

R: 4.2.2 Each Vehicle shall be capable of starting unassisted and operating at ambient air temperatures down to -15º Celsius in the Winter Service Environment.

The vehicle at its maximum GVW shall be capable of operating with the minimum following requirements:

(a) Travelling with or without plough mounted – 56mph (90kph).

(b) Dry or pre-wet spreading only – 50mph (80kph) at 13m

spreading widths.

(c) Liquid spreading only – 50mph (80kph) at 11m spreading widths

(d) Ploughing – up to 40mph (64kph)

R: 4.2.3 The operation of the Vehicle by the Purchaser shall include the following:

a. Preparing the vehicles for use, including: Driver safety checks; salt and/or brine loading operations; fuelling; mounting of the plough; offloading of material due to being overweight; use of access ladders to undertake Driver safety inspections or any maintenance activities; and vehicle movement in the depot.
b. Use of the vehicles, including application of De-Icing Material, Snow Ploughing, undertaking visual inspections following an operating fault being detected and subsequent roadside repair.
c. Post use activities including: offloading of remaining De-Icing material; wash downs; visual and functional inspections (inclusive of hopper and associated components); and demount and storage of the plough.
d. Transportation to other Highways England depots, storage of either vehicle and/or plough when not in use.
e. Scheduled maintenance activities which are undertaken either by the Service Provider or the Supplier.

R: 4.2.4 All preparation and driving Operations including Vehicle and Spreader control, plough mounting and plough Operation shall be a single person Operation. This should also cover any physical movements to align the plough for mounting or dismounting to the DIN plate.

R: 4.2.5 Any other plough movement operations not covered within R4.2.3 a shall require no more than 2 operatives or the use of suitable plant to provide safe movement of the plough.

R: 4.2.6 The completed Vehicle derivatives and types shall conform with the “BS EN 13021:2003+A1:2008 - Winter service machines. Safety requirements” standard.

R: 4.2.7 The Vehicle design shall ensure all Operations can be undertaken by the employees of the Purchaser’s Service Providers whose stature may vary from a 5th percentile female to a 95th percentile male (as defined in the Society of Automotive Engineers (SAE) Anthropometric Reference Data 2015) can be undertaken safely. This shall include:

- ensuring the Operation complies with “The Work at Height Regulations 2005 (as amended)”;
- assessing each operation using the “HSE INDG478 - Risk Assessment of Pushing and Pulling (RAPP) tool (2016)” or equivalent method to ensure that the key risks have been identified and mitigated within the design and that the “Manual Handling Operations Regulations 1992 (as amended)” complies with; and

- ensuring the same levels of safety can be met for Service Provider employees whilst on any access ladders, access platforms and walkways on the vehicle as those stipulated under the “Vehicle Construction and Use” regulations, namely external projections as well as “BS EN ISO 2867-2011 - Earth moving machinery - Access systems”.

Each Vehicle shall be able to mount and operate any existing snow ploughs that are owned by Highways England. The connections are as follows:

(a) Hydraulic couplings ISO A couplings
(b) Electrical 7 pin plug compatible with BS EN 15431:2008 Winter and road service area maintenance equipment — Power system and related controls — Interchangeability

The Supplier shall provide 110 sets of adapters/link hoses that shall allow the existing hydraulic and electrical snow-plough connections to connect to the Vehicle to enable full operation of the snow-plough

Where an existing snow plough is utilised then it shall be capable of operating to full extents without any interference on all derivatives identified within this specification.

Driver vision

R: 4.2.8 Each Vehicle shall be supplied with additional high performance and energy efficient lights to provide dipped and main beam operation in accordance with functional requirements of the Road Vehicles (Construction and Use) Regulations 1986 (As amended), when the plough obscures the standard vehicle lighting. The lights shall be mounted in such a way that they will not vibrate or easily be knocked or move out of alignment and shall be adequately protected from stone damage. The lights shall be directly and permanently mounted to the chassis cab structure (not body panels) with any auxiliary driving lamps to be located on the roof and contained within a lightbar.

R: 4.2.9 Each Vehicle shall be equipped with systems to ensure the Driver has clear visibility under all weather and Operating conditions including the formation of ice and mist. These systems shall include:

- Windscreen wipers;
- Cab heating and dehumidification;
- A heated windscreen (independent of the cab heating);
- Heated mirrors; and
- Cameras to provide cover of the rear and any other vehicle blind spot areas.

R: 4.2.10 The heating and de-humidification systems shall rapidly clear ice and mist, independently of the temperature of the Vehicle engine.

R: 4.2.11 The windscreen wipers including motors, linkages and blades shall be suitably sized so that they can achieve efficient clearance of the windscreen to ensure the driver has an adequate view to the front of the Vehicle. This shall include clearance during Severe Weather conditions including the build-up of heavy snow on the windscreen or bonnet area in proximity to the wiper arms.

R: 4.2.12 The Supplier shall ensure that they will undertake a review of the chassis cab for potential snow accumulation areas which may allow for snow and ice build-up during ploughing Operations. This review should also include non-exposed areas where wiper arm linkages and mechanism operate. This information should be provided as part of the Suppliers proposal.

R: 4.2.13 Where there is potential for snow and ice build-up which will affect the Vehicle Operation (as identified in section 4.2.12), the Supplier will identify potential solutions to be reviewed with the Purchaser.

The Supplier will outline in their proposal how the requirements of R: 4.2.13 will be validated as part of their proposal.

Driver Communication

R: 4.2.14 The Vehicle shall be fitted with an integrated Bluetooth interface connection fitted by the chassis manufacturer as part of the chassis and cab that will allow the connection of a Bluetooth mobile phone to make and receive telephone calls.

Airwave car kit cradle

R: 4.2.15 The Supplier shall install a Sepura STP car kit cradle for use with the Purchaser's Airwave radio. This kit will comprise of the following:

- Panorama Tetra roof mount antenna such as https://www.co-star.co.uk/815/tetra-gps-combination-panel-mount-antenna-gpsk-tet-mot/ or equivalent
- Sepura hand terminal – part number STP 8038
- Sepura car kit cradle – part number 300-00797
- Hands free microphone and Push To Talk (PTT) switch – part number 700-00005
- Low power loudspeaker for car kit - 300-00719
- Wallen Antennae VC3.8S/MEM voltage converter (24-12v)

R: 4.2.16 The Purchaser or their representative shall provide technical support for the Airwave car kit cradle to the Supplier to assist the Supplier during the design and verification stage of the Vehicle build process to ensure the car kit functions correctly.

R: 4.2.17 The Supplier shall install the roof mounted antenna and attach this to the car kit cradle.

R: 4.2.18 The Supplier shall install the PTT switch and microphone which will be wired to the cradle interface unit.

R: 4.2.19 The Supplier shall include the placement of the car kit cradle and

the PTT switch in their ergonomic design under section 4.3. The Supplier shall provide the Purchaser with details of their proposed installation method and location of the car kit cradle, PTT and antenna for their approval in line with the Verification requirements outlined in section 13.

R: 4.2.20 The Purchaser recognises that the system may not be fully tested until the Vehicle is received at any one of the Purchaser sites. The Supplier shall provide technical support to attend any vehicles where system performance issues are identified which may be the result of a defective component or down to a potential installation issue.

Emergency Service Network (ESN) communication requirement

R: 4.2.21 The Supplier shall ensure additional provision for the installation of ESN equipment such as antennas and power supply to allow Highways England to transition to ESN as it becomes available during the operational life of the Vehicles.

4.3 Ergonomics

R: 4.3.1 All Vehicle controls shall be ergonomically designed and located for Driver only operation during each Operation.

R: 4.3.2 The Supplier shall design the Vehicle to minimise Driver distraction and manual intervention whilst driving.

R: 4.3.3 To address the requirements of R: 4.3.2 the Supplier shall as a minimum apply the requirements of:

- BS EN ISO 15005:2017 Road vehicles — Ergonomic aspects of transportation and control systems — Dialogue management principles and compliance procedures
- BS EN ISO 15008:2017 Road vehicles - Ergonomic aspects of transport information and control systems - Specifications and test procedures for in-vehicle visual presentation
- BS ISO 16673-2017 “Road vehicle - Ergonomic aspects of transport information and control systems. Occlusion method to assess visual demand due to the use of in-vehicle systems” to assess visual demand on the Driver when operating the controls of the completed vehicle. This shall cover all intended operating modes of the various vehicle types.
- BS ISO 16505:2015 Road vehicles — Ergonomic and performance aspects of Camera Monitor Systems — Requirements and test procedures

R: 4.3.4 The design of the Cab and its contents shall ensure that Driver access and egress through both nearside and offside doors is not hindered.

The Supplier shall provide the outputs of the ergonomic requirements for approval by the Purchaser. This shall include photographs, drawings and any test results to support the

proposed Vehicle design.

The use of visual icons shall be utilised throughout the Suppliers solution to minimise text warnings/messages to the Driver and shall be in line with the requirements of ISO 2575:2010 +A7:2017.

4.4 Manoeuvring and Reversing

R: 4.4.1 Each Vehicle shall be fitted with an audible white noise reversing warning.

R: 4.4.2 Each Vehicle shall be fitted with forward facing and rearview cameras (minimum of 140° viewing angle), capable of operating during both daytime and night-time lighting conditions. The cameras shall be protected from obscurity due to the build-up of De-Icing agents and other debris during Operation.

R: 4.4.3 The Supplier shall provide additional cameras to cover any Vehicle blind spots.

R: 4.4.4 The camera system shall have the ability to record all camera inputs on removable media.

R: 4.4.5 The camera monitor shall be capable of displaying individual camera displays as well showing all cameras at the same time.

R: 4.4.6 If a standalone camera monitor is required, it shall be ergonomically mounted in the fascia area and shall comply with the ergonomic requirements of 4.3.

R: 4.4.7 The camera shall be capable of being displayed and controlled by the main controller and displayed on any system screen(s) provided by the Supplier (selectable by the Driver).

4.5 Safety equipment and signs

R: 4.5.1 The Vehicle shall be equipped with a 2kg dry powder fire extinguisher suitable for vehicle carriage for use on Class A, B, C fires. Extinguishers shall be Kite marked and British Approval for Fire Equipment (BAFE) approved to BS EN3 or an EC or EEA standard. The location of the fire extinguisher shall be considered in the ergonomic design of the Cab and mounted such that it can be accessed easily but does not interfere with any Driver operations.

R: 4.5.2 The vehicle Lateral Protection Device (LPD) also known as side underrun protection shall include a full infill panel coloured orange (RAL 2011) which shall not inhibit/impede any Operations identified in section 4.2.

R: 4.5.3 The Supplier shall review their proposal against the driver direct vision requirements of TfL (https://tfl.gov.uk/info-for/deliveries-in-london/delivering-safely/direct-vision-in-heavy-goods-vehicles) and provide information around the rating that would be achieved within their proposal.

R: 4.5.4 “No Smoking” signs shall be fitted in each compartment of the Vehicle in which people can be carried. This shall show the international no-smoking symbol no smaller than 70mm in

diameter.

R: 4.5.5 The Vehicle shall be fitted with CCTV signs front and rear of the Vehicle. The Supplier shall agree details with the Purchaser for the text and graphics as well as placement on the Vehicle.

4.6 **Cab**

R: 4.6.1 The Cab shall be a right-hand drive and ergonomically designed for ease of Operation with adequate storage space provision behind the seats and shall safely accommodate:

- cushioned, adjustable high-backed seating for two persons, with head restraint and three-point seat belt;
- A4 document holder;
- a '1 to 10' employee CE approved First Aid Kit,
- Provision for accommodating a medium sized holdall bag approximately 31H x 64W and 30D (dimensions in cm)
- Interior working light; and,
- Storage hooks placed behind the driver, for a minimum of two high visibility coats so that if wet they do not make contact with the driver whilst driving and;
- Any additional PPE such as safety helmet and PPE over-trousers

R: 4.6.2 The interior of the Cab shall be made from robust materials that are suitable for the Vehicle's Operation and environment.

R: 4.6.3 Anti-slip, mesh access steps to the Cab shall be provided. The steps and the area at ground level below the steps shall be adequately lit using puddle lamps to enable safe access and egress to and from the Cab.

R: 4.6.4 The front of the Cab below the windscreen should be continuous to minimise the potential for snow accumulations to build up.

R: 4.6.5 The Cab shall include an auxiliary power socket. The socket should be a 12V power feed rated at max 20A. The Cab shall include a standalone USB charging socket. Where a standalone USB socket cannot be provided then the Supplier shall provide a dual USB adapter to fit the auxiliary power socket.

R: 4.6.6 The cab shall have a dedicated/standalone 24v power feed for the Airwave car kit cradle installation as defined under 4.1.13.

R: 4.6.7 Cab heating shall be provided that is capable of maintaining a minimum temperature of +16ºC inside the Cab whilst the ambient temperatures outside the Vehicle are as low as -15ºC both when the Vehicle is in Operation or when the main engine is turned off.

R: 4.6.8 The Cab shall be capable of earthing a roof mounted communications aerial and shall be designed to allow easy access for the wiring of a roof mounted communications aerial. Where more than one antenna is required, they shall be positioned to minimise any conflict of signals and the reduction in performance of the communications system.

R: 4.6.9 The rear of the Cab shall be fitted with non-corrosive covers to protect exposed engine components from corrosion and accumulation of solid de-icing agent. The covers shall be fitted with quick release fixings to allow easy access to allow operatives to undertake operations identified in section 4.2. Where there are covers under walkways, the walkway grills shall be removable to ensure that the area can be maintained and cleared of any excess salt material.

4.7 **Weight and Stability**

R: 4.7.1 The Supplier shall design each Vehicle derivative so that it is stable. This shall include carrying out a review of the weight distribution and centre of gravity of the Vehicle in all modes of Operation e.g. un-laden and laden states; different modes of intended operation: dry; pre-wet; and, liquid only combinations with and without the plough (including different types) in its various Operating and storage modes.

R: 4.7.2 Each Vehicle should be designed as not to exceed the GVW, prevent overloading of the axles or affect the vehicle stability. Due consideration shall be given to the plough loading on the front axle whilst in the raised or lowered positions. Where it is possible to overload the vehicle, the vehicle shall be fitted with a suitable visual and audible warning system to notify the driver until such time that the vehicle weight falls to or below the GVW.

R: 4.7.3 The chassis shall be capable of withstanding the imposed loading of snow ploughing at maximum speed and GVW operation.

R: 4.7.4 Each Vehicle shall be fitted with a “road friendly” suspension system in accordance with the requirements of the Road Vehicles (Construction and Use) Regulations 1986 (As amended).

R: 4.7.5 The turning circle of each Vehicle shall not exceed 21m diameter kerb to kerb.

R: 4.7.6 Where load cells are fitted to the Vehicle, the Supplier shall ensure the Vehicle will be delivered to the Purchaser with the system already calibrated and ready to use.

4.8 **Transmission**

R: 4.8.1 The Vehicle transmission shall be fully automatic with a fluid drive coupling. Drive couplings which are electronically controlled and utilise mechanical friction components are not acceptable.

4.9 **Wheels, Tyres, Traction and Braking**

Each Vehicle shall be capable of maintaining positive traction to all driven wheels, for all road surface conditions whilst in travel and Operating in a Winter Service Environment. The Vehicle shall be capable of restarting from stationary on incline

gradients of 14% when fully laden.

R: 4.9.1 All axle wheels on each Vehicle shall be fitted with designated 3PMSF standard tyres suitable for the Winter Service Environment. Where the tyres are not fitted by the chassis manufacturer, approval shall be sought from the chassis manufacturer to ensure suitability for the intended configuration and vehicle use.

R: 4.9.2 The braking system on each Vehicle shall be capable of operating efficiently within the winter service environment. This shall include the mitigation of any impact the following could have on the system:

- the Vehicle can stand unused for prolonged periods of time (in excess of 4 weeks);
- the Vehicle is washed down after each Operation and as such brakes can be cooled rapidly; and
- during ploughing operations road surface debris can be deflected onto the Vehicle and braking components.

R: 4.9.3 Each Vehicle shall be fitted with wheel nut movement indicators.

4.10 Fuel and Emissions

R: 4.10.1 Each Vehicle shall be capable of running on Diesel to BS EN 590.

R: 4.10.2 Each Vehicle shall meet the emission standards at point of delivery.

4.11 Vehicle Security

R: 4.11.1 Each Vehicle shall have a security system fitted that meets with Thatcham Cat 1 requirements for an electronic alarm and immobilizer.

4.12 Type approval

The Supplier shall ensure that all necessary Type Approvals are obtained for the Vehicle prior to delivery.

The vehicle in its completed form shall be compliant with ECE R58 (rear underrun protection) and ECE R73 (side underrun protection).

4.13 Design Life

R: 4.13.1 Each Vehicle shall be designed to operate reliably within the winter service environment for a minimum of 10 years.

R: 4.13.2 Internal and external Vehicle components shall be made of materials or have finishes that do not suffer accelerated corrosion when in contact with De-Icing Agent. Where the use of these materials cannot be avoided they shall:

- Have protection systems which are suitable in performance to meet the intended service schedules.

- Be listed in the maintenance schedule and identified in the Supplier's proposal.

R: 4.13.3 Engine exhaust systems shall be manufactured from non-corrosive materials, suitably shielded and located away from corrosive elements where possible.

4.14 Ease of Maintenance

R: 4.14.1 The design of each Vehicle shall ensure that maintenance regimes are minimised. Maintenance for the Spreader and Plough shall be aligned where possible with the Vehicle inspection and servicing schedules.

R: 4.14.2 The materials and components supplied for each Vehicle and any subsequent maintenance shall be designed to facilitate ease of maintenance.

R: 4.14.3 All fixings shall use metric fixing standards and avoid the need for special tools wherever possible.

R: 4.14.4 Where there is a requirement for specialised fixings (non-proprietary) then appropriate provision shall be made by the Supplier, which shall ensure that a minimum stock level is kept ensuring supply during the expected life of the Vehicle. These stock levels shall be reviewed annually based on warranty and maintenance data. Where there is any requirement for any special tools (non-proprietary) to carry out any maintenance activity they shall be identified within the Suppliers tender.

R: 4.14.5 Special tools which have been identified for maintenance and operation of the vehicle shall be provided as free issue by the Supplier. This will be one tool to each depot as identified within the delivery plan.

R: 4.14.6 The materials and components supplied for each Vehicle during the warranty period and any subsequent maintenance schedules shall be designed for ease of maintenance and shall be suitable in all respects for the purpose intended.

R: 4.14.7 Any interim maintenance activities (inspection, fluid top up or greasing) other than the designated full summer maintenance activities, should have service points within easy reach of the technician without the need for dismantling of any sub-systems.

4.15 Minimising parts and common components

R: 4.15.1 Parts count and complexity across the Vehicle types and derivatives shall be kept to a minimum. Standard parts shall be used where possible.

R: 4.15.2 A bill of materials shall be produced and issued to the Purchaser for each type and chassis derivative. Common parts shall be identified across the various derivatives. The bill of materials shall identify the Supplier and their 1st tier supplier part numbers (where applicable) and their respective build or issue levels.

R: 4.15.3 All Vehicle builds shall have parts supplied to the same level build

levels unless agreed with the Purchaser beforehand. Where this cannot be achieved the Supplier shall use parts that are fully interchangeable with the originals. Where this cannot be achieved the Supplier shall use higher grade parts supplied at their own expense.

4.16 Recovery

R: 4.16.1 An easily identifiable system for the recovery of the Vehicle shall be provided at the front and rear of the chassis.

R: 4.16.2 A laminated card shall be provided in each Vehicle outlining the recovery process. 50 spare cards will be provided to the project team for added distribution as necessary.

4.17 Electrical installation

R: 4.17.1 Each Vehicle chassis or body shall not be used for earthing purposes and a separate insulated earth return wiring shall be provided with appropriate separation for power and signal grounds.

R: 4.17.2 An external battery isolator switch shall be fitted. With an isolator button fitted inside the vehicle cab for emergency use by the driver. The position of button shall be agreed with the Purchaser.

R: 4.17.3 The spreader electrical system shall comply with BS EN 16330 2013 winter and road service area equipment power system and related controls - power hydraulic systems and electric interfaces.

R: 4.17.4 Design best practices shall be used for the design of the electrical harness where there is a mix of power feeds and signal feeds. These include using recommended radii for the various cable and cable assemblies being used once installed on the vehicle.

R: 4.17.5 The system shall be designed to minimize quiescent drain on the vehicle in its storage cycles. The Supplier shall ensure that as part of the verification process all operating states of the Vehicle are included and include the chassis as part of the overall calculations.

R: 4.17.6 Electrical components fitted shall be protected from damage and able to cope with any electrical load dump characteristics, such as jump starting the Vehicle.

R: 4.17.7 The Vehicle electrical system must be capable of load balancing with the Vehicle alternator for all the intended operations as identified in section 4.2.

R: 4.17.8 Electrical connections shall be fitted with terminals and connectors suitable for the environment they will be exposed to. (Protection with the use of synthetic resins such as silicon shall not be acceptable as these will require regular maintenance).

R: 4.17.9 The Supplier shall ensure that charge acceptance of the vehicle batteries is not impeded during operation requirements of 4.2.

R: 4.17.10 Any electronic control units shall be easily identifiable in situ and shall have suitable labelling affixed externally to identify the unit part number, build level (hardware and software), and build date to offer full traceability without removal of the unit. This information

shall be recorded within the build card and the vehicle maintenance history book.

R: 4.17.11 All harnessing externally mounted shall be encased in flexible conduit to protect the wiring from the elements. Where split conduit is used this shall be suitable space taped or if non-split is used then it shall be suitably terminated at the end of the conduit to prevent water ingress.

R: 4.17.12 All harnessing runs shall be mounted with suitable cable tie clips edge, hole mount or 'p' clips. No adhesive clips or mounts shall be used.

R: 4.17.13 No harness runs or connection boxes will obscure or break up any conspicuity markings identified in section 9.

4.18 Snow-plough Mounting

R: 4.18.1 Each Vehicle shall be capable of being fitted with demountable snow-ploughs of 2.5 metre (Narrow) and 3 metre (Standard) ploughing widths by means of a DIN 76060 Type A standard mounting plate.

R: 4.18.2 Hydraulic couplings for the plough shall be of a stainless steel finish and easily accessible. Suitable covers for the couplings shall be provided for when the couplings are not in use.

R: 4.18.3 Each Vehicle shall be capable of ploughing snow with a density of up to 200kg/m³ to a depth of up to 0.75m and up to the full width of the Vehicle whilst simultaneously spreading De-icing Agent in accordance with the requirements, over the full range of required Vehicle operating speeds and load weights.

R: 4.18.4 The design load capacity of the Plough mounting plate and vehicle chassis shall be capable of sustaining loading imposed by the ploughing Operations undertaken by the vehicle during the expected operating life.

R: 4.18.5 Snow Plough connections shall comply with BS EN 15431:2008 Winter and road service area maintenance equipment — Power system and related controls — Interchangeability and performance requirements.

5 SPREADER

5.1 Capabilities

R: 5.1.1 Each Pre-wet Vehicle shall be equipped with a Spreader capable of spreading:

- Solid De-icing Agents; and
- Solid De-icing Agents pre-wet with a Liquid De-icing Agent.

R: 5.1.2 Each Combi+ Vehicle shall be equipped with a Spreader capable of spreading:

- Solid De-icing Agents;
- Solid De-icing Agents pre-wet with a Liquid De-icing Agent; and,

- Liquid De-icing Agent.

R: 5.1.3 Each Liquid Vehicle shall be equipped with a Spreader capable of spreading:

- Liquid De-icing Agent.

R: 5.1.4 Solid De-icing Agents shall include:

- 6.3mm dry salt to BS 3247:2011+A1 2016;
- Marine salt; and,
- 6.3mm Agricultural By-Product (ABP) treated salt.

R: 5.1.5 Liquid pre-wetting Agents shall include:

- Sodium Chloride;
- Magnesium Chloride;
- Calcium Chloride; and
- APB brine.

R: 5.1.6 Liquid only De-icing Agents shall include:

- Sodium Chloride brine;
- Potassium Acetate; and
- Magnesium Chloride brine plus ABP.

R: 5.1.7 The Spreader shall be optimised at point of delivery for a solid to pre-wet liquid De-icing Agent ratio of 70% solid to 30% liquid (FS30), by weight. [23% concentrate NaCl is 1176kg/m3 at 15°C].

R: 5.1.8 In addition to the requirements of 5.1.2., the Combi+ Spreader shall be capable of delivering either FS30 or FS50 treatments during a single treatment run. The Supplier shall outline how they intend to achieve this in their proposal.

R: 5.1.9 The Spreader shall meet the requirements of CEN/TS 15597 (part 1 2009 and part 2 2012) for all listed De-Icing agents. Where any requirement in this specification exceeds the requirements of CEN/TS 15597 (part 1 2009 and part 2 2012), the requirement in this specification shall take precedence.

R: 5.1.10 The Spreader shall be directly and permanently mounted on the Vehicle.

R: 5.1.11 Each 18000kg GVW Pre-wet Vehicle shall be capable of carrying a minimum of 8000kg of salt (at an assumed density of 1300kg/m3 at 15°C) with a minimum of 2000 litres of Pre-wet liquid De-icing Agent.

R: 5.1.12 Each 26000kg GVW Pre-wet Vehicle shall be capable of carrying a minimum of 12000kg of salt (at an assumed density of 1300kg/m3 at 15°C) with a minimum of 3000 litres of Pre-wet liquid De-icing Agent.

R: 5.1.13 Each 26000kg GVW Combi+ Vehicle shall be capable of carrying a minimum of 12000kg of salt (at an assumed density of 1300kg/m³ at 15ºC), with a minimum of 3000 litres of Pre-wet liquid

De-icing Agent and a minimum of 2000 litres of liquid De-icing Agent; which can be applied as liquid only treatment or utilised to provide alternative pre-wet treatments such as FS50.

R: 5.1.14 Each 26000kg Liquid Only Vehicle shall be capable of carrying a minimum of 11000 litres of liquid de-icing agent

R: 5.1.15 De-icing Agents shall be discharged from the rear of each Vehicle at a height of between 300 mm and 350 mm when the Vehicle is fully laden. The De-icing Agent shall not rise higher than the distribution spinner(s) or spray nozzle(s) when operational. De-icing Agent shall not be discharged forward underneath the Vehicle.

R: 5.1.16 The dosage for dry and pre-wet De-icing Agent shall be adjustable in 1g increments from 5 to 40g/m^2

R: 5.1.17 The dosage for liquid De-icing Agent shall be adjustable in 1g increments from 15 to 40g/m^2

R: 5.1.18 A "blast" facility shall be provided to temporarily deliver De-icing Agent at the maximum dosage rate upon Driver demand.

R: 5.1.19 The spread width for dry and pre-wet De-icing Agent shall be adjustable by lane widths and will vary between 3.6m and 13m.

R: 5.1.20 The spread width for liquid De-icing Agent shall be adjustable by lane widths to be between 3.6m and 11m.

R: 5.1.21 The spread symmetry of De-icing Agent shall be selectable to provide a range symmetrical and asymmetric spread patterns with respect to the vehicle centre line. The spread pattern shall be selected by the driver indicating the lane in which the Vehicle will be positioned in relation to the lanes to be treated during spreading, as follows:

- Vehicle is positioned centrally - spreading symmetrically, 50% width to the left, 50% width to the right, i.e.
- Vehicle in Lane 1, treating Lane 1;
- Vehicle in Lane 2, treating Lane 2;
- Vehicle in Lane 1, treating Lanes 1,2 and the Hard Shoulder;
- Vehicle in Lane 2, treating Lanes 1,2 and 3;
- Vehicle is in the rightmost lane being treated – spreading asymmetrically, 74% width to the left, 26% width to the right, i.e. Vehicle in Lane 1, treating Lane 1 and the Hardshoulder;
- Vehicle is in the leftmost lane being treated – spreading asymmetrically, 25% width to the left, 75% width to the right, i.e. Vehicle in Lane 1, treating Lane 1 and 2;
- Vehicle in Lane 3, treating Lanes 3 and 4;
- Vehicle is treating Lanes 1,2,3 and the hardshoulder from Lane 2 - spreading asymmetrically, 57% width to the left, 43% width to the right.

R: 5.1.22 The selected dosage of De-icing Agent shall be controlled automatically over the range of Vehicle roads speed required in

R: 5.1.24.

R: 5.1.23 The spreader shall be equipped with a proven, reliable, De-icing agent flow monitoring system calibrated for the range of treatments undertaken by Highways England that shall alert the driver if the measured flow deviates from that required to deliver the selected dosage and spread width at the current Vehicle road speed.

R: 5.1.24 The achieved dosage, width, symmetry, uniformity, accuracy and the percentage of wastage of De-icing Agents specified in R:5.1.3, R:5.1.4 and R:5.1.5 spread on the road surface by each Vehicle shall meet the criteria stated in CEN/TS 15597: (part 1 2009 and part 2 2012) . Where the spreader performance requirements of this specification exceed those of CEN/TS 15597: (part 1 2009 and part 2 2012) then the requirements of Appendix A of this document shall apply while the Vehicle road speed is maintained between 5mph and the maximum achievable operating speed. The Supplier shall indicate the maximum achievable operating speed for each spread width in their tender.

R: 5.1.25 Should the maximum or minimum Vehicle operating speed be exceeded during spreading, the driver shall receive an audible and visual warning to alert the driver that that the Vehicle speed is outside the range required to achieve the required dosage. The visual warning shall remain active until such time the Driver reaches the target spreading speed.

R: 5.1.26 The Vehicle spreading speed shall be automatically limited to the maximum speed permitted for the number of lanes or width being treated. The system shall be capable of preventing unauthorised access or adjustment.

R: 5.1.27 It shall be possible for the driver to adjust the dosage, width and symmetry of each De-icing Agent spread on the road surface while the Vehicle is in motion.

R: 5.1.28 The maximum selectable De-icing Agent dosage shall be automatically limited to the maximum achievable for selected spread width.

R: 5.1.29 The maximum selectable De-icing Agent spread width shall be automatically limited to the maximum achievable for selected dosage.

R: 5.1.30 A manual override system for the Spreader shall be included in case of an electrical fault which inhibits the control of the spreader from the cab. Where there is a system managed “default” condition this needs to be outlined within the Contactors proposal. In such conditions, the system needs to notify the driver and record details at which point of the journey the “default” condition occurred. Any manual activation should be restricted and undertaken only by a technician.

R: 5.1.31 The Supplier shall undertake dynamic performance tests to demonstrate that the achieved dosage, width, symmetry, uniformity, accuracy and the percentage of wastage of De-icing Agent spread on the road surface by each Vehicle type passes the

test criteria stated within the Specification for Spreader Performance Trials in Appendix A of this document. Tests shall be undertaken for all De-icing Agents and all specified treatment ratios namely FS30 and FS50.

R: 5.1.32 Tests shall be repeated during Vehicle production as follows:

FS30

- For the first P26 Pre-wet Vehicle, before the start of main production of Tranche 1 or any subsequent Tranches following any change to the build standard of the Vehicle which may impact on the operation of the Spreader.

FS50

- Prior to Tranche 1 and subsequently at each Tranche where a C+26 is included. This should also include the first Vehicle following any change to the build standard of the C+26 that may impact on the operation of the Spreader.

FS100

- Prior to Tranche 2, including the first Vehicle following any change to the build standard of the L26 that may impact on the operation of the Spreader.

5.2 **Loading, Unloading and Cleaning**

R: 5.2.1 The design of the spreader shall enable rapid and efficient loading and off-loading of De-icing agents

R: 5.2.2 The Spreader shall be fitted with a corrosion resistant grill/grid system to prevent the entry of debris into the hopper body. The system shall allow for rapid loading by loading hopper or mechanical loading shovel and be designed to minimise build-up of De-icing material. Reject screens shall be a minimum of 30 degrees to the horizontal and shall be included as part of the maximum vehicle height measurements. Grills shall be fitted with a secure access hatch to the front and rear of the body.

R: 5.2.3 The Spreader hopper shall be equipped with a system to indicate the maximum de-icing agent load for pre-wetted application.

R: 5.2.4 It shall not be possible to overload the Vehicle during dry, pre-wet and combi+ operations.

R: 5.2.5 Access to all vehicle types, shall be front and rear and shall be provided for inspection or wash down purposes to maximise both access and safety to all areas of the vehicle. The Supplier solution shall incorporate best practice as established in HSE Working at Height Regulations 2005. A working platform shall be provided at the front and rear of the body to assist in wash down or reject screen clearing. Platforms shall be of sufficient height and width to allow the Purchasers Service Provider employees of varying stature (as defined in R: 4.2.7), cleaning inside the hopper from the safety of the platform. Access platforms and ladders shall have non-slip tread patterns and be highly visible.

R: 5.2.6 The Supplier shall ensure that the design of the Vehicle does not require regular manual intervention for clearing accumulation of solid de-icing agent. Where this not achievable, the Supplier shall identify these specific areas within their proposal and outline how their design will allow access for clearance of any accumulations of solid de-icing agent.

R: 5.2.7 The Vehicle shall be designed to ensure that during its stored/parked up state, no liquid or solid de-icing material is discharged from the Vehicle requiring the use of catch or drip trays.

5.3 Lighting

R: 5.3.1 A fixed means of illuminating the inside of the Spreader hopper shall be provided, which shall be independently controlled from within the cab.

R: 5.3.2 A fixed means of illuminating the spinner shall be provided. The illumination for the spinner shall comply with any lighting requirements under the Road Vehicles (Construction and Use) Regulations 1986 (As amended).

5.4 Hydraulics

R: 5.4.1 The Spreader shall be powered by a hydraulic pump driven from the Vehicle engine or gearbox power take off. The pump shall be of sufficient capacity to meet the worst-case load required to meet all the spreader performance requirements with a minimum of 10% contingency to account for any system variations.

R: 5.4.2 The Spreader hydraulic fluid reservoir shall be fitted with a corrosion resistant manual shut off valve to be operated by a technician only.

5.5 Reliability

R: 5.5.1 The Spreader shall meet the reliability requirements for the Vehicle as a whole, along with meeting the following spreader specific requirements.

R: 5.5.2 The pre-wet system shall employ sufficiently robust tanks, pipework, pumps, sensors, valves and couplings to ensure that it operates reliably and avoids the need for intervention under normal operational use other than following the rectification of any faults such as component failure or fluid leakage.

R: 5.5.3 The pre-wet system shall be designed to avoid the formation of air locks that that could prevent the correct operation of the system. An easy to use facility shall be provided to manually clear any air locks that may form following any maintenance activities.

R: 5.5.4 The Pre-wet system shall employ a sufficiently accurate and robust control system to ensure that it operates reliably and avoids the generation of false alarms during operation.

R: 5.5.5 A system to prevent the accumulation of de-icing agent on the returning face of the conveyor shall be included.

5.6 **Maintainability**

R: 5.6.1 The Spreader shall meet the maintainability requirements for the entire Vehicle along with meeting the following spreader specific requirements.

R: 5.6.2 The hopper conveyor, its components and the spinner assembly shall be designed as to allow quick and easy dismantling for maintenance purposes.

R: 5.6.3 Any interim maintenance measures shall allow for fluid or greasing top up operations to be undertaken from the periphery of the vehicle and without disassembly of the hopper or removal of any assemblies.

6 SPREADER AND PLOUGH CONTROLS

R: 6.1.1 Each Vehicle shall be equipped with an integrated system that enables the Driver to operate the Spreader and Snow-plough from within the Cab and, when enabled by the Driver, provide route guidance; and either spreader setting guidance or fully automated spreader control. (The Spreader and Plough Controls).

R: 6.1.2 The Spreader and Plough Controls shall be of a common design and have the same layout, appearance and operation across all Vehicle types.

R: 6.1.3 The Spreader and Plough Controls display panel shall have visual symbols to display information or warnings conforming to ISO 2575:2010 +A7:2017.

R: 6.1.4 The Supplier will be required to agree with the Purchaser any hysteresis requirements for any warning messages.

R: 6.1.5 During normal operating/driving mode written warnings shall not be available to the Driver unless the vehicle is stationary and the park brake is applied.

R: 6.1.6 Other than for overspeed warnings, the Driver will be required to acknowledge any warnings that are displayed. The system shall be required to store records (time and date stamped) of any such warnings displayed and when acknowledged. The data should be transmitted and recorded by the Vehicle data logging solution against each vehicle within the Data collection Service.

R: 6.1.7 The Spreader and Plough Controls shall be ergonomically designed to be easily visible and accessible to the Driver whilst they are driving. Minimising manual intervention. The ergonomics shall conform to the requirements set in 4.3.

R: 6.1.8 The Spreader and Plough Controls shall be located in suitable positions and make use of an appropriate combination of mechanical, audible and visual means of interaction that will enable the Driver to maintain safe control of the Vehicle and full visual surveillance of the road environment around it at all times whilst it is in motion.

R: 6.1.9 The Spreader and Plough Controls shall enable individual Driver identification by means of a secure login utilising either a touch screen option or soft-keys.

R: 6.1.10 The feature of R:6.1.9 shall have the option of being activated or de-activated via a senior user access.

R: 6.1.11 The Spreader and Plough Controls shall, when enabled by the Driver, provide the Driver with audible and visual guidance for route navigation; and the required spreader dosage, width and symmetry setpoint parameters required of each section of a route, based on a predetermined route and treatment schedule selected by the Driver and the current location and heading of the Vehicle determined by the system. The Spreader and Plough Controls shall, when enabled by the Driver, automatically control the spreader dosage, width and symmetry setpoint parameters based on a predetermined route and treatment schedule selected by the Driver and the current location and destination of the Vehicle determined by the system.

R: 6.1.12 The Spreader and Plough Controls shall enable the Driver to:

- Inspect the current GVW and confirm it is not in excess of the maximum permissible for the Vehicle Chassis
- Inspect the current weight of the De-icing Agent Payload
- Start and stop spreading and confirm the current spreading state (spreading/not spreading)
- Demand a Spreader dosage "blast" and confirm the blast state (off/on);
- Set and confirm the demanded spread dosage, spread width and spread symmetry
- Confirm that the spreader has correctly responded to the demanded spread dosage, spread width and spread symmetry settings
- Confirm the current De-icing Agent flow is as expected
- Confirm the current De-icing Agent storage level is not low
- Set and confirm the demanded Snow-plough height and offset positions
- Confirm that the Snow-plough has correctly responded to the demanded height and offset position settings
- Confirm the Spreader and Snow-plough equipment including the hydraulics, conveyor, spinner and pumps are operating as expected
- Inspect the current road surface temperature
- Select a route and treatment schedule from a predefined list
- Confirm the currently selected route and treatment schedule
- Activate, deactivate and override route and spreader control guidance
- Activate, deactivate and override automated spreading.

R: 6.1.13 The Spreader and Plough Controls shall bring to the Driver's attention any exceptions requiring action using a combination of visual and audible means. Exceptions requiring action shall include and not be limited to:

- Demanded values outside the expected range
- Measured values outside the expected range
- Equipment failures.

R: 6.1.14 The Spreader and Plough Controls shall be illuminated so the Driver can see them clearly in low light conditions. The brightness of the illumination shall be adjustable by the Driver.

R: 6.1.15 All Vehicle systems shall have security features that prevent unauthorised adjustment of any settings, limits or calibration values.

6.2 Driver Guidance and Automated Spreader Control Solution

R: 6.2.1 The Driver Guidance and Automated Spreader Solution shall make use of an appropriate combination of audible and visual means of communication with the Driver and shall conform with ISO 2575:2010 +A7:2017.

R: 6.2.2 The Driver Guidance and Automated Spreader Control Solution shall provide sufficient advance warnings and reminders to the Driver of the need to make any necessary safe manoeuvres or make manual changes to the spreader controls so that these can be planned and executed safely.

R: 6.2.3 The Driver Guidance and Automated Spreader Control Solution shall inform the driver of the correct lane within which to position the vehicle during spreading in accordance with each predetermined treatment route.

R: 6.2.4 The Driver Guidance and Automated Spreader Control Solution shall warn the driver if they have deviated from the required route and enable the Driver to take corrective action to rectify the deviations and resume the selected treatment schedule.

R: 6.2.5 When the Spreader is under automatic control, any guidance provided to the Driver shall take into account the required spreader setpoints are under automatic control.

R: 6.2.6 The Driver Guidance and Automated Spreader Control Solution shall ensure that the planned spreader dosage, width and symmetry is applied to each section of the selected route in accordance with the selected treatment schedule. Starting, stopping and adjusting the spreader shall be timed to take into account any uncertainties in the accuracy of the Vehicle location; any delay between spreader control demands being made and the demanded treatment being achieved; and, when in manual mode, delays due to Driver reaction time. The approach to achieving the required treatment accuracy shall be such that sections requiring treatment are 100% treated in accordance with the selected treatment schedule whilst minimising any wasted De-icing Agent that may need to be applied in advance of a section starting and after a section ends to accommodate these uncertainties and delays.

R: 6.2.7 The Driver Guidance and Automated Spreader Control Solution

shall ensure that the Vehicle location is better than +/- 10 metres surface distance error for more than 95% of location records.

R: 6.2.8 The system shall be capable of receiving remote or local, software updates by the Supplier and/or updated route information by an authorised user. The system shall verify when the updates have been successfully completed and the information be made available to respective user levels. A history of any software changes (including any functional changes) should be logged by the Vehicle data logging solution and made available as a separate report against each vehicle within the Data collection Service.

R: 6.2.9 The Driver Guidance and Automated Spreader Control Solution shall allow for files to be downloaded in standard industry formats such as '.shp' revised and then uploaded back to the respective vehicles

7 DATA-LOGGING

7.1 In-vehicle Equipment

R: 7.1.1 Each Vehicle shall be equipped with a system to detect, measure, store and transmit Vehicle Logging Data

R: 7.1.2 The Vehicle Logging Data shall include:

- Vehicle geographic position data in accordance with BSEN15430-1 record code 3, including a minimum of the following fields populated with valid measured data:
  - All mandatory fields required by the standard;
  - GeoTime;
  - GeoDate;
  - GeoSpd; and
  - GeoCours.

- Snow Plough data in accordance with BSEN15430-2 record code 6, including a minimum of the following fields populated with valid measured data:
  - ManufID;
  - EquipID;
  - Source;
  - SysTime;
  - SysDate;
  - PBPresent;
  - PBPos;
  - PBMode;
  - PBInfo indicating plough orientation];
  - GeoLat;
  - GeoLong;
  - GeoSQ; and
  - CRC.
  - Any other mandatory fields in record 6 may be empty.

- Spreader/ sprayer data in accordance with BSEN1540-1 record code 8, including a minimum of the following fields populated with valid measured data:
    - All mandatory fields required by the standard;
    - RoadTemp;
    - BeaconOn; and
    - FreeDef1 containing the current measured GVW in kg in the format “GVW = NNNNN kg”.
    - Spreader Control warnings (R: 6.1.6)
    - Software updates or parameter changes (R: 6.2.9)
- Vehicle chassis data records including a minimum of the following fields populated with valid measured data:
    - Engine Total Fuel Used, SAE J1939 SPN 250; and
    - High Resolution Total Vehicle Distance, SAE J1939 SPN 917.
- Where the Supplier’s system is able to collect any additional data they shall identify this within their tender proposal.

R: 7.1.3 The Vehicle Data-logging Solution shall detect, measure and store each element of the Vehicle Logging Data at the following times:

- Vehicle geographic position records:
    - In accordance BSEN15430-1 with an update rate of once every 30s whilst the Vehicle ignition is on; and
    - Once every 24 hours whilst the Vehicle ignition is off;
- Snow plough records whilst the Vehicle Ignition is on:
    - In accordance with BSEN15430-1; and
    - On any change in PBInfo.
    - Spreader/sprayer records whilst the Vehicle Ignition is on:
    - In accordance with BSEN15430-1; and
    - On any change in BeaconOn.
- Vehicle chassis data records:
    - When the vehicle ignition is turned on;
    - Once every 10 minutes whilst the Vehicle ignition is on;
    - When the Vehicle ignition is turned off.

R: 7.1.4 The Vehicle Data-logging Solution shall store Vehicle Logging Data locally and have sufficient capacity store all the data generated during a minimum of 12 hours of Vehicle operation.

R: 7.1.5 The Vehicle Data-logging Solution shall transmit the Vehicle Logging Data to a Vehicle Logging Data Collection Service.

R: 7.1.6 The Vehicle Data-logging Solution shall transmit the Vehicle Logging Data using the GSM, UMTS and LTE based UK mobile data network service(s) selected.

R: 7.1.7 The Vehicle Data-logging Solution shall transmit the Vehicle Logging Data to the Vehicle Logging Data Collection Service using the Transmission Control Protocol in accordance with the requirements in section 7.2

R: 7.1.8 The Supplier will consider the use of supplementary transmission means for the vehicle data-logging solution, where GSM, UMTS

and LTE based UK mobile data network service(s) may not be available/restricted.

R: 7.1.9 The Vehicle Data-logging Solution shall uniquely identify the originating Vehicle each time it connects to the Vehicle Logging Data Collection Service. If the unique identifier used does not include the Vehicle Registration Mark (VRM), the Supplier shall provide the Vehicle Logging Data Collection Service with a VRM as a unique identifier cross reference when connecting for the first time.

R: 7.1.10 The Vehicle Data-logging Solution shall transmit the Vehicle Logging Data within 60 seconds of measuring it unless it is unable to connect to the Vehicle Logging Data Collection Service. The Vehicle Data-logging Solution shall commence transmitting any previously un-transmitted Vehicle Logging Data within 60 seconds of connection to the Vehicle Logging Data Collection Service being re-established following a loss in connection.

R: 7.1.11 The Vehicle Data-logging Solution shall attempt to transmit the Vehicle Logging Data whilst the Vehicle ignition is on. On occasions where un-transmitted Vehicle Logging Data remain when the Vehicle ignition is switched off, it shall continue to be transmitted for up to 60 minutes whilst the ignition is off. Following that, or if the vehicle is unable to connect to the Vehicle Logging Data Collection Service during that time, transmission shall cease and recommence within 60 seconds of the Vehicle ignition subsequently being turned on and the connection to the Vehicle Logging Data Collection Service being re-established.

R: 7.1.12 The Vehicle Data-logging Solution shall minimise its power consumption whilst the ignition is switched off to avoid the Vehicle battery being discharged to the extent where the Vehicle cannot be started after a period of idleness of up to three months.

R: 7.1.13 The Vehicle Data-logging Solution shall store and transmit the Vehicle Logging Data in accordance with the requirements for handling Purchaser Data.

R: 7.1.14 The Supplier shall ensure that the Vehicle Data-logging Solution implements sufficient security measures to protect the integrity and availability of the Vehicle Logging Data and the Vehicle Logging Data Collection Service in accordance with commercial best practice.

R: 7.1.15 All authentication data used to secure the Vehicle Data-logging Solution shall be stored and transmitted using cryptographic protection in accordance with commercial best practice.

7.2 Vehicle Logging Data Collection Service

R: 7.2.1 The Supplier shall provide a Vehicle Logging Data Collection Service for five years from delivery of the first Vehicle.

R: 7.2.2 The Vehicle Logging Data Collection Service shall receive, process store and distribute Vehicle Logging Data from Vehicles delivered under the Contract.

R: 7.2.3 The Supplier shall provide SIM cards and the associated mobile telecommunication services to enable their Vehicle Logging Data Collection Service to receive data from each of the Vehicles for the duration of the Vehicle Logging Data Collection Service.

R: 7.2.4 The Vehicle Logging Data Collection Service shall collect all the data that is transmitted by the Vehicle Data-logging Solution.

R: 7.2.5 The Supplier shall make use of a proven, off-the-shelf solution to provide Vehicle Logging Data Collection Service. The Supplier shall provide full details in their Tender submission of which data fields will not be supported.

R: 7.2.6 The Supplier shall mobilise the Vehicle Logging Data Collection Service and ensure it is fully operational within one month of receiving notice that the Purchaser requires it.

R: 7.2.7 The Supplier shall ensure that the Vehicle Logging Data Collection Service is accessible as a secure Internet web site compatible with the current versions of common web browsers including:

- Internet Explorer;
- Edge;
- Chrome; and
- Mozilla Firefox.

The web site shall not require any additional software to be downloaded locally to make the Vehicle Logging Data Collection Service accessible.

R: 7.2.8 The Vehicle Logging Data Collection Service shall provide a web based interface that will provide functionality that enables users to fulfill the user stories described in Table 2. The functionality in user stories shall provide relevant information based on the following users:

- Fleet team members can have access to vehicles which are in transit to the Purchaser service areas as well as access to all the operational Vehicles
- A National Fleet team or National Winter Team user that can view information about all active operational Vehicles and those vehicles in transit from the Supplier to the Purchaser.
- An Area/Service Area user that can view information on the operational Vehicles that are associated with their area.

No.	User Story
1	I want to see an overview on a map of the current location and status (including roadworthiness) of my vehicles.
2	I want to see the journeys that the Vehicles associated with me have undertook during a selected date and time period. I would like to select a journey and view the detail on a map and in table format to determine where and how the Vehicle has travelled and what the activity was of the Spreader throughout that journey.

3	I want to see details of a selected Vehicle on a map and in table format for a selected date and time period, including: • the journeys it undertook; • where and how the Vehicle has travelled; • what the activity was of the Spreader throughout those journeys including types of material used and include a summary overall quantities; and • which vehicles have not undertaken scheduled service runs.
4	I want to be provided with Vehicle and Spreader activity data for a specified date and time range in a format that I can analyse on my own computer using my own software e.g. using Microsoft Excel.
5	I want to be able to create and view reports related to individual Vehicles and summarised information for all those Vehicles associated with me, these shall include information on the following: • Vehicle mileage; • Fuel used; • Software version and updates; and • Driver warning acknowledgements.
6	I want to be able to generate a separate report for the ambient and road surface temperature sensor readings (if fitted) for a given service area along with date and time stamp as well GPS coordinate information
7	As a member of the fleet team or senior service Area user I want to be able to add, relocate or remove vehicle from service keeping a record when the vehicle entered service and when it was removed from service.

Table 2 User Stories

R: 7.2.9 The Supplier shall provide a data exchange service that shall allow all the data from the vehicle data logging collection service to the current SWIS (Severe weather Information System) and Highways England's Fleet Management System and any other future systems during the life of the Contract that may require it.

R: 7.2.10 The Supplier shall ensure that the Vehicle Logging Data Collection Service protects all Purchaser Data from unauthorised access, modification or deletion.

R: 7.2.11 The Supplier shall ensure that the Vehicle Logging Data Collection Service can be accessed by up to 500 individual users that have been authorised to do so by the Purchaser. Where this is not achievable, the Supplier shall confirm the limits of user numbers that can be logged in at any one time.

R: 7.2.12 The Supplier shall ensure that the respective functional user capabilities of the Vehicle Logging Data Collection Service are available for 99.9% of each calendar month of operation. The Supplier shall continuously measure and record the availability of its solution and report the performance achieved to the Purchaser in

writing at the end of each calendar month.

The Supplier shall ensure that the respective user capabilities of the Vehicle Logging Data Collection Service fulfil the user requests within a maximum of ten seconds of receiving them. The Supplier shall continuously measure and record the user request response times of its solution and report the performance achieved to the Purchaser in writing at the end of each calendar month.

R: 7.2.13 The Supplier, with consideration to the minimum requirements already stated, shall provide details of the performance levels for availability and response time that their Vehicle Logging Data Collection can achieve and how this will be delivered in their tender submission.

R: 7.2.14 The Supplier shall provide a monthly report that provides details of: the performance of the Vehicle Logging Data Collection Service; and, any incidents that have had an impact on the service including any action required to resolve these. The Supplier shall agree the format of the report with the Purchaser.

The Supplier shall provide training to ensure that the Purchaser and its Service Providers can use the Supplier's Vehicle Logging Data Collection Service.

R: 7.2.15 The Supplier shall prepare and deliver a Vehicle Logging Data Collection Service training plan for approval by the Purchaser as part of the verification plan.

R: 7.2.16 The Vehicle Logging Data Collection Service training shall be structured and provided to ensure that, following completion of training, a minimum of the following learning objectives are met:

- Users shall understand how to use the Vehicle Logging Data Collection Service in order to successfully complete the required tasks;
- Users shall be able to identify the full extent of service support, correctly identify and locate user manuals/help guides provided as part of the services; and
- Users shall be able to articulate the benefits of using the Vehicle Logging Data Collection Service.

R: 7.2.17 The Supplier shall obtain the Purchaser's approval for the Vehicle Logging Data Collection Service training material. The process for achieving this shall be agreed with the Purchaser and included in the Vehicle Logging Data Collection Service training plan.

R: 7.2.18 The Supplier shall deliver 12 Vehicle Logging Data Collection Service training workshops over the period of the contract.

R: 7.2.19 Each Vehicle Logging Data Collection Service training workshop shall be delivered at a location in England identified by the Purchaser. The Supplier shall provide a suitable venue and all equipment and materials required to deliver the training workshops at each location.

R: 7.2.20 The Supplier shall deliver the Vehicle Logging Data Collection Service training workshops in accordance with the Vehicle Logging

Data Collection Service training plan. These shall be delivered outside the winter season (1st May to 30th September) each year.

R: 7.2.21 The Supplier shall provide evaluation evidence to the Purchaser to demonstrate the learning objectives have been achieved, in accordance with the Vehicle Logging Data Collection Service training plan.

R: 7.2.22 The data logging training shall be incorporated as part of the relevant training modules identified in R11.7.

8 SNOW-PLOUGH

R: 8.1.1 The Supplier shall supply a demountable Snow-plough compatible with each vehicle supplied under this Contract.

R: 8.1.2 Snow-ploughs shall be able to clear slush and snow to a ploughing width of either 2.5 or 3 metres, when fitted to the vehicle.

Plough type	**Vehicle type**
2.5m ploughing width (Narrow)	P18 and L26
3.0m ploughing width (Standard)	P26

R: 8.1.3 Snow-ploughs shall have sufficient angle of attack and swept curve to maximise snow clearance and eliminate over-shoot from the plough onto the front of the Vehicle from both snow and slush clearance.

R: 8.1.4 Each Snow-plough assembly shall conform with; BS EN 13021:2003+A1:2008 Winter service machines — Safety Requirements alongside the overall safety requirements of each Vehicle, when fitted.

R: 8.1.5 Snow-ploughs shall conform to BS EN 15431:2008 Winter and road service area maintenance equipment — Power system and related controls — Interchangeability and performance requirements.

R: 8.1.6 Snow-ploughs shall be designed to maintain Driver visibility whilst fitted to a Vehicle and shall prevent snow being blown onto the windscreen.

R: 8.1.7 Snow-ploughs shall be provided with a system to assist the Driver to identify the left and right extremities of the plough during ploughing operations.

R: 8.1.8 Snow-ploughs shall be fitted with illuminated marker lamps to highlight the left and right extremities of the equipment.

R: 8.1.9 Snow ploughs shall be fitted with a mechanical lock (carry stay).

R: 8.1.10 Snow-ploughs shall be coloured Orange to RAL 2011 and maintain the overall visual conspicuity of each Vehicle, when fitted.

8.2 Capacity

R: 8.2.1 Snow-ploughs shall be capable of operating at speeds of up to 40mph while ploughing snow or clearing slush.

R: 8.2.2 The Supplier shall identify any other operating limits of their plough

8.3 Height and offset adjustment

R: 8.3.1 Each Snow-plough shall be equipped with a mechanism to enable it to be adjusted in height and offset (left to right) from within the Vehicle. The design of the proposed adjustment mechanism shall be detailed in the Tender.

R: 8.3.2 The Snow-plough shall return to a pre-determined safe position in the event of a hydraulic or electrical control failure.

R: 8.3.3 Each Snow-plough shall be capable of operating at zero height and be equipped with easily removable flexible wearing edges designed to maximise wear life and minimise damage to the road infrastructure.

8.4 Mounting

R: 8.4.1 The Snow-plough mounting shall be compatible with DIN 76060 Type A standard mounting plate.

R: 8.4.2 The Snow-plough will be controlled by the snow and plough controls mounted in the cab which operate the hydraulics to position the plough.

R: 8.4.3 Hydraulic couplings for the Snow-plough shall be of a stainless steel finish and easily accessible. Suitable covers for the couplings shall be provided when not in use.

8.5 Vehicle width limits

R: 8.5.1 The Supplier shall identify the extremities of the Snow-plough beyond the vehicle width in all operating positions and in the transit position.

8.6 Chassis/subframe protection

R: 8.6.1 The Snow-plough assembly shall be designed to reliably withstand with the forces experienced during intended operations. The Snow-plough assembly shall include a system to protect the itself, its mounting and the Vehicle chassis by limiting the maximum load to be tolerated during abnormal conditions such as hitting an obstruction.

8.7 Weight and centre of gravity

R: 8.7.1 Each Snow-plough, when mounted and in operation anywhere within the limits of the required height and offset adjustments, shall not overload the maximum permissible front axle load of any Vehicle type supplied by the Supplier under this Contract.

8.8 Reliability and maintainability

R: 8.8.1 Snow-ploughs shall be designed and constructed to operate reliably over an operating life of at least 10 years with the minimum of maintenance. Any parts which are expected to wear through use shall be identified as part of the maintenance schedules

R: 8.8.2 Snow-ploughs fitted with castor assemblies shall have commercially available wheels and tyres, and be capable of withstanding prolonged use at maximum ploughing speeds.

8.9 Storage, mounting and demounting

R: 8.9.1 Each Snow-ploughs shall be supplied with a mobile storage frame capable of horizontal movement in all directions to aid storage and positioning against a vehicle. The frames shall be equipped with a manual braking system sufficient to prevent unwanted movement of the frame when applied.

R: 8.9.2 Physical movement of the Snow-plough to or from its storage location as well any requirements for mounting or demounting of the plough to the vehicle shall conform with the Manual Handling Operations Regulations 1992 (as amended). Operations shall be assessed using the HSE INDG478 - Risk assessment of pushing and pulling (RAPP) tool (2016) or equivalent to ensure that key risks have been identified and mitigated within the design.

9 CONSPICUITY

R: 9.1.1 The Supplier shall obtain Purchaser approval for the Vehicle's conspicuity markings and equipment design. This includes:

- the placement of beacons and additional lighting
- the proposed colours for the Chassis, Cab, Spreader, access systems and Snow Plough
- providing samples of the paint colours that will used
- the Highways England livery on the Vehicle and Snow Plough
- Proposed markings in accordance with the requirements below.

R: 9.1.2 Four high performance, low energy, high visibility rotating beacons (two front, two rear) shall be mounted to achieve maximum conspicuity to road users whilst minimising impact on driver vision in all weather conditions. Beacons shall not be mounted in a position where the visibility of any other vehicle signs (namely "spreading") or other reflective markings may be washed out during operation.

R: 9.1.3 All beacons shall be gear driven.

R: 9.1.4 Where required beacons shall be protected to prevent damage from any operations undertaken.

R: 9.1.5 Front and rear beacons shall be automatically activated during spreading and ploughing operations with manual override option available for when beacons are required to be switched on whilst the vehicles is not spreading/ploughing.

R: 9.1.6 The beacons must comply with the requirements of the Road Vehicle Lighting Regulations and the United Nations Economic Commission for Europe (UNECE) Regulation 65 on Special Warning Lamps.

R: 9.1.7 The colour for the Cab, Spreader body, side protection panels and brine tanks shall be Orange (RAL 2011). The design shall aim to maximise the extent of the colour to increase Vehicle's contrast against the background winter service environment. The Supplier shall consider any non-body coloured areas of the Vehicle and outline any added conspicuity considerations to maximise the block orange (RAL 2011) colour as part of their proposal.

All systems of access including cab access steps, handrails, covers, ladders, platforms and walkways shall be painted in the colour Orange (RAL 2011). Any of the main areas where feet (such as cab or platform step treads) or hands are expected to make physical contact as part of undertaking operations identified in 4.1 shall be painted in a contrasting highly visible Yellow.

Vehicle livery and reflective marking shall be in accordance with the "UN ECE 104: Uniform provisions concerning the approval of retro-reflecting markings for vehicles of category m, n and o" regulation.

9.2 **Material Requirements**

R: 9.2.1 Markings shall be manufactured from retro reflective material with full cube corner optics, complying with the requirements of UN ECE R104 and Chapter 8 of the Traffic Signs Manual (https://www.gov.uk/government/publications/traffic-signs-manual).

R: 9.2.2 Markings shall either:

- Be applied directly to the vehicle bodywork that is clean and free from detritus; or
- Be mounted on boards fixed to the bodywork using tamper-proof fixings.

R: 9.2.3 Markings shall, as far as practicable, be manufactured so as to consist of one complete piece.

9.3 **Rear Markings**

R: 9.3.1 The Vehicle shall be fitted with a flat panel rearmost (post the hopper and any inspection/working platforms) of the vehicle. The panel shall form a minimum of 40% of the Vehicle area and shall be fitted with Chapter 8 markings. The panel should be a maximum of 2.4 metres wide and mounted centrally within the vertical plane.

R: 9.3.2 In addition to the Chapter 8 requirements, a “SPREADING” warning sign shall be displayed on the rear of the vehicle which will have a yellow retroreflective background using material as defined in 9.2.1 with black non-reflective text. Text height must meet the minimum requirements as defined in BS1622:1989.

R: 9.3.3 The spreading sign shall not obscure or form any part of the requirements in R9.3.1.

9.4 **Side Markings**

R: 9.4.1 All side markings shall comprise 50mm high + 10mm/-0mm of yellow reflective material.

R: 9.4.2 All side markings shall be fitted so that the lower edge is horizontal.

R: 9.4.3 Each side of the Vehicle shall be marked as follows:

(i) One 50mm strip extending the length of the top of the hopper
(ii) One 50mm strip extending the length of the bottom of the hopper, or where this is not practical, in a series of lengths to identify the overall length of the hopper
(iii) One 50mm strip along the length of lower side-impact bars
(iv) One 50mm strip along the length of the cab at a height as near as practicable to item (ii) above.

R: 9.4.4 Side markings shall be a minimum height above ground of 350mm and a maximum of 2100mm, except where otherwise stated.

R: 9.4.5 Markings over each side of the vehicle shall be sufficient to identify a minimum of 80% of the length. In addition, a 200mm high x

200mm length day glo strip shall be fitted on each corner of the spreader to aid loading.

9.5 Highways England Livery and Fleet referencing

R: 9.5.1 All Vehicles shall be marked as detailed in Table 3. Three digit references and pictures are illustrative only, the required digits and electronic versions of the images to be used shall be provided by the Purchaser.

R: 9.5.2 All letters and numerals used in the livery shall be Transport Heavy font as specified by the Traffic Signs Regulations and General Directions, 2002, Schedule 13, Part II.

Area of Vehicle	Marking	Description
Nearside and offside doors		An electronic version will be provided by the Purchaser which the Supplier shall adjust to suit their specific vehicle design. The livery shall have a minimum wide of 500mm and be coloured black.
Cab door markings	HE 004	Letters and numerals in black non-reflective vinyl 80mm high to be placed below the Highways England logo on both the nearside and offside cab doors.
Standard Snow Plough	P004	
Narrow Snow Plough	N004	

Table 3 - Vehicle and Snow Plough Livery

10 DOCUMENTATION

R: 10.1.1 The Supplier shall provide documentation to the Purchaser that details the operational and maintenance requirements for the Vehicle, including the chassis, spreader body and Snow Plough. The documents shall be provided as both a hardcopy and digital

version and include the following:

- Operational handbook (produced in accordance with the “BS ISO 6750:2005 Earth-moving machinery — Operator's manual — Content and format” standard)
- Workshop repair manual
- Vehicle management plan
- Parts Catalogue
- Build card
- Vehicle maintenance history book.

R: 10.1.2 A build card shall be completed by the Supplier for each Vehicle. The build card shall record all the relevant build information including any rework prior to delivery to the Purchaser. A copy of the build card shall be retained by the Supplier for the life of the Vehicle and may be accessed by the Purchaser upon request.

R: 10.1.3 In addition to the chassis cab handbook, the Supplier shall supply an operational handbook which shall include a list of all the faults that can be displayed by the Vehicle. The list shall provide a description of the fault and the required action to be taken by the Vehicle operator.

R: 10.1.4 The Supplier shall prepare and deliver a Vehicle management plan. This shall cover the maintenance and service requirements for the whole life of the Vehicle.

11 SERVICES

R: 11.1.1 The Supplier shall provide the following services:

- Supply Vehicles and Snow-ploughs
- Provide Vehicle Data Logging Service Interface Development Support
- Connect Vehicles to the Vehicle Data Logging Service
- Vehicle Inspection and Defect Reporting
- Supply Route Digitisation Kits
- Provide Training
- Stock Spare Parts
- Stock Special Tools
- Maintain Records and Provide Reports
- Undertake Performance Monitoring

11.2 Supply Vehicles and Snow-ploughs

R: 11.2.1 The Supplier shall deliver the Vehicles and Snow-ploughs to any location within England as instructed by Purchaser. The procedure for Vehicle hand-over shall be agreed in the Verification Plan.

R: 11.2.2 The Suppliers delivery plan shall be limited to the working week (generally between the hours of 07:00 to 17:00 Monday to Friday) with a maximum of 3 vehicles per day in any given Service Area.

R: 11.2.3 The delivery plan for each Tranche shall be limited to the 1st May and 30th September unless otherwise agreed with the Purchaser. The Supplier shall also ensure that the delivery plan takes into account the distribution and timing of training vehicles for each of the Service Areas in each Tranche.

R: 11.2.4 Following agreement of a build and delivery plan for each Tranche, the Supplier shall notify the Purchaser and any Service Area with a minimum of 5 working days' notice of any changes to the delivery schedule for the following week informing the Purchaser and Service Area as to the reasons why and confirm any mitigation measures being taken to recover the delivery plan.

11.3 Provide Vehicle Data Logging Service Interface Development Support

R: 11.3.1 The Supplier shall provide the Vehicle Logging Data Collection Service Provider with full details of the protocols used to transmit the Vehicle Logging Data, samples of the data to be transmitted and a software based test harness at least three months prior to delivery of the first Vehicle.

R: 11.3.2 The Vehicle Logging Data test harness shall be capable of accurately and realistically simulating the messages and data transmitted by each of the Vehicles in a manner that is indistinguishable from the messages transmitted by actual Vehicles.

R: 11.3.3 The Vehicle Logging Data test harness shall be user configurable and capable of individually simulating:

- Realistic data in all fields simulating the data produced by actual journeys and treatments;
- Random data within the maximum and minimum permissible values in all fields:
- Data containing the maximum and minimum permissible values for all fields; and
- Data containing invalid values for one or more fields selected by the user.

R: 11.3.4 The Vehicle Logging Data test harness shall be capable of simulating Vehicle, speed heading and location data following realistic journeys along the Strategic Road Network following user selected locations waypoints.

R: 11.3.5 The Vehicle Logging Data test harness shall be capable of simultaneously simulating messages from a user selectable number of Vehicles. The number of Vehicles simulated shall be between one and a minimum of 100. Each of the Vehicle simulated shall transmit unique identifiable data values.

R: 11.3.6 The Vehicle Logging Data test harness shall be capable of connecting to and successfully operating with the Internet network interface of the Vehicle Data Logging Service.

R: 11.3.7 The Supplier shall provide the Vehicle Logging Data Collection

Service Provider with a complete set of user documentation for the Vehicle Logging Data test harness.

R: 11.3.8 The Supplier shall provide the Vehicle Logging Data Collection Service Provider with support to enable them to deploy and test a compatible Vehicle Logging Data Collection interface and make use of the Vehicle Logging Data test harness.

11.4 Connect Vehicles to the Vehicle Data Logging Service

R: 11.4.1 The Supplier shall obtain approval form the Purchaser to connect the Vehicles to the Vehicle Logging Data Collection Service prior to connecting any Vehicle.

R: 11.4.2 The Supplier shall provide the Vehicle Logging Data Collection Service Provider with full details of any new Vehicle to be connected at least 10 working days in advance of first connection.

R: 11.4.3 The Supplier shall obtain written confirmation from the Vehicle Logging Data Collection Service Provider that the Vehicle Logging Data is being successfully transmitted from each Vehicle prior to Delivery of each Vehicle.

11.5 Vehicle Inspection and Defect Reporting

R: 11.5.1 The Supplier shall provide a solution that will enable the user to log information whilst carrying out the daily vehicle check in line with DVSA requirements and guidance. The solution shall also allow the driver to capture any other additional vehicle defects.

R: 11.5.2 The solution will include a central data collecting service and an application that can operate on mobile devices.

R: 11.5.3 The mobile application shall operate on either Android and iOS mobile devices and be available to be installed from the Google Play Store and the Apple App Store as appropriate.

R: 11.5.4 The mobile Application shall allow designated user levels to access the various dashboard reports and allow the vehicle status to be changed for their Service Area.

R: 11.5.5 The data collection service shall record details of users who have generated the initial inspection/defect reports as well details of users where any changes of a vehicle status have been made including the addition or removal of a vehicle from the system.

R: 11.5.6 The solution shall include a data exchange to enable the data to be made available immediately following receipt at the central data collecting service to other Highways England systems, which may include, but not be limited to, the Highways England Severe Weather Information Service (SWIS) and the Fleet Management system.

R: 11.5.7 The Supplier shall ensure that the Defect Logging Data Collection Service can be accessed by up to 500 individual users that have been authorised to do so by the Purchaser. The Purchaser shall confirm any delegated responsibilities for upto 10 user levels either at national or local level for each service rea.

R: 11.5.8 The Supplier will be responsible for ensuring that all vehicles under this contract are added to the system following their PDI at the factory. The system shall allow the Purchaser (National Fleet team) to add and remove existing vehicles they own as well as allocate their operating area.

R: 11.5.9 The Supplier shall provision defect reporting for a minimum of 450 vehicles.

R: 11.5.10 The mobile application shall be capable of logging the Vehicle defect/issue in written and visual form where appropriate.

R: 11.5.11 The solution based on the logged defects, shall be able to determine if the vehicle should be logged as Vehicle off Road (VOR) and record this information accordingly.

R: 11.5.12 Where a communication signal is not available the application shall still record and retain this information. The mobile application shall transmit the information as soon as a signal becomes available.

R: 11.5.13 Where the data collection service has been notified of a daily check, the system shall make the data immediately available to both Highways England's Severe Weather Information System (SWIS) and Fleet Management Systems by means of a data exchange service.

R: 11.5.14 Both VOR and non-VOR defects shall generate a daily dashboard report during the winter season (1st October to 30th April) to the respective user levels about the status of their vehicles located within that Service Area.

R: 11.5.15 Where the data collection service receives a notification of a defect, the system shall immediately notify the appropriate user levels such as depot supervisor(s), Service Area fleet manager, National Fleet team and the Suppliers service desk outlining the vehicle details, information of the defect and confirm the vehicle status (VOR or still safe to use).

R: 11.5.16 The data collection service shall only allow selected user levels for their respective Service Areas to change a vehicle status from VOR or remove any noted defects.

R: 11.5.17 The data collection service shall record details of the user reporting the vehicle inspection or reported defect and details of any user updating the report or modifying any vehicle status.

R: 11.5.18 The Vehicle Inspection and Defect Logging Data Collection Service shall be available to cover existing vehicles on the fleet up to the point of their disposal.

R: 11.5.19 The Vehicle Inspection and Defect Logging Data Collection Service shall allow selected user levels to modify vehicle details within their respective Service Areas or to change administrators where a vehicle may be re-located to a different Service Area.

R: 11.5.20 The Vehicle Inspection and Defect Logging Data Collection Service shall produce a report to identify where vehicles which are

not being utilised to undertake treatments and are not undertaking their scheduled service runs.

R: 11.5.21 The Contractor will provide training on the Driver check app as part of the training requirements identified in R11.7.

11.6 Supply Route Digitisation Kits

R: 11.6.1 The Supplier shall supply 7 Route Digitisation Kits.

R: 11.6.2 The Route Digitisation Kit shall enable Vehicle operators to digitise all the navigation, spreader dosage, spread width and spread symmetry parameters required to enable the Driver Guidance and Automated Spreader Control Solution to follow each of the predetermined treatment schedules used by each Vehicle operator.

R: 11.6.3 The Route Digitisation Kit shall be portable and capable of operating stand-alone in:

- Any office environment
- Any vehicle equipped with a 12V power supply.

R: 11.6.4 The Route Digitisation Kit shall be equipped with a GNSS receiver with an external antenna with identical capabilities to that used in the Driver Guidance and Automated Spreader Solution.

R: 11.6.5 The Route Digitisation Kit shall include a Driver interface with identical behaviour and capabilities to that used by the Driver Guidance and Automated Spreader Solution.

R: 11.6.6 The Route Digitisation Kit shall enable:

- The learning of routes by recording data as each route is driven
- The creation of routes by entering data by means of a map based application
- The display and modification of existing route data by means of a map based application.

R: 11.6.7 The Route Digitisation Kit shall enable all the data that it captured to be exported to third party solutions by means of an XML based data format. The data format shall be fully documented by the Supplier and be free of restrictions on its distribution and reuse by the Purchaser and its Service Providers.

R: 11.6.8 Any supporting software applications for the route digitisation kit shall be web based and free of any licensing restrictions and be permitted to be used be used anyone within Highways England or anyone authorised by Highways England to have access to it.

R: 11.6.9 All supporting data route files shall be compatible with standard industry formats to allow use in any existing vehicles that Highways England operate.

11.7 Provide Training

R: 11.7.1 The Supplier shall provide training for the following areas:

1. The Vehicle and Snow Plough – “Train the Trainer”

2. Technical Service Training – To include Route Digitisation Solution and all calibration requirements
3. Vehicle and Snow Plough - Driver and Operating training and familiarisation

Training will cover the requirements as defined below. Where any evaluation evidence is required, this shall be sent to the Purchaser within 2 weeks of each training session being undertaken.

Vehicle and Snow Plough - Driver and Operator Training and familiarisation

R: 11.7.2 The Supplier shall provide training to ensure the Purchaser and its Service Providers understand how to operate and maintain the Vehicle and Snow Plough.

R: 11.7.3 The Supplier shall prepare and deliver a Vehicle and Snow Plough training plan for approval by the Purchaser.

R: 11.7.4 The Vehicle and Snow Plough training shall be designed to form part of an amended City & Guilds 6159: Part 004 - 'Prepare and Operate Highways England Equipment' qualification. Details of which can be viewed on line at https://www.cityandguilds.com/qualifications-and-apprenticeships/construction/construction/6159-winter-service-operations#tab=documents

R: 11.7.5 The Vehicle and Snow Plough training shall be structured and provided to ensure that, following completion of training, all Operations identified within 4.1 can be achieved safely.

R: 11.7.6 The Supplier shall obtain the Purchaser's approval for the Vehicle and Snow Plough training material in accordance with the verification requirements. The process for achieving this shall be agreed with the Purchaser and included in the training plan.

R: 11.7.7 Areas of training shall include;

- Familiarisation of Vehicle and equipment
- Fitment and removal of plough
- Driver and Operator checks – to include access to platforms and any subsequent processes for clearing
- Loading and emptying of the spreader including rapid emptying for overloaded vehicle
- Use of Spreader and plough control panels
- Post treatment wash down and Vehicle checks
- Question and answer session

R: 11.7.8 The Supplier shall deliver 6 sessions' of Vehicle and Snow Plough Operator training workshops per service area (Expected number of operatives 8-10 for each session). The attendees will consist mainly of vehicle operatives and supervisors and is expected to last approximately half a day per session.

R: 11.7.9 Each Vehicle and Snow Plough training workshop shall be delivered at a location in England identified by the Purchaser. The Supplier shall provide all equipment and materials required to deliver the training workshops at each location.

R: 11.7.10 The Supplier shall deliver the Vehicle and Snow Plough training workshops in accordance with the Vehicle and Snow Plough training plan. These shall be delivered outside the winter season (October to March) and completed by 1st October each year.

R: 11.7.11 The Supplier shall provide evaluation evidence to the Purchaser to demonstrate the learning objectives have been achieved, in accordance with the Vehicle and Snow Plough training plan.

Train the 'Trainer' – Training

R: 11.7.12 The Supplier will provide training to a number of supervisors and Service Provider representatives who will undertake additional Vehicle and Snow Plough - Operator training and familiarisation training to all their remaining drivers and technicians in accordance with the training requirements identified above.

R: 11.7.13 The Supplier will provide electronic copies of all training materials to the Purchaser in order that Service Providers can undertake their own training on an ongoing basis.

R: 11.7.14 Each Train the 'Trainer' training session is expected to last one day.

R: 11.7.15 The Supplier will provide 1 training session per Service Provider Area and an additional training session per Tranche to catch any that are not able to attend the initial training within each of the Service Areas.

R: 11.7.16 The Supplier will assess the attendees to ensure that the training requirements have been understood and that the individuals are competent to convey the training within their own organisations.

R: 11.7.17 The Supplier will make available any relevant technical support via phone and/or email during the Contract period to address any subsequent technical queries that may result following the training sessions.

Technical Service Training – To include Route Digitization Solution

R: 11.7.18 The Supplier shall provide Technical training for service Engineers at the Purchasers sites.

R: 11.7.19 The Supplier shall provide 2 training sessions per Service Area expected to last 1 day each.

R: 11.7.20 The Technical Service Training shall include;

- Provision of copies of the Suppliers workshop manual

- Review of a vehicle – to include functions and position of components or systems
- Vehicle Maintenance and servicing requirements
- Setting and Fault diagnosis
- Electrical and Hydraulic circuits
- Route digitization
- Spreader and weigh cell calibration

The Supplier shall prepare and deliver a Technical Service Training and Route Digitisation training plan for approval by the Purchaser as part of the verification plan.

R: 11.7.21 The Route Digitisation training shall be structured and provided to ensure that, following completion of training, a minimum of the following learning objectives are met:

- Setting up of the equipment either on a bench or in a vehicle
- Use of the equipment to capture the treatment routes
- Downloading of the route for storage
- Uploading to vehicles for use
- Validating the uploaded route

R: 11.7.22 The Supplier shall obtain the Purchaser's approval for the Route Digitisation training material. The process for achieving this shall be agreed with the Purchaser and included in the Route Digitisation training plan.

R: 11.7.23 The Supplier shall provide all equipment and materials required to deliver the training workshops at each location.

R: 11.7.24 The Supplier shall deliver the Route Digitisation training workshops in accordance with the Route Digitisation training plan. These shall be delivered outside the winter season (1st May to 30 September) unless otherwise agreed with the Purchaser

R: 11.7.25 The Supplier shall provide evaluation evidence to the Purchaser to demonstrate the learning objectives have been achieved, in accordance with the Route Digitisation training plan.

R: 11.7.26 The Supplier will make available any relevant technical support via phone and/or email during the warranty period to address any technical difficulties experienced.

11.8 **Training Validation**

R: 11.8.1 The Supplier shall develop a proforma for each training type and ensure that the proforma shall validate the learning attained through validating the knowledge of each candidate at the end of the training session.

R: 11.8.2 Where the individual has not demonstrated a level of attainment the Supplier shall confirm this back to the Purchaser.

R: 11.8.3 Copies of the completed forms are received and validated by the

Purchaser within 2 weeks of each training session.

11.9 Stock Spare Parts

R: 11.9.1 Where Vehicles or Snow-ploughs make use of specialised fixings then appropriate provision shall be made by the Supplier to ensure that a minimum stock level is kept maintained ensuring supply during the expected life of the Vehicles. These stock levels shall be reviewed annually based on warranty and maintenance data. Any use of specialised fixings shall be identified within the Suppliers tender.

R: 11.9.2 The Supplier shall ensure that following initial delivery of each Tranche that any service parts will be available from start of production.

R: 11.9.3 The Supplier shall ensure that following initial delivery of the 1st tranche that any non-service parts which could impact the availability of the Vehicle during peak season are delivered to the Service Area within 3 working days.

11.10 Stock Special Tools

R: 11.10.1 Where operating and maintaining Vehicles requires the use of special tools then appropriate supply provision shall be made by the Supplier to ensure that a minimum stock level is maintained ensuring supply during the expected life of the vehicles. These stock levels shall be reviewed annually based on warranty and maintenance data. Any requirement to use special tools to shall be identified within the Suppliers tender.

11.11 Maintain Records and Provide Reports

R: 11.11.1 Warranty and maintenance data (both chassis and conversion) recorded either by the chassis manufacturer or the Supplier for the Purchasers fleet shall be supplied to the Purchaser at no extra cost during the life of the contract (5 years). The data shall be made available annually and shall be separated into chassis vehicle and conversion (spreader and ancillaries) to allow detailed analysis to be undertaken by Purchaser.

11.12 Undertake Performance Monitoring

R: 11.12.1 The Supplier shall comply with Highways England's Collaborative Performance (CPF) Framework during the period of the Contract.

12 Programme Management

R: 12.1.1 The Supplier shall deliver the programme in line with recognised programme and project management principles such as Prince 2 or APMP.

R: 12.1.2 The Supplier shall establish a cloud based project folder which will provide restricted access to the project team and any designated

parties with appropriate read and write access privileges which will be agreed with the Purchaser.

The supplier shall ensure the project folder is available to the Purchaser and nominate representatives for the duration of the contract.

13 VERIFICATION AND ACCEPTANCE

R: 13.1.1 The verification plan shall confirm any requirements on the Purchaser for the Purchaser approval process to ensure the programme is maintained.

R: 13.1.2 The verification plan shall detail the procedures that will be used to provide the Purchaser the necessary confidence that each type of Vehicle and Snow Plough will meet the technical requirements and is acceptable at the following stages of delivery:

- Initial design before any Vehicles are built
- Completion of the first Vehicle of each type built at the factory
- Subsequent Vehicle builds at the factory
- Vehicle delivery and hand over at the Purchaser's premises
- Training

R: 13.1.3 The verification plan shall include the items detailed in Table 4 for each delivery stage.

R: 13.1.4

Delivery Stage	Verification Item
	Evidence that each of the requirements have been met including:
Contract duration	Programme to reflect the requirements within this Contract including: • Programme and Project management • Timeline to reflect Purchaser cut off points for any development or changes to the Technical Requirements for each Tranche • Supplier 1st Tier supply chain order and parts delivery schedules • Engineering design and validation programme • CPF submission periods • Agreed Vehicle delivery schedule – to support Highways England's financial forecasting requirements • Spare part availability against each Tranche
Initial design	• Identify Type Approval requirements for each type of Vehicle • Evidence and/or results of design analysis e.g. Vehicle stability/handling; Failure Mode, Effect and Criticality Analysis (FMECA) on spreader; Mean Time Between Failures (MTBF) data; etc. • Results of Vehicle Logging Data integrity and availability risk assessment. • Ergonomic assessment and Vehicle design proposal. • Design change cut-off points

Completion of the first Vehicle of each type	• Successful Inspection and Test Results • Build card • Spreader body certificate of conformity • Spreader calibration certificate • Pre-Delivery Inspection (PDI) completed and signed off • Certification for full Type approval • Ergonomic Validation
Subsequent Vehicle builds	• Design change cut-off points • Proof of successful inspection and test results • Build card • Spreader calibration certificate • Pre-Delivery Inspection (PDI) completed and signed off
Delivery at Purchaser's premises	• Successful on-site inspection by Supplier and Purchaser • Completed delivery check list with no issues • Signed off acceptance by Purchaser
Training	• Purchaser approval of the Vehicle and Plough Driver training plan and material 4 weeks prior to any training commencing • Successful delivery of the Vehicle and Plough Driver training • Purchaser approval of the Train the 'Trainer' training plan and material 4 weeks prior to any training commencing • Successful delivery and assessments of the Train the 'Trainer' and provision of supporting training material • Purchaser approval of the Technical and Route Digitisation training plan and material 4 weeks prior to any training commencing • Successful delivery of the Route Digitisation training • Purchaser approval of the Technical training plan and material 4 weeks prior to any training commencing • Successful delivery Technical Training and provision of supporting training material • Submission of training evaluations to the Purchaser within 2 weeks of each training session

Table 4 - Verification

R: 13.1.5 The Supplier shall agree procedures for Pre-Delivery Inspection and delivery with the Purchaser to ensure the Vehicle and/or Snow Plough are built to the agreed standard, meet the requirements

and can be accepted by the Purchaser. These procedures shall be included in the verification plan.

R: 13.1.6 The completed Pre-Delivery Inspection and relevant delivery documentation shall be provided to the Purchaser and a copy kept by the Supplier for the life time of the Vehicle.

R: 13.1.7 The Supplier shall provide test documentation for approval by the Purchaser within 4 weeks of contract award, this will include:

- a test strategy detailing the approach that will be taken
- a test plan covering the timetable and detailed procedures for carrying out each of the tests
- specifications for each test

R: 13.1.8 The Supplier shall invite the Purchaser to attend relevant tests.

R: 13.1.9 The Supplier shall notify the Purchaser at least ten working days (or such other period as the Purchaser may agree in writing) in advance of the date, time and location of the relevant tests.

R: 13.1.10 Each Vehicle shall be supplied with an appropriate spreader body certificate of conformity and calibration certificate that clearly details the spreader settings. This shall include (where applicable) conveyor, spinner speed, chute actuator and discharge doors setting.

R: 13.1.11 Each Vehicle shall be supplied with a weigh cell certificate of conformity and calibration certificate that confirms the weight cells have been calibrated prior to receipt of the Vehicle by the Purchaser.

14 INFORMATION SECURITY

R: 14.1.1 The Supplier shall ensure that all Purchaser Data is handled in accordance with Her Majesty's Government Security Policy Framework requirements for information with an OFFICIAL classification.

15 WARRANTY

R: 15.1.1 For the purposes of this specification the warranty period covers any chassis and vehicle conversion aspects. The maximum period for each aspect will be as defined in the Suppliers proposal.

R: 15.1.2 The warranty period for the completed vehicle shall be 60 months and shall commence for each vehicle at the point of delivery and acceptance by the Purchaser.

R: 15.1.3 Any specific exemptions to the warranty shall be identified within the Suppliers proposal.

R: 15.1.4 The Supplier shall accept all responsibility for quality, design and workmanship of all such materials and components, whether manufactured by them or supplied to them by others.

R: 15.1.5 Where the chassis or the cab requires modification, the Supplier shall demonstrate compliance with the manufacturers coach and bodybuilding requirements as part of the verification and acceptance plan, to ensure that the vehicle warranty is not compromised through the Suppliers' design.

16 OPTIONAL SERVICES AND REQUIREMENTS

16.1 Additional works and services

R: 16.1.1 The Purchaser is requesting cost for a number of vehicle options and additional services as outlined below. The Purchaser shall not be obliged to undertake any of these additional options or services, however reserves the right to select these at any point of the contract in line with the requirements set below. The Supplier should highlight any requirements/restrictions for mobilisation of these services as part of their proposal.

16.2 Additional Vehicles

R: 16.2.1 The Purchaser reserves the right to increase the quantity of vehicles during the life of the Contract by up to 5% of the contract volume. The Supplier should be able to account for this requirement within their production scheduling. Any build restrictions should be confirmed within the Suppliers proposal.

R: 16.2.2 The Supplier shall deliver the additional vehicles within 25 weeks following an instruction in Contract from the Purchaser subject to any build restrictions identified within the Suppliers proposal in R: 16.2.1.

16.3 Supplier Support

R: 16.3.1 The Supplier may be called upon to support Highways England in undertaking Engineering services during the life of the Contract. Each requirement will be on a call off basis and will be priced according to the issued scope of works.

R: 16.3.2 The Supplier as part of their proposal will identify any laboratory or on-site test facilities available to them. The Supplier will also identify any restrictions that may be in place.

R: 16.3.3 The Supplier shall identify a daily rate for any of the test facilities identified within R:16.3.2 and outline any charges for days where weather or other factors prevent actual tests from being undertaken.

R: 16.3.4 The Supplier shall confirm different levels of Engineering resource and technician hourly rates for undertaking works that may be required for such services.

R: 16.3.5 The Supplier will be required to respond within 10 working days of any request and provide a breakdown of costs for each request.

16.4 **Vehicle Disposal**

R: 16.4.1 The Supplier shall provide the Purchaser an additional cost option for the disposal of any vehicle with a plough being replaced (1 in– 1 out basis) for each of the Tranches. See Vehicles for disposal in price list.

R: 16.4.2 Each vehicle to be disposed will require the de-activation of any tracking equipment, de-branding of any Highways England logos or livery.

R: 16.4.3 All vehicles will be assumed as operational and road worthy unless identified by the Purchaser prior to contract award.

R: 16.4.4 Any equipment removed shall be logged and offered back to Highways England for re-use or disposal.

R: 16.4.5 It will the responsibility of the Supplier to make their own arrangements for removal of non-roadworthy vehicles from the Purchaser's site.

R: 16.4.6 The Supplier will be expected to provide a fixed cost per vehicle for the term of the Contract for any additional vehicles which are subsequently deemed as non-roadworthy.

R: 16.4.7 The Supplier will be expected to include the income or cost of disposal of the vehicle as part of their invoice for the new vehicle.

R: 16.4.8 Upon delivery and acceptance of the replacement vehicle at the nominated Purchaser premises the Supplier shall assume immediate and full ownership and responsibility for the outgoing vehicle.

16.5 **Vehicle maintenance**

R: 16.5.1 The Supplier shall provide the Purchaser additional cost options during the life of the Contract for undertaking the annual and intermediate services/inspections of;

R: 16.5.2 The Spreader and in its associated components in line with the current Highways England maintenance schedules which will be provided to the Supplier.

R: 16.5.3 The Chassis and its associated systems in line with the Chassis manufacturers terms and conditions for maintaining any warranty provision offered as part of the Suppliers proposal

R: 16.5.4 As part of the Supplier's proposal, the Supplier should not assume any provision of maintenance/inspection facilities at any of the Purchaser sites.

R: 16.5.5 The Supplier shall outline hourly labour costs for any unplanned maintenance work and any other associated charges for attending site or any administration charges.

R: 16.5.6 The Supplier shall also in outline their proposed service level agreements for undertaking such services.

APPENDIX A - Spreader Performance Trials

1. General

Performance trials shall be carried out as specified below to demonstrate that a spreader is capable of spreading de-icer uniformly at the required spread rate over a target area representing a three-lane motorway and hard shoulder or All Lane Running. The total amount of de-icer discharged and the de-icer distribution profile shall be within the tolerances stated in section 5 of this trial specification.

Each test shall be visually recorded and utilise the vehicle camera recording system and be support with overhead recorded footage from either a pole mounted (ensuring full coverage of the test area) or drone to demonstrate the vehicle spread pattern. All test recordings shall be provided to the Purchaser to support the reports.

The amount of de-icer discharged and the de-icer distribution profile can vary significantly with the de-icer type and its moisture content. The grading and moisture content of a solid de-icer proposed for the trials shall be determined in accordance with BS 3247 and it shall be demonstrated that it is typical for the de-icer when used (or when it will be used) by Highways England (circa 2% m/c). Similarly, the concentration of a liquid de-icer/pre-wetting agent shall be determined and shown to be typical of normal usage.

Tests shall be undertaken with the Vehicles as defined in R: 5.1.32 and shall be repeated where different material ratios are specified in this technical specification, as in the case of pre-wet with FS30 and FS50.

Material Type	Part 1	Part 2
1) Solid De-Icing Agent - 6.3mm dry salt to BS 3247:2011+A1 2016	Required	Required
2) Pre-wet De-Icing agent - 6.3mm dry salt, prewet with Sodium Chloride to BS 3247:2011+A1 2016	Required	Required
3) Liquid De-Icing agent of sodium Chloride to BS 3247:2011+A1 2016	Required	In part'
Note 1 In the case the case of liquid only treatments the vehicle shall be driven through the test area for the purposes of visually confirming the spread patterns for recording and evidencing vehicle performance.		

Testing is divided into 2 parts

- Part 1 - Dynamic Test A – Road Discharge Test
- Part 2 - Dynamic Test B – Salt Recovery Test

Tests shall be carried out on all vehicle types specified within as defined in R: 5.1.32 at two nominal spread rates with the hopper fully loaded and with the hopper 10% full. Typical test conditions for a performance trial are as follows:

- Hopper full, spread rate 10g/m2
- Hopper full, spread rate 20g/m2

- Hopper 10% full, spread rate 10g/m2
- Hopper 10% full, spread rate 20g/m2

To ensure de-icer is not consolidated in the hopper, the hopper shall be fully unloaded prior to each performance trial before it is loaded with the chosen De-Icer. The distance travelled by the spreader after the hopper is loaded for the trials shall be minimised and recorded. Also, the time between the loading of the hopper and completion of the trials shall be kept to a minimum and be recorded.

The moisture content and grading of a representative sample of the de-icer shall be determined.

A representative of the spreader manufacturer shall monitor all trials and confirm that the settings on the spreader are appropriate for each test condition.

A representative of Highways England shall monitor the trials. The Supplier shall give Highways England a minimum of 14 days' notice prior to the commencement of trials.

Notice shall include details of trials to be carried out, proposed commencement and completion dates, location of trials / tests (including laboratory analysis is appropriate) and contact details. Highways England will give the Supplier 3 days' notice of any intention to attend.

2. Part 1 – Dynamic Test A - Road Discharge Test

The vehicle shall be filled with appropriate quantities of respective de-icing agents to achieve a 100% hopper and or liquid load.

The vehicle shall be filled with fuel and weighed on a permanent weighbridge or portable weigh machines which shall have a tolerance of no more than ± 0.3 %.

The spreader shall be set to a 9m spread width with a discharge rate of 10g/m² and driven whilst spreading at a speed of 50mph (80 kph) over a 2km test run.

The vehicle shall be re-fuelled and re-weighed to calculate the remaining load.

The test shall then be repeated for the various de-icing agent loads and spread rates detailed in section 1 above against all vehicle types.

The tests shall be repeated, increasing the spread width to 11m, then in the case of dry and pre-wet materials to the maximum 13m width.

The rate of discharge shall be calculated for 9m, 11m and 13m widths at each of the vehicle loads and spread rates.

3. Part 2 - Dynamic Test B – Salt Recovery Test

3.1 General

Uniform spreading shall be achieved after spreading is initiated within a distance to be specified by the Supplier.

The trials shall be carried out on a day with little or no wind because the effect of even a slight wind on fine particles is considerable. When fines are likely to be suppressed by pre-wetting or by additives, the trials can be carried out at wind speeds not exceeding 2.5m/s at a height of 2m. Trials with untreated, dry de-icer shall be carried out at wind speeds not exceeding 1.5m/s at a measured height of 2m.

3.2 Test Site

The performance trials shall be carried out on a straight length of road or runway with surfacing that is representative of the surfacing on the Highways England network. The test area shall be as flat as possible with a longitudinal gradient not exceeding 1 in 100 and a crossfall not exceeding 1 in 40. Suppliers shall seek approval for their proposed test site prior to commencing the trials.
The test area shall include three test strips that are spaced, as shown in Figure 1, with strips 2 and 3 at least 50m from strips 1 and 2, respectively. Spreading shall start at the distance specified by the Supplier that is required to achieve uniform spreading at the rated speed. Spreading shall stop at typically 50m after the third strip. There shall be sufficient distance before and after the test area for the spreader to reach the rated speed and decelerate to a stop.

Test panels shall be marked-up in each strip as shown in Figure 2 for a three-lane motorway and hard shoulder configuration. The dimension of the strips in the direction of travel shall be 1m. The configuration is based on that specified in BS 1622. There are two 1.8m wide panels for each lane and two 1.5m wide panels for the hard shoulder (left margin) and one 2m wide panel for the left verge. There are two panels for the central reserve area, one 1.5m wide for the right margin and the other 2m wide for the right verge. De-icer distributed to the left and right verge is wastage. De-icer distributed to the right margin is also wastage, but a right margin has been defined as a ‘transition’ area between lane 3, which shall receive the target spread rate, and the right verge that should receive little or none.

Markings shall be placed as required within the test area but not within 5m before each strip to ensure that the spreader driver follows the correct path across the strips. The path taken by the spreader shall correspond to the path that would be taken during normal de-icing runs on the highway.

The test area shall include three test strips that are spaced, as shown in Figure 1, with strips 2 and 3 at least 50m from strips 1 and 2, respectively. Spreading shall start at the distance specified by the Supplier that is required to achieve uniform spreading at the rated speed. Spreading shall stop at typically 50m after the third strip. There shall be sufficient distance before and after the test area for the spreader to reach the rated speed and decelerate to a stop.

Test panels shall be marked-up in each strip as shown in Figure 2 for a three-lane motorway and hard shoulder configuration. The dimension of the strips in the direction of travel shall be 1m. The configuration is based on that specified in BS 1622. There are two 1.8m wide panels for each lane and two 1.5m wide panels for the hard shoulder (left margin) and one 2m wide panel for the left verge. There are two panels for the central reserve area, one 1.5m wide for the right margin and the other 2m wide for the right verge. De-icer distributed to the left and right verge is

wastage. De-icer distributed to the right margin is also wastage, but a right margin has been defined as a ‘transition’ area between lane 3, which should receive the target spread rate, and the right verge that should receive little or none.

Markings shall be placed as required within the test area but not within 5m before each strip to ensure that the spreader driver follows the correct path across the strips. The path taken by the spreader shall correspond to the path that would be taken during normal de-icing runs on the highway.

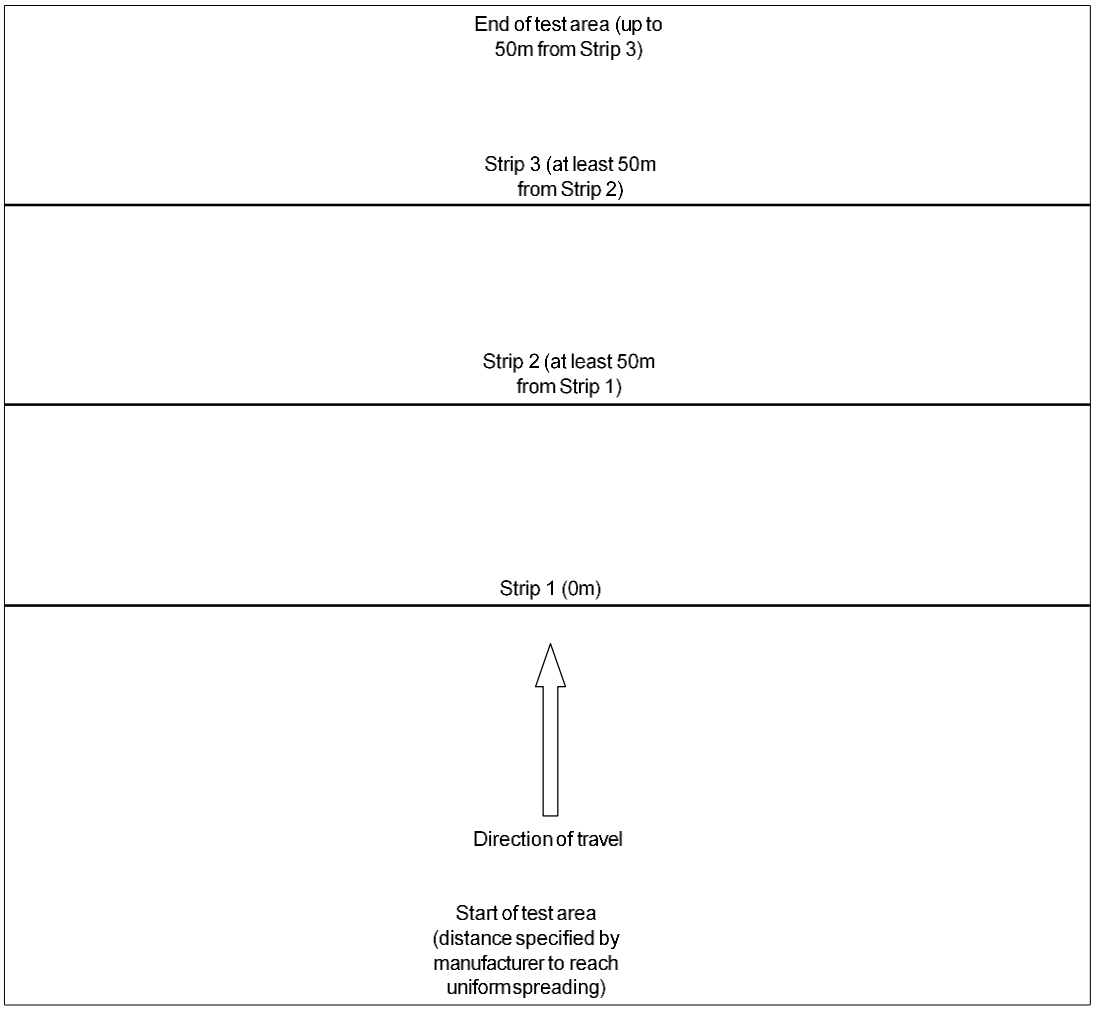

Figure 1 Layout of test area

Location	Left verge (2.0m)	Left margin/hard shoulder (3.0m)		Lane 1 (3.6m)		Lane 2 (3.6m)		Lane 3 (3.6m)		Right margin (1.5m)	Right verge (2.0m)
Panel identifier	LVA	LMA	LMB	L1A	L1B	L2A	L2B	L3A	L3B	RMA	RVA

Direction of travel

Figure 2 Layout of each test strip

3.1 Test Procedure for Each Test Run

Each test strip and at least 2m before and after each strip shall be washed and swept by a road sweeper in order to remove any residual de-icer and detritus. The wheel paths shall be washed and swept from the start of the test area to strip 3 in order to prevent any de-icer being carried on the tyres of the spreader into the test strips.

To confirm that the residual de-icer has been removed from the panels before the first trial, de-icer shall be collected from two panels within lanes 1 to 3 of each strip before the first run (6 panels in total). The recommended method for collecting the

de-icer is described below. Alternatively, all of the panels can be wet washed to remove all residual de-icer using the method described below.

The spreader shall be loaded as required for the test run.

The spread rate, spread width, mode of symmetry and other settings that are adjusted during spreader calibration (e.g. belt speed, gate height, spinner speed) shall be set for the test and recorded. The representative of the spreader manufacturer shall confirm that the spreader has been set up correctly before each run.

The wind speed shall be measured and recorded.

When the wind speed is within the limits, the spreader shall be driven at a speed of 50mph (80kph) through the test area, discharging salt at the appropriate spread rate.

De-icer shall be collected from each panel using an appropriate method and the amount determined. An acceptable wet wash method is described below. Suppliers shall seek approval for their proposed methodology prior to commencing the trials. The accuracy of the recovery method shall be determined in calibration trials in which samples of de-icer of known weight are scattered within six $1m^2$ panels
in the test area away from the test strips and then collected using the chosen method. The weight of the samples shall be 5g, 7g, 10g, 15g, 20g and 30g, with a tolerance of ±1g. The weight of the samples and the panels to which they are scattered shall be confirmed by the representative of the spreader manufacturer.

4. Wet Wash Collection Method for Chloride-based De-icers

4.1 Collection of De-icer from Test Panels

The de-icer shall be collected from the test panels using an industrial vacuum cleaner (e.g. Numatic type) that can be operated in dry and wet modes.
The water used for the wet vacuuming and for cleaning the vacuum when emptying its contents shall be clean and from one source.
Recovery from each panel shall be as follows:

- The panel shall be dry vacuumed with the suction head passing slowly over each section of the panel twice.
- The panel shall be wet washed and vacuumed with the suction head slowly passing over each section of the panel in two directions, perpendicular to each other. Typically, 1.5 litres of water shall be used to wash each square metre (i.e. 2.7 litres to wash a 1.8m wide panel)
- The panel shall be dry vacuumed to remove any liquid remaining after wet washing with the suction head passing over each section of the panel in two directions, perpendicular to each other.

The contents of the vacuum cleaner shall be emptied into a clean bottle (5 litre) using a funnel. The internal surfaces and components of the vacuum that have come into contact with the de-icer solution shall be cleaned using a pressure sprayer filled with water to ensure that all traces of de-icer are emptied. Care shall

be taken while the vacuum is being dismantled, cleaned and emptied to ensure no de-icer solution is lost.
The bottle shall be marked with an appropriate descriptor that identifies the strip number, the panel location and the test number.

4.2 Determination of Chloride Content of De-icer Solutions

The amount of de-icer in each panel shall be determined from the Chloride concentration of the collected solution. The titration method shall be used. This requires the preparation of a standard solution of known concentration and the determination of the reference Chloride level o f the solution in accordance with Equation 1.

$$\text{Reference Chloride level in a standard solution } (\text{g Cl/g de - icer}) = \frac{\text{Volume of water (l)} \times \text{Chloride concentration (g Cl/l)}}{\text{De - icer in standard solution}}$$

Equation 1

The de-icer in the solution collected from each panel shall be calculated from Equation 2.

$$\text{De - icer in Sample (g)} = \frac{\text{Sample Chloride concentration (g Cl/l) x Sample volume (l)}}{\text{Reference Chloride level in standard solution (g Cl/g de - icer)}}$$

Equation 2

The standard solutions shall be prepared by adding samples of de-icer of known weight to water from the same source as the water used to collect de-icer from the test panels. The concentrations of the solutions shall cover the estimated range of concentrations of the collected solutions. For example, if de-icer is distributed at a nominal spread rate of 10g/m^2 to a 1.8m wide panel in the main zone, the weight of de-icer collected should be 18g. If 2.7 litres is used to wet wash such a panel, the solution concentration will be 6.7g/litre. To allow for different solution concentrations, standard solutions shall be prepared that are 0.5, 1.0 and 1.5 times this nominal

concentration. Standard solutions shall not be less than 1.5 litres. For the case described above, standard solutions should be prepared by adding 5, 10 and 15g of de-icer to 1.5 litres of water, in addition to solutions with no de-icer. Four solutions of each concentration shall be prepared.

After the solutions have been mixed thoroughly to ensure the de-icer is dissolved and the concentration is uniform, 0.25l sub-samples shall be prepared and analysed. The mean reference Chloride level of the sub-samples (of each concentration) shall be determined so the de-icer recovered from each panel can be determined using Equation 2. When the reference Chloride concentration level varies with the Chloride concentration of the solution, the level corresponding to the Chloride concentration of the collected solution shall be used.

When the volumes of the collected solutions are determined by weight, the weight of any detritus shall be taken into account.

If background residual salt was present in the test strips before the first test run, this shall be subtracted from the de-icer recovered from each panel for first run only. The background level shall not be subtracted from the amount collected in subsequent runs because the strips will have been wet washed to remove all de-icer.

5. Performance Requirements

Part 1 : Dynamic Test A – Road Discharge Test

- The rate of discharge shall be within ± 10% of the nominal rate of discharge set.

Part 2 : Dynamic Test B – Salt Recovery Test

As indicated above, the layout of the test area is based on BS 1622. For a three-lane motorway and hard shoulder configuration, the main zone corresponds to lanes 1 to 3, the left margin (the hard shoulder) is 3.0m wide and the right margin is 1.5m. The vehicle is required to deliver coverage of the hard shoulder at half the nominal spread rate. With the minimum coverage and width of the hard shoulder being greater than those for the corresponding BS 1622 two lane motorway configuration, it is accepted that wastage to the left verge may be unavoidably higher than that specified in BS 1622.

The calculated total for the three-lane motorway and hard shoulder configuration shall be defined as follows:

2 x (Area of panels in lanes 1 to 3 x nominal spread rate + Area of panels in left and right margins x 0.5 nominal spread rate)

The following performance criteria shall be satisfied, making allowance for the accuracy of the method of recovery when necessary:

- The mass of de-icer from the main zone, margins and verges during runs with the hopper full and 10% full shall be no more than ±10% of the calculated total.

    ▪

- The mass of de-icer collected from either verge during runs with both hopper loads shall not exceed 1.0% of total mass collected
- The mass of de-icer collected from the left margin in one run shall not be less than 70% of the mean mass collected from all the panels in the main zone with the hopper full and 10% full
- The mass of de-icer collected from the right margin in one run shall be less than 50% of the mean mass collected from all the panels in the main zone with the hopper full and 10% full.
- The total mass of de-icer collected in the run with the hopper full shall differ from the total collected in the run with the hopper 10% full by no more than ±10%.
- For each run, the difference in the mass of de-icer collected from one strip and the mean of the three strips shall be no more than ±20%.
- For each run, the difference in the mass of de-icer collected from one lane and the mean of the three lanes shall be no more than ±20%.
- The mean coverage for each lane shall be no less than 90% of the nominal spread rate.
- The mass of de-icer collected from one lane in one run shall be ≥75% and ≤133% of the mean of the three lanes in the runs with the hopper full and 10% full.
- The mass of de-icer collected from one panel in the main zone in one run shall be ≥60% and ≤166% of the mean collected from panels in the main zone in the runs with the hopper full and 10% full.