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# Double-crewed ambulance specification

Version 1, October 2021

# Contents

# Section 1: Base vehicle specification

This is the Specification for the Base Vehicle that will be converted into a Type B Emergency Ambulance compliant with BS EN 1789:2020. The Conversion specification is provided in Section 2.

| Area | Requirement | Description |
|---|---|---|
| **Type** | Panel van | The vehicle must be a panel van |
| | Minimum gross vehicle weight (GVW) of 4,250kg | The vehicle must have a minimum GVW of 4,250kg |
| **Safety features** | Adaptive electronic stability programme | The vehicle must have an adaptive electronic stability programme |
| | Electronic brake force distribution | The vehicle must have electronic brake force distribution |
| | Autonomous emergency braking | The vehicle must have autonomous emergency braking |
| | Brake assist | The vehicle must have brake assist |
| | Adaptive brake lighting | The vehicle must have adaptive brake lighting |
| | Roll over mitigation system | The vehicle must have a roll over mitigation system |
| | High beam assist | The vehicle must have high beam assist |
| | Automatic windscreen wipers | The vehicle must have automatic windscreen wipers |
| | Automatic headlights | The vehicle must have automatic headlights |
| | Seat belt warning | The vehicle must have seat belt warning |
| | Anti-lock braking system | The vehicle must have an anti-lock braking system |

| Area | Requirement | Description |
|---|---|---|
| | Hill start assist | The vehicle must have hill start assist |
| | No speed limiter | The vehicle must not have a speed limiter |
| | Driver and passenger air bags | The vehicle must have driver and passenger air bags |
| | Side air bags in cab | The vehicle must have side air bags in the cab |
| | Traction support with hill descent control | The vehicle must have traction support with hill descent control |
| | Blind spot assistance | The vehicle must have blind spot assistance |
| **Warranty** | Driveline warranty of 3 years, 100,000 miles | A 3-year, 100,000 mile driveline parts and labour warranty covering the engine, transmission and drivetrain is required |
| | Structural corrosion warranty of 8 years | A structural corrosion warranty of 8 years is required |
| **Dimensions** | External height (excluding flexible aerials/antennas) | 2,750mm to 2,920mm |
| | Internal height | Minimum 2,000mm |
| | External width | 2,050mm to 2,450mm |
| | External length | 6,350mm to 6,950mm |
| | Wheelbase | 3,600mm to 4,500mm |
| | Front overhang | 900mm to 1,050mm |
| | Rear overhang | 1,300mm to 1,500mm |
| | Approach angle clearance | 20 to 25 degrees |
| | Departure angle clearance | 10 to 15 degrees |
| | Turning circle (kerb to kerb) | 13,500mm to 14,500mm |
| | Ground clearance | 190mm to 240mm |

| Area | Requirement | Description |
|---|---|---|
| **Driveline** | Power output | The vehicle must have a minimum power output of 120kW |
| | Emissions standards | The vehicle must have a minimum rating of Euro 6d-TEMP |
| | Acceleration | The vehicle must accelerate 0km/h to 80km/h in <35 seconds |
| | Gearbox | The vehicle must be available with both automatic and manual transmission |
| | Vehicle range | The vehicle must have a minimum range of 500 miles from a full tank of fuel |
| **Tyres** | Tyres | The vehicle must have all season tyres fitted |
| | Tyre pressure monitoring system | The vehicle must have a tyre pressure monitoring system |
| **Electrical** | Electric interface socket for conversions | The vehicle must have an electric interface socket for conversions |
| | CANBus gateway module | The vehicle must be fitted with a CANBus gateway module |
| | Alternator output | The vehicle must have an alternator with a minimum output of 200 amps |
| | Fog lights | The vehicle must have fog lights |
| | Daytime running lights | The vehicle must have daytime running lights |
| | Battery boost socket | The vehicle must have a battery boost socket |
| **HVAC** | Cab – climate control | The vehicle must have climate control in the cab |
| | Rear – support aftermarket fitment | The vehicle must support aftermarket fitment of rear climate control |
| **Entertainment** | Entertainment system | The vehicle must have an entertainment system |
| | Bluetooth, USB charger | The vehicle must be Bluetooth enabled with at least one USB charger |
| **Security** | Locking | The vehicle must have remote central locking with three keys |

| Area | Requirement | Description |
|---|---|---|
| | Immobiliser | The vehicle must have an immobiliser |
| **Doors** | Nearside sliding door with window | The vehicle must be supplied with a nearside sliding door with window |
| | Twin rear doors with windows | The vehicle must be supplied with twin rear doors with windows |
| | The twin rear doors must open to 270 degrees | The vehicle must be supplied with twin rear doors that open to 270 degrees |
| **Other** | Paint finish | The vehicle must be finished in RAL 1016 paint |
| | Pre-delivery inspection and number plates | The vehicle must be supplied with satisfactory pre-delivery inspection certification and number plates |
| | Passenger seat | The vehicle must be supplied with a height adjustable single passenger seat |
| | 16-inch alloy wheels | The vehicle must be supplied with 16-inch alloy wheels |
| | Heavy duty front springs | The front springs of the vehicle must be suitable for heavy duty application |

# Section 2: Conversion specification

This is the Specification for the Conversion of a Base Vehicle that meets the specification provided in section 1 above into a Type B Emergency Ambulance compliant with BS EN 1789:2020. Authorities may convert Base Vehicles with automatic or manual transmission. This Specification applies to both transmission options.

Please note that where this Specification refers to equipment supplier names, part numbers and other details, this is solely to identify the equipment type and the performance levels required. There is no mandatory requirement for the Supplier to include this specific equipment in the Ambulance.

This Specification has 11 parts:

A. General requirements
B. Body exterior
C. Technology
D. Cab requirements
E. Saloon requirements
F. Emergency lighting and switches
G. Communication system
H. Vehicle inventory and flexibility
I. Vehicle markings and livery
J. Compliance verification
K. Options.

Capitalised words and phrases used in this Specification shall have the definition given herein, or if not so defined, shall have the definition given in the Contract.

# A. General requirements

## Assurance

1. Supplied vehicles, goods and equipment must comply with UK standards BS EN 1789:2020 and BS EN 1865-4:2012, and the ECWVTA 2007/46/EC ('ECWVTA') (together 'the Standards'), all as amended and/or replaced from time to time.

2. The Supplier shall provide the Authority with a Letter of Association between the Base Vehicle manufacturer and the Supplier to demonstrate compliance with the Standards and ECWVTA (as amended and/or replaced from time to time) until such time as the Worldwide Harmonised Light Vehicle Test Procedure (WLTP) supersedes this requirement, from which time each Ambulance must comply with the WLTP.

3. The Supplier shall certify in writing that at the time of delivery to the relevant Authority the completed Ambulance, with all equipment fitted, fully complies with all relevant vehicle legislative regulations. This includes all relevant standards applicable in Great Britain.

4. The Supplier shall ensure that the Ambulances are fit for purpose and meet the requirements of all applicable standards and legislation. This will include: all aspects of liaison, Warranty and support; setting agreements; and conformity/interface matters to do with the Base Vehicle and equipment manufacture, for all works completed and products and/or goods supplied by the Supplier. The Authority is responsible for the day-to-day legality of operating the Ambulance.

5. The Supplier shall assess the vehicle build and compliance with the relevant specification, and at the earliest opportunity shall identify and inform the Authority in writing of all issues/problems/non-compliance that may affect the operation/use of the Ambulance as intended or anticipated by the Authority.

6. On delivery of each Ambulance the Supplier shall provide the Authority with an assurance manual and statement confirming the Ambulance is fit for purpose, complies with this Specification, and meets all relevant legislative regulations and standards.

7. The Supplier shall not alter any Base Vehicle system or circuit without the prior express written permission of the Base Vehicle manufacturer. All electrical systems provided by the Supplier as part of the Conversion must properly interface with the Base Vehicle manufacturer's CAN bus system. The Supplier is responsible for obtaining the prior express written permission of the Base Vehicle manufacturer.

## Durability

8. The Conversion shall be designed and constructed to enable the Ambulance to withstand the rigours of use as an emergency ambulance for 24 hours a day, seven days a week for a minimum of seven years.

## Delivery

9. The Supplier shall produce a delivery plan and meet all agreed target timescales for each Delivery Order. Any changes to these timescales must be agreed in writing by the Supplier and the Authority. The Supplier shall deliver the Ambulances to the locations designated by the Authority in the Delivery Order, all of which will be in England.

## Ergonomics and design

10. The Supplier shall ensure that the design and layout of the Ambulance is fit for the purpose of emergency ambulance use, minimises manual handling for ambulance staff and patients, and reduces the risk of work-related musculoskeletal disorders for ambulance staff.

11. The Conversion must be ergonomically designed using computer-aided design (CAD) with reference to relevant research.

## Environmental sustainability and innovation

12. The Authority will consider technologies that can reduce the vehicle's environmental impact. The Supplier shall propose innovations in its design of the Conversion to improve aerodynamics and to reduce weight, the need to operate the engine on standby and fuel consumption.

## Under-body protection

13. The Ambulance shall have complete under-body protection applied. All fittings or alterations carried out by the Supplier must be de-rusted and treated to prevent corrosion, including electrolytic corrosion.

## Water test

14. The Ambulance must pass a high-volume, whole-vehicle pressure water test. This is to be certified.

## Tilt test

15. In arrangement with the Authority, the Supplier shall undertake a Tilt Test at a recognised proving ground on one of the first Ambulances it Converts under the Call-off Contract. The Ambulance will achieve a minimum tilt of 38 degrees without its outside wheels losing contact with the tilt bed. This is to be certified by the proving ground.

16. All Ambulances shall meet the 38-degree requirement, with the Authority reserving the right to sample test compliance with this requirement.

## Assessment of handling and stability

17. In arrangement with the Authority, the Supplier shall undertake a Handling and Stability Test at a recognised proving ground on one of the first ambulances it Converts under the Call-off Contract. The recognised proving ground will assess the Ambulance's handling characteristics in its fully operational condition and provide a report to the Supplier and the Authority confirming compliance with BS EN 1789:2020 in terms of the following:

    - steady-state cornering
    - straight line behaviour
    - obstacle avoidance
    - straight line braking
    - braking in a turn.

18. All Ambulances shall meet the same level of satisfactory performance in accordance with paragraph 17 above, with the Authority reserving the right to sample test compliance with this requirement.

## Electromagnetic compatibility test

19. The Supplier shall undertake an Electromagnetic Field Test and certify that the Ambulance, with all digital, communication and medical equipment fitted (supplied by the Authority until common equipment is agreed), fully complies with all requirements of the Electromagnetic Compatibility Regulations and the Electromagnetic Fields at Work Regulations as applied in Great Britain.

## Insulation

20. All cavities between the interior and exterior body mouldings (including the rear doors) shall be filled with suitable fire-retardant thermal insulation material to ISO 3795:1989, fitted in accordance with the manufacturer's recommendations. The insulation must extend into all relevant framing members.

## Noise test

21. The Supplier shall ensure that the Ambulance does not exceed the Control of Noise at Work Regulations 2005 (Directive 86/188/EEC) or such replacement standard as may apply from time to time.

22. The Supplier shall undertake a noise test in a variety of environments and using only test equipment that has been registered and fully calibrated. The Supplier shall provide the Authority with a compliance report giving the maximum noise exposure for each road speed tested. The noise test shall involve:

    - sirens switched on
    - noise levels tested from both the driver and passenger seating positions
    - test completed at road speeds of 30mph, 50mph, 70mph and maximum speed
    - test repeated with the driver and passenger windows open.

## Vehicle mass test

23. The Supplier acknowledges the need to reduce the operational mass of the Ambulance throughout all requirements of this Specification. The Supplier shall fully consider and reflect this reduction in every aspect of its approach and design concept.

24. The Supplier shall test that the Ambulance is not overloaded as a whole, on an axle or on a wheel position once it is fully constructed and loaded to its operational weight. Operational mass must meet the requirements of BS EN 1789:2020. It must include: a fully equipped operational vehicle with all equipment and medical items on board; one person weighing 75kg on each seat and on the stretcher; and a full tank of fuel.

25. The Supplier shall provide an Ambulance loaded to its operational mass (with the Authority to provide the non-supplied equipment) for weight certification by a Driver and Vehicle Standards Agency (DVSA) approved technical specialist for weight certification, prior to build commencement for each Authority. This DVSA approved technical specialist will confirm that:

    - the total operational weight does not exceed 95% of the Base Vehicle's stated gross vehicle weight rating
    - the total operational weight on each axle does not exceed 95% of the Base Vehicle's stated gross axle weight rating for each axle
    - all other weight/mass limits provided by the Base Vehicle manufacturer are fully complied with when the Ambulance is constructed and loaded to its operational weight.

26. The Authority shall have the right to reject any Ambulance that, once loaded to its operational weight, fails to meet the test criteria stated.

## Infection prevention and control (IPC)

27. To minimise infection, surfaces inside the Ambulance must be white, easy-to-clean, without material edging and clutter free. The design of the Ambulance will follow the principles of one-piece design theory with no dirt or finger traps, and have a smooth, clean and tidy appearance overall.

28. The Supplier shall use materials and construction methods that can withstand deep, rigorous cleaning regimens in line with relevant IPC requirements. For example, surfaces should be manufactured from materials that can withstand daily wear and resist surface corrosion under extreme cleaning regimens. The Supplier shall use materials with anti-soiling properties to meet BS EN ISO 11378-2, and anti-bacterial/fungicidal qualities.

## Latex policy

29. The Supplier must achieve a Latex-free environment in the Ambulance.

## Electrical

### General

30. Before starting to Convert the Base Vehicle, the supplier shall carry out a full and complete electrical calculation – that is, the electrical drain when all equipment and vehicle and auxiliary batteries are in use – and compare this to the alternator output over the entire engine rev range.

31. The calculation must show the vehicle equipment and control systems are adequate and suitably designed to maintain the battery (all batteries).

32. Power management and load shedding systems shall be provided to optimise battery condition and protect sensitive electronic equipment, including, but not limited to, by reducing power demand from ‘parasitics’.

33. The inverter (2,000W) should be capable of running a minimum of two 230V three-pin sockets. All associated cabling and connections will be of such capacity to carry 10% more than the maximum current and protected appropriately.

34. An automatic shoreline disconnect three-pin socket rated at 16A with an external IP44-rated plug that meets the requirements of BS EN 60309-2 must be provided in a suitable location.

35. The Ambulance shall require a ‘run lock’ security system that shuts down the engine when the vehicle’s handbrake is disengaged. This system will allow the ignition key to be removed and the Ambulance locked with this key while ensuring the alternator output meets the maximum current consumption. The run lock will be activated via the control panel but will only be available through the ‘arrive

scene' mode, 'arrive hospital' mode or when blue lights are active. In all other states, if run lock is selected the system will switch off the engine after one minute providing the auxiliary batteries are above 80% state of charge, or it will switch off the engine at the point the batteries reach 80% state of charge.

36. The Supplier shall provide the Authority with detailed electrical/wiring diagrams for each batch of Ambulances it delivers to the Authority.

37. Before delivery to the Authority, the Supplier shall ensure that all batteries are fully charged.

## Emergency lighting and siren

38. Emergency lighting must comply with European regulations for blue lights and meet ECE-R-65 Class 2 compliance as a system once fitted to the vehicle. Individual approvals for the light heads are not acceptable. Measured at a vertical angle of 0 degrees and a horizontal angle of 360 degrees, the light output must be a minimum of 120cd in the day and 50cd at night.

39. The Supplier shall fit an audible warning system comprising a wail, yelp, piercer, bullhorn noise siren that faces out from the front of the Ambulance but is recessed so as not to cause injury. The minimum output is 120dB at a distance of 1m in front of the centre line of the front bumper, but within The Control of Noise at Work Regulations 2005 limits in relation to the Ambulance crew, for all outputs. The system will be located in the front bumper, facing front, but recessed in an all-weather housing. It will be wired through and operated by the vehicle road-horn control. The bullhorn should be operated by a clearly labelled button adjacent to the steering wheel. For data logging of siren activity, the siren must provide an interdomain routing output back to the power management system.

## Link to base vehicle

40. The Supplier will be approved by the Base Vehicle manufacturer for chassis conversion and will be responsible for ensuring that the Base Vehicle manufacturer knows about all the installed auxiliary electrics. The Supplier will supply a certificate of conformity to the Authority as part of the contract document pack.

## Auxiliary electrical demand

41. Notwithstanding any requirement for minimum auxiliary battery capacities and alternator size, the Supplier shall be ultimately responsible for ensuring that the auxiliary power system can support the auxiliary electrical demand on the Ambulance. Supporting documentation, including test data, will be supplied as part of the contract document pack on the Call-off Commencement Date. This will demonstrate that the Ambulance can meet its on-board electrical power requirements.

## Wiring and installation

42. All DC and AC wiring in the Ambulance must conform to all applicable Institution of Engineering and Technology (IET) wiring regulations. On completion, the wiring system shall meet the minimum requirements of sections 415 and 717 of BS7671 and be certified as such by an approved body, eg NICEIC. In particular:

    a. All wiring will be multistrand, flexible PVC-covered cable with each cable a unique colour for identification purposes. All wiring will be protected by being run through appropriate trunking or conduit. Where routed through bulkheads, wiring will be protected by glands, and at points liable to chafing by grommets or rubber.

    b. Wiring terminations will be adequately protected and insulated, including all external connections which should be IP67 rated.

    c. All circuits will be separately protected and installed in accessible positions, and tested for insulation, non-contact and continuity.

    d. All underfloor wiring will be fitted into approved sleeving and all joints sealed with PVC adhesive tape and must comply with British Standard BS AU7:1963.

    e. DC cables must be protected by fuses or circuit breakers at source, and these must be rated for the current-carrying capability of the wire, and AC cables protected by residual current circuit breakers.

    f. Cables must be of the correct size for the current required by the circuit they supply, to avoid overheating and excessive voltage loss.

    g. All wiring or appliances that require electrical warning or hazard identification will display clear labels, in accordance with current regulations.

    h. All auxiliary electrical components will be CE and ‘e-marked’ in accordance

with current regulations.

i. Except for the isolator switch, all switches in the cab must be within easy reach of the driver and labelled appropriately.

j. All electrical components must be mounted in identical locations and wiring routed uniformly across all vehicles supplied by the Supplier.

k. All connections made to the Base Vehicle wiring must be ‘plug and play connectors’ so if a problem occurs the Base Vehicle and Supplier systems can be isolated, and also to facilitate easy removal and replacement if repair or maintenance is needed.

l. Wherever possible, electrical components should be mounted on sub-assemblies using ‘plug and play connectors’ to facilitate easy removal and maintenance.

m. The Supplier will supply and fit a supplementary heavy-duty earth strap to the Base Vehicle electrical circuit that terminates at the vehicle gearbox.

## Quality control

43. The Supplier shall ensure that high levels of quality and build standard controls apply to each Ambulance, including the Base Vehicle and all components and systems identified in the Specification or related requirements. The Supplier shall provide and ensure quality control assurance throughout the build, including for all medical items, equipment and components supplied. The Supplier must have a current ISO quality control system that is relevant to the building of vehicles.

## Warranty and support

44. The Supplier will provide a fully inclusive, comprehensive, ‘bumper to bumper’ five-year parts and labour warranty covering build quality, all components supplied and all fittings undertaken as part of the Contract, including all electrical installations. The Supplier shall provide the Authority with a written procedure for warranty claims and carrying out work. In addition, there shall be a minimum seven-year anti-corrosion warranty.

45. Further to paragraph 44, the Authority has the option to require that the five-year warranty is extended by two years to a total of seven years.

46. The medical gas pipeline system must conform to all applicable regulations and standards. All inlet fittings on regulators and equipment used for connection to medical gas cylinders, including oxygen and nitrous oxide + oxygen (where required), should be in accordance with BS341 and ISO407 as applicable. The supply systems and associated pipework should comply with the appropriate requirements of the Pressure Systems Safety Regulations 2000 and meet the requirements of BS5682 and the piped medical gases in ambulance vehicles Health Technical Memorandum 2022 Supplement 2.

47. The Authority may undertake Warranty claim work in its own workshops that is rechargeable to the Supplier.

48. A process shall be in place for resolving matters urgently and priority given to both the resolution and any associated works. The contract to be entered into with each successful supplier provides detail on the service levels required.

## Specialist tooling

49. The Supplier shall provide the Authority with a comprehensive list of specialist tooling and also the specialist tooling required to maintain and repair the Ambulance.

## Spare parts

50. The Supplier shall provide the Authority with a comprehensive parts list giving part numbers in electronic format. All parts must be available for a minimum of seven years from the date of delivery of the last Ambulance supplied. In addition, the Supplier shall provide an online system that gives access to parts listing and ordering, and technical information/support; this will be in the form of a dedicated customer-specific web portal. The parts list will be updated to reflect any supersessions, changes or replacements as and when required and shall be in place for a minimum of seven years from the date of delivery of the last Ambulance supplied.

## Training

51. The Supplier shall provide on-site training (either at Authority or Supplier premises) for the Authority's operational and workshop staff as appropriate. Operational

training will cover the operational use of the Ambulance and its equipment, and workshop training will cover maintenance, fault diagnosis and repairs.

52. The Supplier shall provide the Authority with an associated written training syllabus, along with confirmation certificates detailing who has been trained and what criteria they have met.

53. To support training delivery the Supplier shall provide the following in electronic form, in hard copy and online:

    a. an operational manual explaining operator use
    b. a maintenance manual for technical staff that includes:
        i. system hardware location schematics
        ii. wiring diagrams
        iii. fault diagnosis guidance information
        iv. warranty claims process and contact information
        v. spare parts catalogue.

## Build information pack

54. For each build batch the Supplier must supply the Authority with a comprehensive manual (written and electronic copy) that contains the:

    a. Specification
    b. agreed changes listing
    c. CEN compliancy certificates
    d. proof of compliance with ECWVTA for the specific chassis type and vehicle design
    e. statement confirming Disability Acts have been considered and adhered to where applicable
    f. electromagnetic field test report
    g. build identification numbers for each chassis number
    h. operational and equipment manual
    i. training syllabus
    j. vehicle mass certificates
    k. noise, water and tilt test reports

l. road handling test report
m. full four-wheel laser alignment certificate for the completed vehicle
n. other component/equipment certification as required
o. warranty terms, contacts and procedure
p. electrical wiring diagrams and location of components and connections in the vehicle's electrical system
q. telematics installation certificate
r. electric installation certificate to meet the minimum requirements of sections 415 and 717 of BS7671
s. drawings of external and internal layouts
t. letters of non-objection/certificates of conformity as required
u. bill of materials.

## Meetings

55. The Supplier and the Authority will hold meetings during the Conversion process at milestones agreed on order, or more regularly if required by the Authority. Minutes of meetings will be produced and distributed to an agreed circulation list, including the National Contract Manager.

56. The Supplier shall attend user group meetings with the Authority on a six-monthly basis or more regularly if required, to establish working relationships and determine product effectiveness. These visits will be used to improve the product and drive innovation in vehicle design. The National Contract Manager will be invited to these meetings.

## Production and conversion process

57. The Supplier shall use a fully controlled and documented construction process that accurately documents each stage of the Conversion process to maintain quality and traceability, and to provide accurate after-sales information. This will ensure that all spare parts are correct and fit first time, every time.

58. The Supplier shall provide proof of certification to the standards BS EN 1789:2020, ISO 9001 and ISO 14001 to the Authority so soon as possible.

# B. Body exterior

59. As far as is possible, the exterior dimensions of the Base Vehicle should not be compromised by the conversion. Where changes to the dimensions are unavoidable the supplier must ensure that this does not compromise the vehicle's compliance with relevant legislation, eg Road Vehicles (Construction and Use Regulations) 1986.

59. The complete exterior of the Ambulance must be finished in RAL 1016 yellow save for any livery and markings required.

60. Wheels and bumpers must be left in factory finish. Rear bumpers must have underside stainless steel skid plates (2mm) fitted.

61. Wheel nut indicators/retention devices must be fitted.

62. All external door locks must have a central locking facility and the extra facility that enables the vehicle to be locked while on run lock. This function should be controlled by the manufacturer's key fob.

## Body exterior windows

64. The Base Vehicle is supplied with a window in the sliding door and in the rear doors. In addition, a single emergency escape hatch type window measuring 1,352mm x 585mm must be positioned in Zone C (nearside) and the same in Zone D (offside). These windows should be exactly opposite each other and positioned relative to both the stretcher position and seat positions.

65. An opaque covering that allows as close to 100% natural light transmission as possible while protecting privacy by completely blocking inward vision, including in the dark while the interior lights are illuminated, must be fitted to the windows in the rear doors and the window in the nearside sliding door. The offside window and rearmost window on the nearside must be tinted to 5% light transition.

66. Integrated venetian blinds must be fitted in the offside window and rearmost window on the nearside that also prevent any reflection from the window. The integrated venetian blind in the offside window will incorporate a dementia and

child friendly scenic design depicting key points to talk and reminisce about, including children playing to remind people of their youth and animals for patients to find and identify.

67. Break glass hammers with seat belt cutters must be safely and securely provided adjacent to the rear door windows and the nearside sliding door window.

# C. Technology

68. The Supplier shall install a telematics system to record a range of inputs from the Ambulance's chassis and saloon. It shall be installed in a secure space that can be accessed by engineers but not routinely by unauthorised personnel.

69. The Authority shall provide the telematics system 'free issue'. However, an Option is provided for the Authority to ask the Supplier to supply as well as install the telematics system.

70. For the purposes of the Option, any telematics system provided by the Supplier must meet the minimum requirements set out in paragraphs 71 and 72.

71. The telematics system must:

    a. Contain poling rates that are configurable, but as a minimum report every five seconds for routine driving, every one second when blue lights are activated, and multiple inputs per second when the vehicle is in crash phase.

    b. Contain accelerometers at 100Hz that must record in X, Y and Z directions up to ±16g to an accuracy of ± 0.01g. This could include linked low and high range accelerometers (eg ± 0 to 3g and 3 to 16g).

    c. Collect information for the entire trip, showing:

        - start and stop times throughout the trip
        - positional information at relevant stages throughout the trip (breadcrumbs)
        - ability to develop geofences
        - detailed speed information
        - detailed idle times
        - odometer readings
        - detailed fuel usage and levels
        - siren activation
        - blue light activation
        - emergency/non-emergency miles

- chassis lights information
- seat belts engaged information for all seats
- windscreen wipers information
- brake lights information
- dash warning lights information
- steering wheel position
- throttle position
- X, Y, Z accelerometer inputs.

72. The telematics system must be ‘open’ such that it can integrate with the different ‘back office systems’ within the Authority, and also have a standalone reporting portal. Data must be available for the Authority to view and interrogate remotely.

73. The Supplier shall supply and install a tamper-proof, two-way intercom system between the cab and the saloon area that is powered when the ignition is on and only accessible for maintenance. This device should have an open-speech facility from the saloon to the cab and a press-to-talk button should be fitted in the cab for the driver’s use. It should be possible to control volume from the cab but not to turn off the device. The intercom system should be correctly calibrated to provide clearly audible communications.

74. Additional speakers will be provided in the saloon area for the Base Vehicle entertainment system with a separate on/off switch and volume control in the saloon. It must be possible to play music from a USB device in the cab into the saloon.

75. The Supplier shall fit an audible reverse warning device that operates when reverse gear is selected. This device will be used to alert pedestrians that the vehicle is reversing and will be fitted with a night isolation switch. An ultrasonic reversing aid connected to a reversing proximity warning device will be provided to give the driver audible and visual (a tri-colour light-emitting diode (LED) will be located to the right of the main instrument console) warning of any obstruction at the rear. The device must not to be sensitive to emergency vehicle LED lights.

76. A rear (reversing/incident) camera that operates when reverse gear is selected must be added; the rear image will be displayed on the MDT screen. This camera must be positioned high up under the rear light bar, protected from rain, dirt and

spray to maintain a clear image, where it gives a wide-angle image across the rear of the vehicle that includes the ramp and covers approximately 3m to the rear of the vehicle.

77. The Supplier shall supply and install a CCTV system for staff protection and to provide evidence in any incident/collision, in line with the requirements below. The recording unit must be inaccessible to crews/patients but easily accessible for maintenance and the removal of storage devices. All aspects of the system must comply with the General Data Protection Regulation as it applies in the UK (GDPR).

- **Eight channel HD digital video recorder:**
  - records eight cameras at HD resolution
  - ability to record data at a frame rate of at least 24 frames per second
  - records vehicle G force data in three separate axes, each individually adjusted
  - records vehicle GPS data for integration with mapping in playback software
  - records vehicle GPS speed
  - logs use of left/right indicators and brakes, with all functions individually searchable in playback software
  - integrates with ambulance management system outputs to record use of sirens/blues/headlight flash/panic alarm – system should differentiate between sirens armed and sirens emitting noise
  - programmable shutdown delay
  - programmable/switched video output
  - removable 1TB recording storage device with dedicated lock
  - lockable front cover
  - clearly labelled fault repeater LED positioned in the dashboard
  - fault output for third-party integration
  - front accessed monitor output for set-up and testing
  - event search function allowing operator to search and view specific recorded scenarios, eg only those recordings when the vehicle's blue lights are active, or the vehicle is travelling at a certain speed, or any combination of multiple events

  - a separate back-up recording and storage function for recording driver behaviour data such as acceleration, braking and speed
  - allow for 4G/Wi-Fi connection to vehicle to view live images and download recorded footage encrypted to Advanced Encryption System 256-bit encryption
  - ability to review footage on a PC direct from the removable storage device and remotely from the vehicle
  - option to auto-convert encrypted format footage to Audio Video Interleave format directly from playback software
  - ability to display all external camera images simultaneously on the monitor on the bulkhead in the saloon.
- **Forward-facing camera:**
  - mounted behind the rear-view mirror looking forwards
  - cameras to record when vehicle is in operation and for a programmable period of time post ignition of up to one hour.
- **Nearside and offside externally mounted micro-dome cameras:**
  - mounted nearside and offside at the rear of the vehicle facing forwards
  - external cameras mounted on micro-dome base
  - high resolution with minimum day/night function of 600 TV lines
  - vandal resistant with lockable rim
  - cameras to record when vehicle is in operation and for a programmable period of time post ignition of up to one hour.
- **Saloon micro-dome cameras:**
  - two flush mounted into the ceiling above the bulkhead cabinet and at the foot end of the stretcher
  - high resolution with minimum day/night function of 600 TV lines
  - vandal resistant with lockable rim
  - cameras to record when switched on or when the driver alert strip is pressed with passive recording function to enable video from one hour before activation to be captured
  - microphone installed in saloon area that is also turned on when the camera is turned on with a passive recording function to enable recordings from one hour before activation to be captured

  - switching on the camera leads to a clearly labelled visual warning (red LED light) that video and audio recording is active, and activation via the driver alert strip also leads to a voice alert that CCTV and audio recording is in operation
  - crews should be able to leave the camera on and in continuous record mode.
- **Rear camera (same camera as per paragraph 76):**
  - mounted at the rear of the vehicle, in the centre, for use as a reversing aid and to record events at the rear of the vehicle. The Supplier will ensure this is wired in such a way that there is no delay between selection of reverse gear and footage being displayed on the dashboard screen
  - camera to record while the vehicle is in operation and for a predetermined time after ignition.
- **Accident review service:**
  - the CCTV supplier will offer the ability to recover or receive accident footage and to prepare an independent expert report on the circumstances, possible causation and liability
  - this must comply with relevant data protection requirements including the General Data Protection Regulation as it applies in the UK (GDPR) and footage must be prepared in a way that meets all relevant Home Office guidelines.
- **Footage preparation service:**
  - the CCTV supplier will have a process in place to recover footage in a timely manner (within 24 hours of request) or receive incident footage required for third-party purposes such as police request
  - this must comply with relevant data protection requirements including the General Data Protection Regulation as it applies in the UK (GDPR) and footage must be prepared in a way that meets all relevant Home Office guidelines.

# D. Cab requirements

78. The cab design will maximise crew comfort and leg room for both driver and passenger.

79. No fittings in the cab will restrict the range of seat and seat belt adjustment provided by the Base Vehicle manufacturer.

80. The dashboard must be designed to appropriately incorporate the additional electrical switching, warning and communication equipment and the mobile data terminal. This should be achieved with robust extra moulded cowls that do not obstruct routine maintenance tasks. The final design must be suitably ergonomic, look tidy and clean, and comply with all relevant regulations and standards. It will be subject to ECWVTA assessment if it is different from the Base Vehicle design.

81. Any cab overhead shelf shall be removed and the area made good.

82. A floor-mounted console shall be installed in the centre between the passenger and driver seats to provide maximum storage, including a document storage solution, two drinks holders and a waste bin. It will be sealed against fluid ingress.

83. Two rechargeable torches will be installed at positions both crew members can easily reach. The charging system will operate in a way that preserves torch battery life for as long as possible to reduce through-life cost.

84. Two coat hooks will be fitted.

85. A non-slip wear plate will be supplied and fitted on the cab floor below the driver's pedals. This must be sealed around its edges to prevent any type of ingress under the plate. This plate must not impede any full pedal travel.

86. One BS EN 3 compliant single use 2kg ABC 40 powder, visible gauge, controllable flow fire extinguisher will be positioned within easy reach of the driver and also from outside the vehicle, and not at head height. Its bracket will be a complete base, not two-pronged. The extinguisher will have a minimum seven-year life without the need for scheduled maintenance or service or any form of manufacturer overhaul.

87. Supplementary cab-dimmable strip lighting will be fitted above the driver and passenger seats, for completion of paperwork.

88. Two 12V USB outlets will be fitted for charging of aux devices and to supplement the Base Vehicle fitted outlets suitable for rapid charging of mobile phones.

89. Strengthening plates will be supplied and fitted to the driver and passenger doors with check strap mounting points at the ‘A’ pillar.

90. Tailored infection control anti-bacterial seat covers will be fitted to the driver and passenger seats. These will be made according to the Base Vehicle manufacturer’s digital patterns and have a maximum tolerance of 0.02mm to ensure a perfect fit. Where airbags are fitted for the original seats, they must conform to applicable TUV crash safety standards and applicable regulation.

91. The fuel cap will be non-locking and the Supplier will supply and fit a mechanical misfuelling prevention device in the fuel filler neck. The Authority has the option not to require the misfuelling prevention device.

92. The Supplier shall provide a solution that safely and securely mounts each Authority’s mobile data terminal (MDT) screen (provided ‘free issue’ by the Authority) to the dashboard without obscuring access to any Base Vehicle entertainment or heating controls. The screen will be positioned to reduce glare and must meet all relevant regulations.

# E. Saloon requirements

93. The bulkhead will have one square 1,430cm$^2$ minimum, nearside to offside opening window in line with the requirements of BS EN 1789:2020.

94. The saloon interior roof (including its components) must be at a height not lower than 1,890mm.

95. The saloon interior design must allow ambulance type carry chairs to pass between the wheel arch/nearside seating and the stretcher in its locks, with attendant seats in stowed position.

96. The Ambulance must be able to carry a bariatric stretcher in the fixed floor stretcher mountings without any equipment needing to be moved.

97. The bulkhead must have no protrusions that touch a person sitting in the seat when in its most rearward position.

98. The original Base Vehicle cab dimensions must not be compromised during the construction of the bulkhead; in particular, the geometry relative to the driver and passenger seating must be maintained.

99. All seat coverings will be made from a single piece of material and have sealed seams to prevent the ingress of body fluids for infection control purposes and to protect against damage.

100. All saloon seats will include a seat belt warning system that provides a visual warning to the driver that a seat is occupied but the seatbelt is not engaged.

101. Appropriate storage in cupboards and overhead lockers will be provided, all of which will have contents identification labels.

102. Unless otherwise stated all high-level lockers will have transparent doors and all other cupboards solid doors. All high-level lockers will have strong hinges with two gas struts per locker.

103. All overhead lockers will have dividers to accommodate different consumables, with a clear 40mm lip at the bottom and on horizontal dividers to avoid items

moving, unless otherwise stated.

104. All cupboards and lockers will have rounded corners/edges on the inside for easy cleaning and infection control.

105. The rear doors of the vehicle are not to be used for the storage of equipment and a suitable door check system will be installed to retain the rear doors at opening of 90 degrees.

106. Head impact bump pads, finished in Ambla Cairnwell Grey (or equivalent), will be appropriately positioned under each locker unit and above the inside of the side door.

107. Unless explicitly stated otherwise, all locker, cupboard and drawer doors will have a locking system with a manual reset device that indicates whether the door has been opened. This system is known as a ‘make ready system’.

108. All saloon door entrances will have grab rails/handles to aid entry/exit. As a minimum, there should be one between the side door and the first seat in Zone C, and two at the rear doors.

109. All grab rails in the saloon must be strong enough to take the weight of heavy persons, be 35mm in diameter and be finished in RAL1016 yellow powder coating.

110. Protection shall be fitted to the side door sliding mechanism to prevent ingress of items that could hinder operation of the sliding door.

111. A full air suspension lowering system for the rear axle will be fitted, including any chassis reinforcement required. The Supplier will be fully approved by the system supplier to fit the equipment and to provide support during the associated Warranty period.

112. A mechanism must be fitted to the rear doors, to hold the doors open at 90 degrees. The design must not affect the integrity of the Base Vehicle doors, hinges or mountings.

113. An electrically operated bariatric compact inboard access ramp will be fitted to the rear of the vehicle and will give an angle of no more than 12 degrees, allowing unrestricted access. The total area of the ramp will be covered with replaceable and maintainable anti-slip material, including any stainless steel. When not in use,

the ramp must fold flush with the vehicle floor.

114. Manual operation of the ramp must be possible in the event of mechanical failure; exchange from mechanical to manual should take no longer than five minutes. High visibility markings must be fitted around the edge of the ramp and visible when it is deployed. No working components should be exposed to the elements.

115. The ramp controls will be linked to the air suspension, so the vehicle is lowered when the ramp is deployed and raised when the ramp is retracted.

116. A single speed bariatric stretcher winch (with a minimum safe working load of 500kg) will be fitted, with a wander lead positioned at the rear doors and a pendant control to operate the winch, air suspension and ramp, with each button clearly labelled. The winch strap will not damage the floor when in use, should be in a high visibility colour and of a flat woven construction, and with a breaking strain rated to the maximum loading of the bariatric stretcher. A rated and appropriate attachment to the stretcher will be supplied and based on two carabiner connections attached to the winch via a seat belt mechanism, which attaches to the stretcher as per the stretcher manufacturer's recommendations.

117. The winch will have an auto shut off to prevent it from operating when fully stowed and the full out spooling of the winch strap.

118. Warning red LED lights must be fitted to all doors, to warn moving traffic around the vehicle that a door is open.

119. Suitable illumination to entries will be provided; this is turned on through door activated micro-switches. To provide a combined puddle, alley and blue lights will be fitted above the driver and passenger doors.

120. Nearside, offside and rear scene lights that can be switched on independently will be provided. Scene lights must be switched off when road speed is above 10mph. Scene lights will be positioned on each rear door to illuminate each rear corner of the vehicle and to aid reversing – all scene lights need to come on when reverse gear is selected and the vehicle's headlights are on.

121. Nearside and offside 45-degree alley lights will be mounted above the driver and passenger doors.

## Floor construction

122. The floor will be constructed from robust, strong and durable material to withstand the demands of regular use and with due consideration of the weight of the conversion, the equipment and the people on it.

123. The floor covering will be made from a light-weight single piece with its edges sealed to make washout easy and to enhance infection control. It must be non-slip and have anti-soiling properties that comply with BS EN ISO-11378-2, and anti-bacterial/fungicidal properties. It must be resilient enough to withstand high wear rates and will meet all relevant requirements of BS EN 13501-1:2007+A1:2009, and BS EN 13845:2017, and all relevant tests within those standards.

124. The underside of the floor panel will be coated with suitable underseal protection.

125. The wheel arch sections will be treated with suitable stone chip protection.

## General design

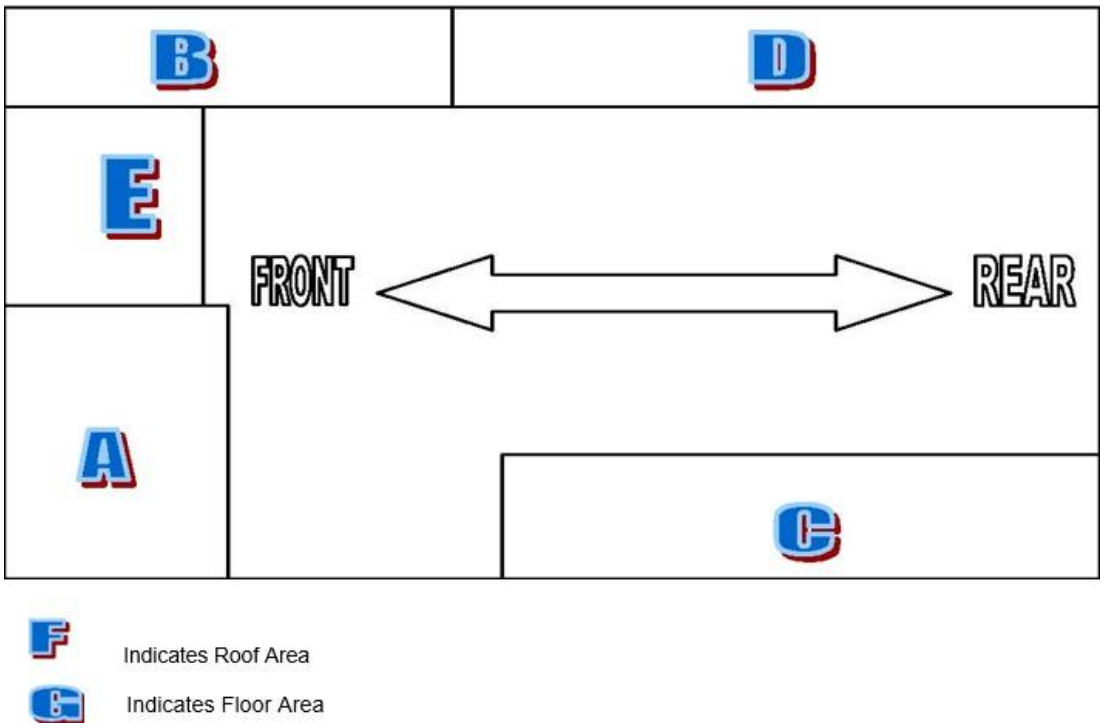
126. Figure 1 below divides the saloon into seven indicative zones.

127. Within this layout the Authority has three options for the location of the defibrillator, the provision of piped nitrous oxide + oxygen, and the secure ventilator quick release bracket. The options are clearly stated and link to section K of this Specification.

128. The options shown below should be used as the base point for the specification.

- **Defibrillator:**
  - located on top of the cabinet in Zone A
- **Piped nitrous oxide + oxygen:**
  - no piped nitrous oxide + oxygen required
- **Ventilator:**
  - provision and fit of a secure ventilator quick release bracket and associated power supply

**Figure 1: Saloon layout**




## Zone A

129. This zone will comprise a single cabinet that includes the following:

a. Storage for equipment and bags that need to be quickly accessed. These items must be accessible through both the vehicle side door when open and through doors from inside the vehicle (without a make ready system). The storage facility must have open shelving when accessing from the side door with a quick release retention strap to avoid bags falling out when the door is opened. This area will hold response bags, oxygen and resuscitation equipment.

b. The cabinet will include a locker to hold personal protective equipment (PPE) equipment and a slide out tray across the width of the cabinet with a 10mm lipped edge to avoid items rolling off. The slide out tray will contain removable and adjustable compartment dividers.

c. Communications equipment will be fitted in a cupboard at the bottom of the cabinet and be inaccessible by crews (therefore no make ready system). It should be ventilated as required and slide out of the cupboard, with adequate cabling, to allow for maintenance. The construction should be

designed to prevent fluid ingress.

d. The top of the cabinet will have a 10mm raised lip to prevent items rolling off and be reinforced, if required, to hold a defibrillator.

e. If the Authority selects this Option, space will be provided on top of the cabinet for a defibrillator with a 12-lead ECG monitoring facility, with the screen facing into the saloon centre and appropriate power supply. The alternative Option is provided in section K.

f. Space will be provided for an Electronic Patient Report Form device. Brackets and equipment will be supplied by each Authority but fitted by the Supplier alongside appropriate power outlets.

g. Stainless steel (or lightweight alternative with the same protective properties) wear plates will be fitted to the bag storage area and top of the cabinet.

h. The single speed bariatric capable stretcher winch shall be fitted in a cupboard at the bottom of the cabinet. There is no requirement for a make ready system indicator.

130. A specialist 24-hour emergency time manager LED clock, specifically designed to assist the crew with time critical clinical interventions and operations, will be installed on the bulkhead within easy reach of crew members. It will be directly connected to the vehicle's electrical system and protected against any harmful changes to voltage conditions.

131. A polycarbonate lidded locker construction will be fitted above the sliding door to hold four boxes of disposable gloves and a box of wipes, each with its own access hole.

132. A grab rail will be fitted from the top of the storage locker to the top edge of the sliding door aperture to ease entry and exit from the vehicle through the sliding door. A weather shield screen, made from polycarbonate material with an obscuring covering and the NHS logo, will be fitted between the bulkhead wall, the top of the storage cabinet and the top edge of the sliding door aperture

133. A covered 300mm paper towel holder will be fixed to the bulkhead.

134. Two 12V USB outlets (one type A and one type C), suitable for rapid charging of mobile devices, will be provided on the bulkhead above the cabinet such that any

devices charging can rest on the surface of the cabinet.

135. A horizontally centred cupboard will be built into the over cab area with access via a solid door that is fitted with two gas struts to hold it open.

## Zone B

136. A low-level storage construction will run along the side of the vehicle from the bulkhead at the side of the attendant seat in Zone E, through Zone B and to the cabinets in Zone D. The sealing of all locker doors, lids and joints in this construction will prevent fluid ingress as much as possible, with lift-up lids having an overlap with the adjacent surface. All lift-up lids will be operable with a single hand and have a retaining system to hold them open during use. This construction will house the following:

    a. A 7L capacity UN type approved rigid domestic waste container capable of accepting a plastic liner at the head end. The container (and any shelving) will be removable to allow thorough cleaning, clearly marked ‘Domestic Waste’ with a black colour reference and adjacent to the attendant seat.

    b. A 7L capacity UN type approved code orange rigid clinical waste container capable of accepting a plastic liner at the head end. The container (and any shelving) will be removable to allow thorough cleaning and will be clearly marked ‘Clinical Waste’ with an orange colour reference.

    c. A 2.5L capacity UN type approved code yellow sharps bin at the foot end. The bin (and any shelving) will be removable to allow thorough cleaning and will be clearly marked ‘Sharps Bin’ with a yellow colour reference.

    d. A 7L capacity UN type approved code orange rigid clinical waste container capable of accepting a plastic liner at the foot end. The container and any shelving will be removable to allow thorough cleaning and will be clearly marked ‘Clinical Waste’ with an orange colour reference.

    e. The sharps bin and the clinical waste bin at the foot end will be in the same locker housing which will be raised to avoid needing to lean over the patient and at a comfortable height for easy use.

    f. One additional low-level locker between the head end bins and foot end bins.

137. A 1L capacity UN type approved code yellow sharps bin will be positioned on the

wall at the head end of the stretcher. It will be removable to allow thorough cleaning and clearly marked ‘Sharps Bin’ with a yellow colour reference.

138. Two piped oxygen outlets will be provided relative to patient positions. They will be clearly labelled $O_2$ and coloured pure white RAL9010. The Authority has the option to add a third outlet for piped nitrous oxide + oxygen as detailed in section K.

139. A secure ventilator quick release bracket will be fitted, and a suction unit base plate securely mounted with the electricity supply hard wired. The Authority has the option, in line with section K, not to require a secure ventilator quick release bracket.

140. A vertical pole, 30mm in diameter, will be supplied and fitted adjacent to the stretcher on the wall in front of the window for the purpose of attaching syringe pump drivers, etc.

141. A magnetic white marker board (A4 size) shall be fitted on the wall within easy reach of the rear saloon seat and be provided with two dry wipe pens, one red and one black.

142. A 2 gang 230 AC three-pin socket with twin USB outputs, a 12V DC universal DIN socket and a 12V DC cigar socket will be fitted in the same mounting panel. There should also be a switch in this panel to turn the inverter on and off with a green LED that illuminates when it is turned on. All switches and sockets should be clearly labelled, including with an ‘Inverter Status’ label with red text stating that the green light indicates the system is on and that no light indicates the system is off. Next to the three-pin socket and at the same height as the socket, there should be a prominent label stating in bold red text ‘To activate the power socket turn inverter to ON’.

143. A high-level storage construction that runs along the side of the vehicle from the bulkhead will be installed through Zones B and D to the back of the vehicle. The bottom shall not exceed 450mm from the roof and 1,560mm from the floor. Edges should be rounded as required to minimise the risk of injury.

144. A hand strap will be fitted under the high-level storage construction relative to the attendant seat in Zone E and the head of the stretcher.

145. A ‘pick and mix’ storage solution for consumables will be located under the high-

level storage solution between the bulkhead and a position before the window appropriate to the stretcher, patient position and attendant position. There should be two separate units, each with multiple compartments and each with its own lid, fastened by a side release buckle. A make ready system indicator is not required in the ‘pick and mix’ solution.

146. Two spotlights shall be mounted on the underside of the high-level storage construction to illuminate the full length of the stretcher; these can be independently touch controlled or controlled via the saloon switch control panel.

147. A grab rail will be fitted to the bottom of the storage construction above the stretcher and be of reasonable length relative to the stretcher. An additional grab rail should be provided for the patient on a stretcher to hold on to.

## Zone C

148. This zone will include two reclining and swivelling seats fitted on the left-hand side and coloured Ambla Cairnwell Grey (or equivalent) with a RAL1016 (or closest match possible) yellow piped trim around the edges.

    a. The seat closest to the sliding door will fold with its back to the side of the vehicle, enabling the attendant to sit and face the stretcher. It shall swivel and lock in both the forward-facing position and at 45 degrees from forward. When this seat is occupied it must be possible to comfortably occupy the rear seat in the forward-facing position.
    b. The second seat will fold against the side of the vehicle and lock in the forward-facing position.
    c. Both seats must have a headrest, adjustable armrests and a three-point retractor seat belt with the tongue attachment on the right side of the seat. Extra length seat belts will be provided that can secure a child seat or accommodate a bariatric patient.
    d. Seat squabs will be 470mm above the floor.
    e. An enclosure will be created for the front forward-facing seat and under no circumstances should the seat base be drilled to fix a shroud.
    f. These seats will be designed and positioned to ensure maximum comfort, accessibility and ergonomic movement, and to maximise effective care of a patient lying on a stretcher. The swivel action of both seats should be easily

operated.

g. A protective plate must be fitted to the nearside wall of the vehicle to protect the interior liner from damage by the seats.

h. The seat edges shall be fitted with protectors to prevent damage to seat covers from contact with equipment, eg stretchers and carry chairs.

149. A 35mm diameter RAL1016 yellow handle shall be placed in the recess of the sliding door window aperture to assist with closing the door. In addition, the sliding door shall have a door lock handle located centrally within easy reach of crew members, that works simultaneously with the Base Vehicle door lock handle. The Supplier shall ensure that the strength of the door is not compromised.

150. A closed storage unit, with two access doors secured by a single operation latching mechanism with slam lock facility, shall be fitted in the rear of Zone C for the storage of a spinal board, scoop stretcher, splints, carry chair and/or tracked carry chair. The solution shall be able to take and securely hold any commonly used make and model of this equipment and all required brackets/ fixings will be installed. The tracked chair needs to be stored with the tracks to the wall, the instruction for which will be clearly labelled. The unit will also house various large items of medical equipment, such as leg splints, cervical collars and a resuscitation device.

151. Maintenance personnel must be able to access the rear light assemblies.

152. A high-level storage construction that consists of two separate lockers will be fitted between the closed storage unit and the sliding door, such that it joins the construction above the sliding door. The bottom of the cupboard shall not exceed 350mm from the roof and 1,720mm from the floor. Both lockers shall have a 50mm lip on the bottom to prevent items moving.

153. A piped oxygen outlet, clearly labelled $O_2$ in blue, will be provided between the window and the overhead storage construction, towards the closed storage unit.

154. A switch control panel, as detailed in section F (Electrical switch layout), will be provided between the window and the overhead storage construction, towards the sliding door.

155. The Authority will supply, free issue, relevant communications equipment (eg Tetra

and Airways) and the Supplier will install this next to the switch control panel.

156. An anaesthetic gas scavenging system will be installed at floor level. It will be operated via the saloon switch panel with the same switch as the powered two-way vent such that both systems operate simultaneously. It will comply with the requirements of BS EN 1789:2020.

157. A wipe clean catch strap/lanyard will be fitted to tether the EPR device when in use by an attendant in the seat closest to the sliding door.

158. A digital clock, which is backlit and shows seconds, will be mounted on the wall of the closed storage unit facing into the saloon.

159. An A3 document holder will be provided.

160. One BS EN 3 compliant single use 2kg ABC 40 powder, visible gauge, controllable flow fire extinguisher will be positioned within easy reach of the rear door. The extinguisher will have a minimum seven-year life without the need for scheduled maintenance or service or any form of manufacturer overhaul.

161. A grab rail will be fitted to the bottom of the overhead storage construction above the seats.

162. The vehicle's fleet number (as provided by the Authority) will be clearly visible from the attendant seat in Zone E.

## Zone D

163. Closed gas bottle storage will be provided at the rear to accommodate two HX or F size (or equivalent) oxygen cylinders and a further closed storage provision with three positions to secure CD size (or equivalent) oxygen bottles. The cylinders are to be vertically mounted with the contents pressure gauges visible through clear windows in the doors. The solution for the larger oxygen cylinders (HX/F size or equivalent) shall minimise manual handling, eg have minimal raised lips at floor level. Brackets must be adjustable to accommodate different cylinder diameters. All closed gas bottle storage cabinetry must be vented directly to the outside of the vehicle in line with the Dangerous Substances and Explosive Atmospheres Regs.

164. Closed storage will be provided for a Mangar Elk compressor with appropriate charging point and power supply.

165. The Supplier will supply and fit a safe suitable for the secure storage of controlled drugs, with dimensions and access method (key, code or smart card) confirmed by the Authority. As a guide, Suppliers should assume a size of 180mm x 280mm x 200mm with key-only access with two keys supplied. The drug safe itself will be in a cupboard. The doors to the safe will not open beyond 100 degrees.

166. Storage shall be maximised in this area. The equipment should be easily accessible, but secure, from the patient stretcher area.

167. In line with the requirements for the oxygen system in Zone G (see below), an oxygen line pressure gauge and low-pressure warning system will be positioned on the outside of the closed storage position facing the attendant seat in Zone E where it is clearly visible from the seats in Zone C.

168. It must be possible for maintenance personnel to access the rear light assemblies.

169. Storage will be provided to accommodate snow socks that will be provided by the Supplier.

170. Storage for the stretcher battery charger and spare battery along with the appropriate charging point and power supply will be provided with easy access.

## Zone E

171. A rearward facing attendant seat with fore/aft adjustment will be fitted at the head of the stretcher. This will be an all-ages seat and have a seat belt configuration with Isofix fitting. Padded panels will be provided for head protection. The seat will be coloured Ambla Cairnwell Grey (or equivalent) with a RAL1016 (or closest match possible) yellow piped trim around the edges. The seat squab will be 470mm above the floor with seat edges protected from damage from contact with equipment.

172. A screen will be installed in the bulkhead wall (either in Zone A or Zone E) and display footage from all external CCTV cameras simultaneously. The screen will be active when the vehicle is switched on with the handbrake on.

173. Storage, and appropriate power supply and wiring, for the auxiliary batteries will be provided under the attendant seat. There should also be a high current plug connector for critical care transfer trollies on a retractable 1.5m lead.

174. The vehicle’s fleet number (as provided by the Authority) will be clearly visible above the bulkhead window.

175. A clearly labelled CCTV recording indicator will be installed on the bulkhead, with a LED illuminating when the CCTV is recording.

## Zone F (interior roof)

176. Two specialist infusion bag holders will be provided on the roof or on the underside of cupboards above the stretcher. They should be equally spaced along the length of the stretcher and each capable of holding two fluid bags. They should be designed to minimise injury from any strikes and recessed in the appropriate panel to reduce the risk of head strikes but still allow easy use of the infusion bags.

177. A full-length CCTV activation strip will be fitted in the roof lining above the stretcher. This will activate a voice warning in both the cab and the saloon stating that the system has been activated, as well as activating the internal CCTV. Additional strips will be positioned adjacent to and within easy reach of the seats in Zone C. This system must have a cancel button in the cab area that is within easy reach of the driver.

178. A powered two-way vent, with extract and intake fan, will be installed. It will be operated via the saloon switch panel with the same switch as the anaesthetic gas scavenging system such that both systems will operate simultaneously. It will comply with the requirements of BS EN 1789:2020.

179. Air conditioning outlets, including directional and shut off adjustments, will be inserted relative to each seat position and the stretcher.

180. Overhead LED lighting will be positioned to illuminate the saloon and will activate when any saloon door is opened for a period of 30 seconds. The lights will then switch off unless they are activated via the saloon switch panel. The lights will be dimmable and provide a blue trauma friendly function via the saloon switch panel.

181. All lights in the patient compartment will be recessed or flush fitted.

182. Automatic overhead lighting will be provided at all door entrances in the saloon. This will switch on when the door is opened and off when the door is closed.

## Zone G (interior floor)

183. The saloon floor must be constructed and covered as per section E (Floor construction). It must be laid with coving wherever possible and have reinforced corner radii. All floor covering edges will be sealed.

184. The floor will be Polyflor Woodland Grey 4770 Dementia Flooring or equivalent.

185. The Supplier will install one mechanical stretcher fixation device and associated stretcher provided by the Authority. The locking will be strategically positioned to accommodate an emergency stretcher (including bariatric), an incubator and a critical care trolley, and with space for the attendant to walk between the stretcher and side seats when these are stowed. The stretcher fastening must be the fastening recommended by the stretcher manufacturer for the specific product used and tested to the stretcher safe working load.

186. A guide block shall be fitted to the floor to help guide the stretcher into the locks and to protect the cabinetry where required from damage.

187. To accommodate a critical care trolley, any cabinetry or mounted equipment must not encroach the stretcher footprint.

188. Four independent fixation devices will be supplied and fitted in the floor (flush fitting and easy fit) at the foot end of the stretcher to secure the aortic balloon pump.

189. All floor level cabinetry in Zones C and D will be protected against impact damage to a height of 400mm. The cabinetry in Zone B will be protected from damage by the stretcher.

## Oxygen system

190. Three piped oxygen outlets will be provided, two positioned in Zone B, one in Zone C relative to patient positions.

191. A manual oxygen change-over valve will be incorporated in the system with an in-line pressure gauge positioned in Zone D where it can be easily seen from any seat. The Authority has the Option to request an automatic oxygen change-over valve is installed, which will include a low pressure warning alert, have a test function and make it possible to override the automatic function so that cylinders

can be manually switched.

192. All inlet fittings on regulators and equipment used to connect medical gas cylinders, including oxygen and nitrous oxide + oxygen (where required), must be in accordance with BS341 and ISO407 as applicable. The supply systems and associated pipework should comply with the appropriate requirements of the Pressure Systems Safety Regulations 2000 and should meet the requirements of BS5682, and the piped medical gases in ambulance vehicles Health Technical Memorandum 2022 Supplement 2.

193. Access must be provided for the maintenance of the piped gas installation.

## Climate control

194. The Supplier shall provide and fit an electronic climate control system which allows the user to define the temperature setting in the saloon area, in increments of 1 degree. The temperature range must be, as a minimum, 16 to 28$^{o}$C. The Base Vehicle is supplied with climate control in the cab and with the ability for aftermarket fitment of climate control in the saloon.

195. The electronic climate control system in the cab and in the Base Vehicle must be capable of being separately and independently controlled.

196. The climate control system must be linked to the power management system, which allows the climate control system to operate when the engine is running or the vehicle is operating on run lock.

197. Four air flow vents will be provided in the internal ceiling panel to evenly distribute the conditioned air and positioned relative to the stretcher and the seats.

198. The air conditioning evaporator will be mounted in the roof at the rear (evaporator drain off pipes to rear) of the saloon with an access panel for maintaining the system.

199. A saloon heater will be installed that operates when the vehicle is plugged into a shoreline. It must be possible to maintain the saloon temperature at an adjustable parameter up to 15$^{o}$C.

## Electrical control

200. An electronic electrical power management control system shall be provided using

CAN bus or other suitable technology. This shall control auxiliary circuits and batteries including chassis, assist with fault PC-based diagnosis through a gateway test nodes (mini central processing unit) and provide a sequenced load facility to ensure all vehicle batteries retain a charge status of more than 30% of their rated capacity. It shall be a requirement for this system to interface with and be able to send and receive data from the chassis CAN bus or alternative system and interface to the Authority's MDT solution. This shall provide telematics information such as battery status, vehicle controls activation and emergency controls activation.

201. A dedicated emergency start facility will be provided that is controlled via a cabin button easily accessible to the driver. This can be connected to battery bank 2 – auxiliary batteries; these must have a minimum cold cranking amp (CCA) of 185A and a five-second cranking ability of at least 500A.

202. The Base Vehicle manufacturer's battery will supply the originally designed electrical loads. The battery system shall be split into three independent banks: battery bank 1 shall consist of the chassis manufacturer's original starter battery; bank 2 shall support all additional ambulance auxiliary electrical loads with the exception of communications and be a minimum of 104Ah capacity (20-hour rate); and bank 3 shall support communications and computer equipment and be a minimum of 86Ah capacity (20-hour rate).

203. Heavy duty, cyclic, thick plate AGM (absorbed glass matt) batteries shall be installed for both battery banks 2 and 3. These shall be of a matched type. The minimum battery storage must be 20% greater than the maximum load calculation; batteries must be suitably vented.

204. An appropriate magnetically latching battery isolation contactor shall be fitted to allow the isolation of all battery banks in an emergency. An appropriately marked and illuminated switch shall be installed on the dashboard, away from the normal reach of the driver, to facilitate its remote operation. A discrete switch shall also be located in the passenger seat base to allow a maintenance engineer to isolate the battery system. The battery isolation system shall be ignition inhibited to prevent accidental isolation while the vehicle is in motion.

205. A split charging system shall:

- be installed to allow the vehicle alternator to provide optimum charging of batteries based on their individual requirements, to charge all three battery banks when the vehicle is in motion or the mains powered on-board charger to replenish all three battery banks while the vehicle is connected to a landline supply
- be factory set to engage and combine all battery positives when the DC voltage of either battery bank 1 or 2 rises to 13.1V DC. This voltage shall be adjustable
- disengage, isolating the three battery bank positives from each other if the combined voltage of the battery system drops to 12.4V DC (this shall also be adjustable)
- have an adjustable hold facility to allow a time buffer to be introduced to prioritise charge more toward battery banks 2 and 3 through the life of the ambulance as the health of the batteries deteriorates
- be dynamically self-adjusting to prevent nuisance split charge engagement and disengagement due to intermittent fluctuations in system voltages
- provide 12V outputs when split charging is engaged/disengaged for the purpose of driving/controlling warning lights or external relays.

206. Battery banks 2 and 3 shall be protected from being flattened. If the DC voltages of these battery banks drops to 11.7V DC and remains below that threshold for more than two minutes, then the supplies from the batteries shall be isolated. The electrical supply shall be automatically reactivated when the vehicle engine is started or split charging is engaged (for instance by the mains charger). The flat battery protection system shall be ignition inhibited to prevent isolation while the vehicle is moving. The system shall provide a number of 12V outputs when isolated and non-isolated for the purpose of driving/controlling warning lights or external relays. A low voltage detection system is required to alert the driver to the charge status. This shall provide a staged shut down according to priority load sheading.

207. All auxiliary electrical loads on the Ambulance shall be run from a post battery, load management system (PMS). This system shall be approved and agreed with the Authority. The load management system shall take its power from, but operate independently of, the split charge, emergency start and flat battery protection systems. The PMS must sense and control the batteries' load and when detecting

a battery voltage of 12V start a load shedding sequence that shall protect the battery power by progressively isolating circuits (excluding essential life-threatening ones). These shall be agreed with the Authority. Should load shedding start, the vehicle's voice activation system shall advise the driver of this and, if applicable, for them to start the engine.

208. All auxiliary batteries must be positioned in suitable lockers that are easily accessible for maintenance purposes; they **must not** be located in the vehicle cab.

209. Batteries must be as light weight and energy efficient as possible with due regard to the commercial impact.

210. Electrical circuits shall be controlled by either separate switches or the PMS.

211. The Supplier will provide a speed and rev limiting device that shall prevent the vehicle from being driven uneconomically under non-emergency conditions. This system shall have an automatically linked inhibiter that switches the system off when the blue lights are on to enable the vehicle to be driven unimpeded while on emergency response. This will be included in the conversion only if it can be done for minimal cost, with this cost to be highlighted in the bid document.

212. A voice message shall be installed that indicates when the batteries are becoming low or load shedding is starting and any exterior door is open. This must be protected from being disconnected by ambulance crews.

213. A battery charger with an output of no less than 60A @ 12V DC shall be fitted to the Ambulance in an appropriate location for the purpose of charging the vehicle batteries when stationary. It shall operate at full power from a mains input voltage window of 100–260V AC/45–60Hz. The charger shall be fully automatic in operation with a minimum of a three-stage charging curve. It shall be adjustable to charge sealed lead-acid, calcium/calcium lead-acid and AGM batteries at the correct voltage settings. It shall be power factor corrected for efficient operation from the mains (in particular voltage transformers). The charger shall provide a visual indication of charging status as well as any faults. The charger shall house a LED charging light.

214. The Ambulance shall be fitted with an external waterproof 110V mains input socket mounted in an agreed location complete with tell-tale light to confirm the

power supply. There is also the option to add an additional 240V external waterproof mains input socket or to have only a 240V socket. A mechanism shall be installed to prevent the Ambulance being driven with the mains input still connected. The mains output from the socket on-board the vehicle shall be wired through an earth leakage device (RCCB) mounted in an appropriate enclosure. The mains supply shall also be prevented from overload by installing a MCB (miniature circuit breaker). A combined MCB/RCCB (RCBO) could be used. The RCCB/RCBO must have an earth leakage trip current of 30mA. The RCCB/RCBO shall be mounted as close as possible to the incoming mains supply on the vehicle. Mains protection devices shall conform to the following standards: RCCB BS EN 61008, RCBO BS EN 61009 and MCB BS EN 60-898.

215. There must be at least a 200mm loop of free wire at all switches and components to make their removal easy.

216. In total there shall be six 12V power points protected at 15A and two 12V 50A terminals suitable for incubator and balloon pump units.

217. A DC to AC power inverter must be fitted with a minimum output of 2,000W @ 25°C ambient. The output must be 230V AC (RMS ± 3%), 50Hz (± 0.05%), pure sinewave (max 3% THD). The inverter must be self-protecting against overload, short circuit, over temperature and low DC input voltage. A panel to allow the inverter to be switched on and off remotely shall be installed in an agreed location. The inverter will be fitted with a protective cover to prevent unauthorised access to wiring components. The invertor will power off one hour after no load has been sensed or when on shoreline. All DC supply cabling will be of appropriate rating and fused to exceed the maximum current draw of the inverter under full load by 10%.

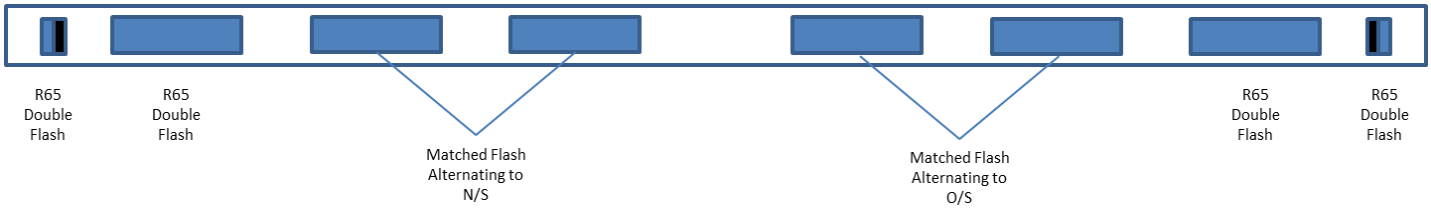
218. The 230V AC mains output from the inverter shall be run through an enclosed RCCB and MCB or RBCO. The RCCB/RCBO must have an earth leakage trip current of 30mA. The RCCB/RCBO shall be mounted as close as possible to the inverter output. If neutral and earth are not bonded inside the inverter, this shall be completed prior to the RCCB/RCBO.

# F. Emergency lighting and switches

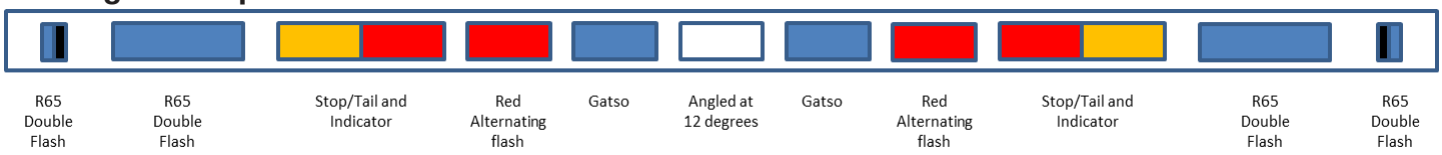
219. All lights will be latest generation LED with maximum light for minimum voltage and incorporated into front and rear aerodynamically profiled pods to reduce their impact on the aerodynamics of the Base Vehicle.

220. A low profile aerodynamic front light bar and rear light bar will be provided and installed to the specification below. Both light bars will be 58 inches in length.

**Front light bar specification**




**Rear light bar specification**




221. High-level blue lights that emit light through 360 degrees around the ambulance body will be fitted.

222. Two high-level rear red lights with an interlock to the handbrake (to prevent operation while the vehicle is moving) and a dashboard warning light will be fitted.

223. Two grill mounted blue flashing lights and two side-facing, wing-mounted blue flashing lights will be fitted, activated with the 360-degree blue light system.

224. An alternating headlight flash (HLF) will be fitted and use only the Base Vehicle headlights on high beam, activated with the 360-degree blue light system but wired so that it cannot be operated by Base Vehicle sidelight or headlight activation.

225. A front number plate plinth with blue flashing lights from each side will be installed

and activated with the 360-degree blue light system.

226. Two blue flashing lights will be fitted at the rear of the vehicle in the line of sight of a car driver behind the vehicle, activated with the 360-degree blue light system.

227. Multifunctional lights will be fitted above the cab doors to give puddle, alley and blue flashing light.

228. Red LED lights will be positioned in all door apertures to be visible from the rear of vehicle when the doors are open.

229. A speed enforcement camera identification blue light will be fitted to the rear and activated with the 360-degree blue light system. This is referenced as ‘Gatso’ in the rear light bar specification diagram above.

230. A UK Civil Aviation Authority CAP168 compliant low-profile amber beacon lamp will be installed on the vehicle roof. This will be activated via a clearly labelled switch adjacent to the steering wheel.

231. All Supplier-fitted accessories will be fed directly from the Base Vehicle manufacturer’s electrical interface. Items that function only in conjunction with sidelights or ignition will be powered by relays activated by an appropriate vehicle system.

## Electrical switch layout

232. The Ambulance will be fitted with a solid-state electrical control unit controlled programmable multiplex electrical management system, with associated switch panels, to control the auxiliary systems and provide a load management solution. All electrical backboards/systems will have access panels for viewing system integrity and easy access for resetting as required.

233. A switch control panel will be provided in the cab and in Zone C. The cab switches will be housed in a one-piece panel that provides touch control, and this mounted in the roof pod, in the centre and angled to make it easy to see the controls. The switch panel facia in both the cab and Zone C will have infection control barrier covers and be silicone sealed to prevent fluid ingress.

234. The following list describes the functionality of the cab switch control panel and the

rear saloon switch control panel. Navigation between the two panels will be provided via a menu option and thus they can be operated from each position. The number and layout of the switches should be designed for ease of operation and simplicity.

a. Cancel all mode (cab panel).

b. Override mode (cab panel): after load shedding the override mode will enable the 360-degree blue lights and limited interior lights to operate until the battery is fully depleted (even though this may well mean that the battery needs to be replaced).

c. Pre-check sequence (cab panel):

    i. five seconds after activation with ignition and the handbrake on, each function that can be visually inspected is activated, individually and in a predetermined order, to allow its inspection. All mode functions will be checked and a warning given if defective

    ii. this ‘health check’ links to the telematics technology.

d. Low power function (cab panel): reduces light output to the front blue lights which will be used in darkness and mist/fog, to prevent reflective light glare for crews and to reduce dazzling for other road users.

e. 999 mode (cab panel): activates all emergency lights, the siren and HLF.

f. Rear emergency lights (cab panel): activates rear emergency lights only, including the flashing reds.

g. Arrive scene mode (cab panel):

    i. deactivates all emergency lighting, sirens, HLF and the 999 function, but not other functions

    ii. the ignition security feature is activated first, allowing the driver to remove the keys and securely leave the engine running; depending on the specification the engine rpm may increase from idle. If the handbrake is released, the engine stalls or the vehicle moves when the system is activated.

h. Leave scene mode (cab panel): activates saloon lights, grill lights, wing lights and HLF.

i. Arrive hospital mode (cab panel): deactivates emergency lighting and 999

function and activates saloon lights that switch off if the vehicle is stationary for 20 minutes (plip key operation can override this).

j. HLF (cab panel): activates the HLF. This can only be selected when the side lights are off and is otherwise disabled.

k. Left scene/alley light (cab panel): activates the 45-degree left scene light and alley light (lights to switch off above road speed of 10mph).

l. Right scene/alley light (cab panel): activates the 45-degree right scene light and alley light (lights to switch off above road speed of 10mph).

m. Rear scene light (cab panel): activates the rear scene lights (lights to switch off above road speed of 10mph).

n. All-scene light (cab panel): activates all scene lights when the handbrake is on and the vehicle is stationary.

o. Saloon-light master (cab and saloon panels): activates the saloon light dimming device.

p. Siren (cab panel): activates the siren.

q. Left saloon lights (saloon panel): activates the left saloon lights and deactivates the saloon light dim.

r. Right saloon lights (saloon panel): activates the right saloon lights and deactivates the saloon light dim.

s. Saloon light dim (saloon panel): activates the saloon dim lights.

t. Stretcher light bright (saloon panel): activates the above-stretcher spotlights.

u. Climate control (cab and saloon panels): activates and deactivates the saloon climate control system.

v. CCTV (cab and saloon panels): activates the CCTV record function.

w. Roof intake (saloon panel): activates the intake function of the powered two-way vent.

x. Roof extract (saloon panel): activates the extract function of the powered two-way vent.

235. Five spare outlets will be provided.

236. A run lock activation function that is independent of all the functions mentioned above will be provided.

237. A battery link emergency start function will be provided.

# G. Communication system

238. The Authority will provide all aerials and antennas, radio equipment, location equipment, servers, MDTs and associated cabling. The Supplier shall install all equipment, including suitably fused power feeds, up to the point of final fix of the front-end terminals, which should be prepared for final commission by a technical specialist from the Authority.

239. All communications systems will be routed to the communications system cupboard at the bottom of the cabinet in Zone A. This should be inaccessible to crews (therefore no make ready system), ventilated as required and slide out of the cupboard with adequate cabling to allow for maintenance. The construction should be designed to prevent fluid ingress.

240. The Supplier shall fit a secure mounting for the Electronic Patient Report Form (ePRF) device in Zone A with aerial and power cables routed as required.

241. The Supplier shall supply and fit a suitable mounting system for the MDT/tablet in the upper central dash area over the Base Vehicle entertainment radio system; one that enables the MDT/tablet to be moved to allow the operation of the Base Vehicle entertainment and climate systems from both the driver and passenger seats.

242. All cable ends, antennae ground planes, radio wiring and vehicle location wiring will be accessible internally via inspection covers in the module roof of a minimum diameter of 100mm. There should be at least 0.5m of antenna cable so that it is not taught at any antenna position within the roof. Cabling from the antenna will be fed to the relevant equipment via a conduit path of at least 20mm internal diameter and include at least 1m of free cable.

243. The Ambulance shall have at least a 50A power supply to the radio and GPS vehicle location equipment, directly fed from the communications battery. This must be connected to two six-way fuse boxes, one positive and one negative, located in the communications systems cupboard.

244. The Ambulance shall have at least a 15A rated ignition switched positive feed to the positive six-way fuse box.

245. The Authority will provide three antennas, one Dual GPS/Tetra antenna, one MIMO antenna for the data terminal and one P25 low-profile antenna for the ePRF solution. The associated twin co-axial cables will be appropriately and differently routed from the front and the rear antenna points.

246. All antennae mounts must be correctly earthed, with the metal exposed on the inside of the roof and not tightened over the inside painted surface.

247. As an indication, the maximum size of one of the Authority's vehicle location equipment boxes is approximately 500mm x 450mm x 200mm.

248. A technical specialist from the Authority will work with the Supplier to agree the precise location and cabling routes for all communications equipment.

249. The Ambulance Radio Programme (ARP) is a Department of Health and Social Care programme to replace the existing mobile communication systems in ambulance trusts with new digital services. The programme has contracted Terrafix Ltd to deliver the replacement mobile communication system. To minimise operational disruption, when supplying communications equipment to Suppliers as part of this Contract, the Authority has the option to supply the cabling to pre-wire vehicles in preparation for the ARP transition as well as that for the existing communications system, and to request that the Supplier installs both sets of equipment.

# H. Vehicle inventory and flexibility

250. While the Conversion itself is to follow the requirements stipulated, the Authority will provide details of the specific equipment and consumables carried, and their positioning in the standardised zones prescribed, until a national common standard equipment and consumables load list is developed.

251. The authority will provide all medical equipment and associated brackets unless specifically noted otherwise in this Specification. The Supplier is required to install the equipment and/or brackets provided by the Authority as part of this Specification, including the provision and installation of any associated electrical supply/wiring. The Authority may ask the Supplier to supply additional equipment, subject to separate, individual agreement between the Authority and Supplier.

252. The Authority may mutually agree with the Supplier minor amendments to this Specification in the course of sign off of the final build design. These shall not significantly alter the Specification or price and must not result in the vehicle failing to meet any of the requirements of this Specification.

253. Once finalised, a Minor Amendments Schedule for each order from the Authority, including details of the amendments agreed and their price impact, will be provided to the National Contract Manager.

254. The requirements regarding weight allowances are shown below:

| Item | Quantity | Unit weight (kg) | Total weight (kg) |
|---|---|---|---|
| Driver | 1 | 75 | 75 |
| Passengers | 4 | 75 | 300 |
| Patient on stretcher | 1 | 75 | 75 |
| Medical equipment (including stretcher) | 1 | 300 | 300 |
| Medical equipment fixings | 1 | 30 | 30 |
| Communications equipment | 1 | 30 | 30 |
| **Total weight allowance** | | | **810** |

# I. Vehicle markings and livery

255. All markings will be in the universally recognised format:

- hazard warnings – black lettering on a yellow background
- mandatory instruction – white lettering on a blue background
- prohibition signs – white lettering on a red background
- exit/safe condition signs – white lettering on a green background
- equipment location signs – red lettering on a white background.

## Exterior vehicle markings

256. Details of the required Battenberg markings and other insignia are provided in the Livery section below.

257. The following markings, in a suitable polyester base under printed film, shall be applied:

| | |
|---|---|
| Patient Assessment sign on side and rear doors adjacent to the handle |  |
| 100 mm CLP Regulation hazchem sign for compressed gas on rear door |  |
| 100 mm CLP Regulation oxidising agent sign on rear door |  |
| Battery acces sign in 12.5mm red lettering on white background on compartment panel | **BATTERY ACCESS** |

| | |
|---|---|
| Multi-hazard warning on compartment panel - 'Danger Battery Charging Area, Wear Personal Protective Equipment, No Smoking, No Naked Light |  |
| Diesel Only sign in 12.5mm red lettering on white background adjacent to the fuel filler | **DIESEL ONLY** |
| Warning triangle adjacent to the Diesel Only sign adjacent to the fuel filler |  |
| Pull to Open sign on hinged doors above the door handle |  |
| Pull Handle and Slide Open on the sliding door above the outer door handle |  |
| Tyre Pressure sign in 10mm black lettering over each front wheel arch. Note: pressure to be agreed after weight testing and with approval of the tyre manufacturer | **TYRE PRESSURE ## PSI** |
| Tyre Pressure sign in 10mm black lettering over each rear wheel arch. Note: pressure to be agreed after weight testing and with approval of the tyre manufacturer | **TYRE PRESSURE ## PSI** |
| Wheel Nut Torque sign in 10mm black lettering over each wheel arch. Note: torque to be agreed | **WHEEL NUT TORQUE ## Nm** |
| 75mmx15mm gauge numbers surrounded by a box 200x100x5mm gauge, central to the front over cab area, towards the windscreen top, and r/h rear towards the right side, below r/h rear door window. Contracting Authorities to confirm fleet numbers. | 1234 |
| Caution Battery Charging notice 90mm x 110mm with black print on yellow background to be attached adjacent to the mains charging point |  |

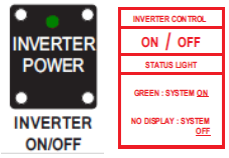
| | |
|---|---|
| Imagine and sound recording notices 90mmx110mm to be attached such that they are clearly visible when entering the vehicle via any door |  |
| At their own cost, a converter may attach a logo, no larger than 100mmx75mm, to the bottom-right of the offside rear door and towards the bottom of each cab door. | Converter logo |

## Interior vehicle markings

258. The following markings, in a suitable polyester base under printed film, shall be applied to firm surfaces where possible:

| | |
|---|---|
| Pull to Open sign on hinged doors above the door handle |  |
| Pull Handle and Slide Open on the sliding door adjacent to the inner door handle |  |
| Nationally recognised 'No Smoking in this Vehicle' signs to be clearly visible, one within the cab, one within the saloon |  |
| ‘Seat belts must be worn’ signs to be clearly visible from all seats in both the cab and saloon and include a BS5378 compliant blue 83 mm × 100 mm pictogram |  |
| Caution Mind your Head' above all doors in the cab and saloon |  |
| Seat must face forward when travelling sign with red 10mm text on white background with red trim, next to the front seat in Zone C |  |
| Emergency Exit on side and rear doors |  |

| | |
|---|---|
| Break Glass with Hammer Provided on the nearside sliding door window and the rear windows |  |
| Fire equipment sign adjacent to each fire extinguisher, highlighting its location and appropriate use |  |
| 100 mm CLP Regulation hazchem sign for compressed gas on gas compartment door |  |
| Stop Abuse' placards to be placed in a prominent position on the bulkhead and on both side walls |  |
| Hot Air Outlet sign adjacent to the saloon heater outlets |  |
| Air Inlet Keep Clear sign adjacent to duct |  |
| A GDPR compliant CCTV warning sign to be located in clear view opposite the saloon side door. Each Contracting Authority to provide the required details. |  |
| Imagine and sound recording notices to be attached to the bulkhead, side walls and inside of rear doors and be clearly visible |  |
| A plaque showing vehicle dimensions (in metric and imperial) to be position in the fade out area of the windscreen above the driver. Example provided with measurements to be confirmed post product design. |  |

| | |
|---|---|
| 5mm red letters on white background 230v AC directly adjacent to, or on, the 13amp socket. | **230v AC** |
| 10mm red letters on white background DOMESTIC WASTE ONLY adjacent to container. | **DOMESTIC WASTE ONLY** |
| 10 mm red letter on white background CLINICAL WASTE ONLY adjacent to container plus pictogram biohazard symbol | **CLINICAL WASTE ONLY**   |
| 10 mm red letter on white background SHARPS ONLY adjacent to container plus pictogram biohazard symbol | **SHARPS ONLY**   |
| Inverter Status label, 45mmx60mm, adjacent to the green LED (clearly labelled) that illuminates when the inverter is on |   |
| Activate power socket turn inverter on instruction label, 45mm x 60mm, adjacent to the 2 gang 3 pin socket |   |
| Wedge ramp operating instructions to be supplied by the wedge ramp manufacturer and affixed near to the control panel | To be supplied |
| Isolator Switch label in 12.5mm red lettering adjacent to the switch | **ISOLATOR SWITCH** |
| Tiger strip ant-slip floor markings to be fitted at floor edge next to entry/exit points. |  |
| Caution mind the step in a conspicious location next to entry/exit points. |   |
| All lockers to have contents identification labels applied to each locker in blue lettering on white background with a blue border. Each Contracting Authority to provide relevant details. |   |

| | |
|---|---|
| In front of the passenger seat in the cab on the windscreen outside the windscreen wipers swept area and so as to not obstruct the driver's vision but clearly visible, "Caution Airbag Hazard Do not place feet on dash" |  |
| Oxygen Outlet | $O_2$ |
| Nitrous Oxide + Oxygen Outlet | $N_2O$ |
| Other labels required are detailed throughout the specification and should be red letters on a white background with a red border |  |

## Livery

259. Battenberg livery will be provided and fitted in line with current guidelines and legislation, including the guidelines published by or for the Association of Chief Police Officers. Livery should also meet NHS branding guidelines.[1]

260. The Supplier shall provide all livery applied and all markings must be applied and positioned consistently across all vehicles supplied.

261. All Ambulances shall be supplied with a Livery Kit Identification Label located on the driver's seat base and under the bonnet. This is a specific reference number to enable prompt reordering of any additional/replacement livery. The livery provider will warrant to the Supplier that any orders for additional/ replacement livery from the Authority must be delivered within two working days of order.

### Regulations

262. The use of reflective films and design of livery must comply with the relevant Vehicle Lighting and Safety Regulations, including Regulation 11 of The Road Vehicles Lighting Regulations 1989 and the Variation Order to Section 44 of the Road Transport Act, 1988.

[1] https://www.england.nhs.uk/nhsidentity/examples/nhs-emergency-ambulance/

## Materials

263. The livery must:

    a. be made from micro-prismatic reflective material
    b. be made from a high-performance material
    c. be of non-metallic construction to avoid corrosion
    d. have auto edge sealing on cuttings on all sections
    e. have minimal application of mixed materials.

## Warranty on livery

264. The livery must be provided with a minimum seven-year performance warranty which includes the following:

    a. no cracking
    b. no fading
    c. no peeling
    d. no loss of adhesion
    e. no ingress.

## General application

265. Recommended manufacturer preparation and application techniques must be strictly adhered to. Inappropriate application or surface preparation could reduce the life of the material or void the manufacturer's warranty; therefore, the work must be carried out by an approved applicator.

266. The vehicle body must be thoroughly prepared prior to application of adhesive materials. This includes multiple degreasing steps with appropriate spirit to ensure good, long-term adhesion to all surfaces.

267. Where possible, all adjoining materials shall maintain a seamless surface to minimise inadvertent catching of material edges and the potential for the accumulation of dirt.

268. Storage of unused materials or packs must be to manufacturer recommendations.

## Side livery application

269. The side panels of the Battenberg must cover the entire length of the vehicle but not exceed half the total height of the vehicle. They should be positioned immediately below the lower line of the saloon window.

270. The application of the livery will start with a green panel at the midpoint of the length of the vehicle. The panel size will be chosen so that:

    a. there are seven panels in the top row
    b. the widths of each panel on the top row are equal, except for the front and rear most, which are a minimum of two-thirds the size of the main panels
    c. the height of the panels on the top row is half their length; the panels on the bottom row can be reduced height to fit/fill the side of the vehicle.

271. Fluorescent retro-reflective yellow panels will be fitted to either side of the central top row green panel, with alternating colours to the front and rear of the vehicle, ending with yellow panels.

272. The pattern will then be extended downwards, starting with a yellow panel vertically below the central green panel on the top row and extending horizontally to the front and rear of the vehicle. The bottom row may be of any height to fit/fill the side of the vehicle.

273. The material will not be folded over the edges but cut short of all edges and cut-outs.

274. In a central position above the side windows the words 'EMERGENCY AMBULANCE' will be prominent and in green. Above the words Emergency Ambulance will be the Crown Badge and the name of the Authority (in black) alongside the NHS logo and the trust form (in blue). This should be in line with the NHS branding guidelines and the example below.


275. National NHS communication messages will be displayed on the rear third of both offside and nearside side panels and on the front third of the offside side panel. It

must be possible to change these as required without damaging the vehicle, or other decals or livery. Vehicles should be supplied with the 999/111 messaging shown below on both rear panels and an NHS logo in a central position on the offside front panel, unless otherwise agreed with the **Authority**.


## Rear livery application

276. The rear of the vehicle will have a full height chevron pattern. The angle of the chevrons will be 45 degrees.

277. The material used throughout shall be the highest-grade fluorescent and retro-reflective material of width 150mm.

278. The materials will be applied as follows:

    a. The centre point of the rear panels/doors will be located, and a line drawn from this point to the outer edges of the vehicle, half height from the bottom edge of the vehicle.

    b. From the centre point, lines will be drawn to the bottom corners of the rear of the vehicle and orange strips applied below and to the edge of the lines. The strips will be cut around any vehicle fittings.

    c. Yellow strips will be applied above and below the orange strips, to the full height of the vehicle.

    d. As much of the remaining area as possible will be filled with additional strips in alternating colours.

279. In 125mm red letters, the word 'AMBULANCE' will be positioned above the rear windows.

280. In 50mm red letters, the words 'KEEP CLEAR' will be positioned midway between the lower window line and ground level, centred across the rear doors.

281. The NHS logo will be positioned in the centre of both rear windows.

282. The exterior vehicle markings section details other markings to be applied to the rear of the vehicle.

## Front livery application

283. The word 'AMBULANCE' in green (mirror image) will be positioned at the front of the bonnet, in the middle.

284. The word ‘AMBULANCE’ in green will be added to the panel above the windscreen with the NHS logo centred above it.

285. The vehicle fleet number will be applied above the windscreen as described in the exterior vehicle markings section.

## Colour and finishing

286. Unless otherwise stated, all interior surfaces in the saloon will be fully colour impregnated white, with saloon upholstery finished in Ambla Cairnwell Grey (or equivalent) with a RAL1016 (or closest possible) yellow piped trim around the edge.

# J. Compliance verification

287. The Supplier will demonstrate compliance with technical aspects of the Specification as follows:

## Body electrical power calculation

288. A body electrical power calculation test datasheet should be supplied.

289. The datasheet should include power consumption in:

    a. 999 mode
    b. arrive scene mode
    c. leave scene mode
    d. hospital arrive mode.

290. The datasheet should be based on a five continuous call basis to replicate the vehicle not being shoreline charged. The call outs should be based on:

    a. 10 minutes urban travel to incident
    b. 20 minutes on scene (with differential between engine running and engine off and run lock applied shown)
    c. 10 minutes urban travel to hospital
    d. 20 minutes at hospital.

## Body tilt and axle bias

291. A theoretical body tilt and axle bias calculation datasheet should be provided upfront with formal testing from a recognised proving ground on the initial build unit.

292. The datasheet should include:

    a. total centre of gravity
    b. calculation of axis
    c. symmetry of axis

d. height of centre of gravity
e. tilt angle
f. limiting velocity.

## Subjective handling test

293. A report, from a recognised proving ground, should be provided covering a subjective handling test on one of the first completed units by arrangement with the Authority and at the Supplier's expense.

294. The report will confirm that the following key handling issues are satisfactory:

a. steady-state cornering
b. straight line behaviour
c. obstacle avoidance
d. straight line braking
e. braking while turning
f. negotiation of speed humps without grounding
g. overall confidence and safe handling.

295. The testing will include a tilt test in which the Ambulance must achieve a minimum tilt of 38 degrees without the outside wheels losing contact with the tilt bed.

## Environmental sustainability

296. An overview of the deconstruction process and an end-of-life environmental impact assessment of Conversion components should be provided. This must conform to current legislation and applicable standards.

# K. Options

297. The Specification includes three specific points in section E (General design) where the Authority is required to state which Option is required. The alternative Options to those detailed in section E are:

**a. Defibrillator**

i. Rather than mounting this on top of the cabinet in Zone A, the Authority may choose to locate the defibrillator with 12-lead ECG monitoring facility on the wall beside the foot end of the stretcher in Zone B/D, with the screen facing into the saloon centre.

ii. In this case the Supplier will supply and fit mounting bolt points for the appropriate bracket and provide an appropriate power supply and outlet.

**b. Piped nitrous oxide + oxygen**

i. In addition to the two piped oxygen outlets in Zone B, the Authority may choose to add a piped outlet for nitrous oxide + oxygen. This should be located adjacent to the piped oxygen outlets, relative to patient position, and be clearly labelled $N_2O$ and coloured gentian blue RAL5010.

ii. If piped nitrous oxide + oxygen is required, one of the three positions for securing size CD (or equivalent) oxygen cylinders in the closed gas bottle storage provision in Zone D will be used for a size CD (or equivalent) nitrous oxide + oxygen cylinder. This will mean that the three positions are used for 2 x CD (or equivalent) oxygen and 1 x CD (or equivalent) nitrous oxide + oxygen.

iii. All cylinder brackets must be adjustable for cylinder diameter. All closed gas bottle storage cabinetry must be vented directly to the outside of the vehicle in line with the Dangerous Substances and Explosive Atmospheres Regulations.

**c. Ventilator bracket**

i. The Authority may choose not to require a secure ventilator quick release bracket and associated power supply.

297. In addition to the options explicitly referenced in sections A to J of this Specification, the Authority may require further Options as detailed below.

**d. Fire suppression system**

i. The Authority may request that a P-mark SPCR 183 compliant fire suppression system is supplied and installed in the engine compartment with automatic activation. On activation there should be an audible alert with small LED flash in the cab and the LED clearly labelled.

**e. Powered self-loading stretcher**

i. Rather than an electrically operated bariatric compact inboard access ramp and associated winch system the Authority may opt for a powered self-loading stretcher.

ii. In this case, the Authority will provide the stretcher and associated brackets and mechanisms but the Supplier will install these.

iii. As a result, the ramp and winch system and the ‘standard’ stretcher with associated brackets, locks and guides will not be required.

iv. In terms of internal vehicle markings, the wedge ramp operating instructions will not be required and will be replaced by powered self-loading stretcher operating instructions.

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