	Heating and Ventilation Control	
20.9	Blown air heating and ventilation system to both lower and upper deck where appropriate. The system should provide a good circulation of air throughout the length of the bus interior. Convection only systems are not acceptable	**M Call-off**
20.10	Fully automatic thermostatic control of the system. The thermostatic sensors should be positioned to reflect the interior, upper and lower deck temperature of the bus and be in a tamper proof location. Heated or unheated air should be circulated throughout the bus dependent on interior bus temperature.	**M Call-off**
20.11	It should not be necessary for the driver, maintenance teams or any other parties to adjust or set the heating or ventilation system during variations of temperature, such as during summer and winter periods. If engine bay "maintenance only" shut off valves are required, they must utilise an independent hand tool and not be capable of being adjusted by lever or hand operation. The system should be designed to enable a full operational check of component functions and settings in the regular service routine.	**M Call-off**

21. Handrails

Handrails		
No.	**Description**	**Type**
Info	In accordance with the agreed general layout drawing to be provided incorporating the following:	**N/A**
21.1	30mm Smooth tube, Nylon coated crackle finish, colour RAL 1028. Polished aluminium fittings. Sufficient hand rails to achieve safe movement through vehicle whilst in motion. Additional hand rail required on staircase as per amended LBSL drawings.	**M Call-off**
21.2	Staircase handrails should be of identical cross section to the main saloon handrails	**M Base**
21.3	A longitudinal waist height handrail is required, to provide a continuous passenger waist height hand grip support from the entrance / cab area to the beginning of the seated area or staircase steps	**M Base**
21.4	Door or door partition handrails positioned to assist boarding and alighting must be fitted at all entrance and exit points	**M Base**
21.5	Exposed butt ends to handrails are not acceptable anywhere on the bus. End of rails should be in a closed position or curved to provide a safe introduction to the rail	**M Base**
21.6	Seat-back to ceiling handrails (with bell push) are required on every other/alternate forward facing seats on lower saloon and upper saloons. The handrails should be offset by one row on nearside and offside seat rows so to allow one seat-back to ceiling hand pole available on one side of every row.	**M Base**
21.7	All bell push buttons to be in red with contrasting surrounds to the red. All bell pushes are required to be marked in brail with the brail symbol for the letter S.	**M Base**

22. CCTV

Close Circuit Television		
No.	**Description**	**Type**
22.1	A 16 camera colour CCTV system with a T1600 recorder or latest model, showing time, brakes, indicators and speed. 4 exterior and 11 interior. With system test button and hard drive condition indicator. Must include a lower saloon passenger monitor . Supplier to be Synectics at this time, drivers monitor switches to rear camera on selection of reverse. NOTE: - *Moving forward to enable electronic recording of driver defects we will be fitting tablets in place of the current monitor.*	**M** **Call-off**
22.2	Must comply with LBSL vehicle CCTV specification listed in sections 22.3 – 22.11	**M** **Call-off**
22.3	**Connectivity** The DVR shall have the following interfaces:- i) A Local Area Network (LAN) interface, presented as Ethernet through an RJ45 connection. ii) An integrated 3G modem. The integrated 3rd Generation Mobile Network (3G) modem, there is a preference that this card fits within the Digital Video Recorder (DVR) thus minimising installation costs. The LAN and 3G modem interfaces shall be password protected and have multiple levels of access i.e. administration, user, read only. The solution shall provide an open interface accessible via the LAN or 3G modem to allow full control of the DVR. The specification, protocols used and command strings will be provided to London Bus Service Limited (LBSL) on request. E. LBSL reserves the right to use these interfaces	**M** **Call-off**
22.4	**Function** A. The image resolution shall be 2CIF or better, 2 CIF will be set as a default. B. Each camera input shall be capable of recording at 25 frames per second at the maximum image size and highest image quality concurrently. C. The CCTV system shall have the flexibility to select the frame rate for each individual camera up to the maximum rate. D. The DVR shall support a minimum total global frame rate of 100 frames per second. E. The DVR shall support 16 camera inputs as a minimum. F. The DVR shall have an easily removable hard disc for external monitoring or ability to be downloaded via external connection. G. Bus data to be recorded on the disc drive i) Bus road speed taken from the GPS, foot brake application and traffic Indicator “left and right” recorded with date and time identification ii) Recording not to be displayed on driver’s cab monitor or passenger monitor H. All images shall be watermarked or equivalent.	**M** **Call-off**

	I. The DVR shall have the capability to record an audio input from two or more microphones. J. The DVRs shall use a high compression video codec to encode and store the image data on the hard disk, this shall be one of the following:- a. MPEG4 Part 2 b. MPEG Part 10 (ISO/IEC 14496-10 version 1) c. ITU-T H.264. Note: the use of any other codec is prohibited K. The DVR shall be able to dual stream i.e. code an image at different rates such that a low rate can be stream for Live CCTV and a higher rate recorded to disk for collection later. This shall be possible with one or more of the codecs listed in 1.2J above. L. The DVR shall be Live Closed Circuit Television (CCTV) capable so that should LBSL decide to rollout Live CCTV in the future the DVR will support this, more specifically:- 1) The system shall have a documented interface from the control and management system that is made available to LBSL for use in a potential Central CCTV Control and Management system. 2) The system's control and management system shall be able to:- i. Manage the video stream i.e. start/stop, pause, Fast Forward, Rewind during the event etc. ii. Select the camera required. iii. Select multiple cameras in thumb nail form. iv. Manage the parameters that control the quality of the video stream. v. Perform System Administration and Operations and Maintenance functions. M. The unit shall have an NMEA compatible Global Navigation System interface. N. The system clock shall have a resolution of 1 second and the time will be maintained to an accurate to +/- 10 seconds	
22.5	**Diagnostic Interface** A. The unit shall have the LBSL diagnostic interface implemented and approved for use with iBus. B. The LAN interface of the DVR will be made available to LBSL for diagnostics and other uses agreed at a later date.	**M** **Call-off**
22.6	**Cameras** A. All cameras shall be analogue and antiglare B. The cameras used shall be high quality colour 480TVL day/night or low light. C. All cameras must be housed in a Vandal Resistant Dome or Concealed D. Wide angle lenses utilised where necessary to improve vision coverage.	**M** **Call-off**

22.7	**Displays** A. The displays shall be LCD colour monitors. B. All the displays shall show the time which is derived from the system radio adjusted clock. C. The display shall be available in the following sizes:- i) 5” or equivalent suitable for locating in the drivers cab ii) 15” or equivalent suitable for placing in the passenger area	**M** **Call-off**
22.8	**Type Approval** A. The CCTV systems shall be designed to operate in a public transport environment. The operator will be required to supply type approval for:- i) e Mark ii) Electromagnetic Compatibility. iii) Shock and Vibration iv) Temperature v) Water ingress Note: the CCTV system comprises the DVR, Cameras, intermediate cables, screens, connectors and any ancillary equipment. B. The integrity of the type approval shall be maintained throughout the life of the contract. C. The cameras should be rated as IP65 as a minimum.	**M** **Call-off**
22.9	**Implementation** 2.1 Installation A. The CCTV systems shall be built in accordance with the LBSL CCTV System Installation Guidelines. The key aspects of this are:- i) LBSL approval of the installation, the operator will present the installation instructions for approval prior to build. ii) Documentation, the operator shall maintain the documentation for each build type and make them available for LBSL inspection. iii) Co-existence with iBus, where possible the DVR shall be placed in the same location as the iBus unit. B. The DVRs shall be designed to work with the bus native power supply; any additional equipment necessary for this shall be considered part of the CCTV system. C. The DVRs shall remain on for 30 minutes once the ignition has been turned off. D. Installers of the CCTV system should be accredited to FCS 1362 (formally MPT 1362) or equivalent. E. LBSL reserves the right to inspect the installation at source to ensure the standards are being applied appropriately.	**M** **Call-off**
22.10	**Configuration** A. The image quality configuration parameters will be set to a LBSL default as a minimum.	**M** **Call-off**

22.11	Each camera will be set to a frame rate as defined by LBSL as shown in the table below. Location / Reference / Frame rate Entrance/Exit Platform, wheelchair space and Passenger / Driver Interface — A1, A2 — 4 Rear of interior seated area — A3, C1 — 4 General passenger space — A4, B1, C2, C4 — 4 Forward facing to road — A5 — 4 Driver's Cab — A6 — 4 Stair Well — C3 — 4	**M** **Call-off**
22.12	A footwell camera is required directed at the driver pedal controls	**M** **Call-off**

23. Body Insulation

Body Insulation		
No.	**Description**	**Type**
23.1	Full bodywork insulation to sides, roof, front and rear, where appropriate to ensure noise and heating standards are maintained.	**M** **Base**
23.2	The floor and supporting bulkheads between the engine and passenger area are to be well insulated against noise and heat intrusion.	**M** **Base**

24. Electrical Systems

Electrical Systems		
No.	**Description**	**Type**
24.1	Bus stopping illuminated signs on both decks are part of the iBus system and both are suitably positioned for maximum visibility to passengers. Suitable mouldings and fixings for the LBSL provided iBus signs must be provided. Duplication to this iBus signage is not permitted.	**M** **Call-off**
24.2	Induction loops that provide driver communication to passengers with T band equipment are necessary to the following requirements:- Passenger entrance platform / cab interface area to be covered by induction Loop. Drivers cab microphone for communicating with T band passenger, active at all times when the bus is in service.	**M** **Call-off**
24.3	Additional induction loop for the wheelchair bay area receiving driver communication from cab microphone and linked to passenger iBus information of next stop and all other messages.	**M** **Call-off**
24.4	Nationally accepted sign on cab door and wheelchair bay area identifying T band driver communication available is provided within the notices, labels, signs or logos section. It is required that the induction loop system will be linked to all iBus announcements.	**M** **Call-off**
24.5	A Synectics Genius Drive Safe driver monitoring telematics system is required (subject to confirmation of the location of Perivale). Note: Confirmation with Technical Manager at Metroline required during build stage.	**M** **Call-off**
24.6	Buses are required to be equipped with an active Intelligent Speed Adaption system. ***Please double click on the embed document link below for full ISA specification***. Transport for London London Buses LONDON BUS SERVICES LIMITED INTELLIGENT SPEED ASSISTANCE SPECIFICATION Operational Performance	**M** **Call-off**
24.7	Passenger seat back USB sockets are required on every accessible seat back and designated wheelchair area. Installations must be such that USB power supply:-	**M** **Call-off**

	• Individual plug-in port power supply must incorporate inline fuse • Design and installation should be such that plug-in port(s) maintain the seat back profile, and do not protrude from the panel surface panel by 4mm • The plug-in port should be in a colour that would not be mistaken for a bell push • Charger ports should be tamper proof • Charger port should have a minimum IP54 rating • System E marked • Plug- in ports must not be attached within any designated head impact zones • Plug-in port for the designated wheelchair area must be accessible for the wheelchair occupant when in the recommended travelling position	
24.8	Day time running lights. (Note: These may be independent of headlight system, provided a sufficient light intensity is provided to enhance bus visibility in daylight).	**M Base**
24.9	Reversing alarm "white sound" with driver's cab time delayed isolation override.	**M Base**
	Interior saloon lighting to provide at minimum:	
24.10	Seats: 150 mm above cushion level – 150 lux	**M Base**
24.11	Aisles: floor level on bus centreline adjacent to all seats – 100 lux	**M Base**
24.12	Steps: floor level, centre of entrance and exit steps – 100 lux	**M Base**
24.13	Double deck stairs: floor level, centre of every tread – 100 lux	**M Base**
24.14	An automatic system for interior saloon lighting to turn off when exterior ambient illumination levels determine no supplementary illumination is required in daylight. Turning on of the interior lighting will remain under driver's control.	**M Base**
24.15	Provision of electrical supply to the ticket machine. The ticket machine base position must be provided with a clean continuous power feed at all times.	**M Base**

25. Notices, Labels, Signs & Logos (Internal and External)

Notices, Labels, Signs & Logos (Internal and External)		
No.	**Description**	**Type**
25.1	Mandatory interior labels, provided by LBSL, will be located in the approved positions of; exterior driver's rear cab bulkhead or staircase fascia on lower saloon and cove panel immediately opposite top of staircase on upper saloon, two per double deck. Labels must at all times display the current bus registration number	**M Call-off**
25.2	Exterior and interior notices are provided by LBSL as listed in the notices guidance booklet. Any additional notices required to comply with hydrogen vehicle type approval and exterior logos by project funding bodies (FCH-JU, EU, CEF, OLEV etc.), shall be provided by Wright Bus. LBSL to provide detailed design and installation instructions of additional notices not included in the LBSL guidance booklet or vehicle type approval regulation.	**M Call-off**
25.3	All as described in booklet Manufacturers" Application Procedure. The above notices may be obtained by bus manufacturer or operator FOC from the current supplier Stewart Signs.	**M Call-off**
25.4	Specific operator notices not permitted, such as Operator specific Welcome Aboard notices (ON DRIVER"S CAB DOOR, PANELS, GLASS OR IN FLOOR COVERING) No notices, information, legal address, recruitment or any other advertising material is permitted on the interior or exterior of any window without prior permission of Head of Tendering at LBSL.	**M Call-off**
25.5	Notices provided by operator must be fitted in the appropriate positions:- Fleet numbers and operator identification code on roof. Operator codes to be provided on order. Black cut out lettering of operator code over fleet number, character New Johnson Bold font 350mm in height, positioned on centre line of bus, transversely at rear of white roof section Operator logo positions as agreed in management document illustrations for each operator All external and internal legal notices, in a single contrasting colour, cut out type if appropriate	**M Call-off**
25.6	All notices and signs to be in Transport for London's "New Johnson" bold or medium font unless legally required otherwise	**M Call-off**

25.7	Exterior advertising panels are permitted in the following areas when bus width permits • Off Side • Near Side • Rear All advert panels must be framed with frame in London Bus Red, except where specific LBSL authority has been given to support a particular activity. Any non standard, illuminated or special in any way advertising method or advertising display must be approved by LBSL prior to installation.	**M** **Call-off**

26. Route and Destination Displays

Blinds and Destination		
No.	**Description**	**Type**
26.1	Default Option A: Power operated Mobitech smart blinds front, side and rear displays with route selection unit in driver's cab simultaneously controlling front, side and rear displays. Technical specification and dimensions available on request. Sourced through McKenna Brothers and LBSL specification compliant. The price for this option has been included in the total cost of the bus. This option will apply if LBSL does not approve the go-ahead with Option B.	**M Call-off**
26.2	Option B: Ultra High Definition LED smart blinds front, side and rear displays with route selection unit in driver's cab simultaneously controlling front, side and rear displays. Technical specification and dimensions available on request. A sub-option is for the supply and installation of the same specification big blinds at the front of the bus with journey information as specified for the rear of the bus. Sourced through Hanover Displays Limited and LBSL specification compliant. This option has not been priced and any difference in price from Default Option A under 26.1 will be applied to the total cost of the bus. Supplier will supply prices to LBSL a minimum of 45 days prior to chassis build stage commencing..	**M Call-off**
26.3	All displays in Transport for London's Classic Johnston font.	**M Call-off**
26.4	All displays in white font on black background including out of service or any other passenger information.	**M Call-off**
26.5	All displays to be fully back illuminated by LED type lighting systems and automatically illuminated at all times, positioned at the horizontal centreline of each blind, providing an even distribution of illumination across the full blind area.	**M Call-off**
26.6	No light illumination gaps should be visible around any point on the displays from the exterior view of the bus.	**M Call-off**

27. Exterior Livery

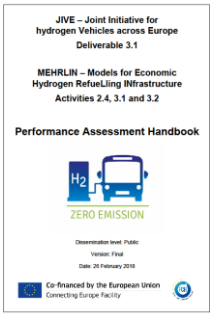
Exterior Livery		
No.	**Description**	**Type**
27.1	All buses shall be painted in a livery that is fully London Buses Red Reference ICIP498FPF3 or exact colour equivalent with the following exemptions.	**M Call-off**
27.2	White roof panels to interior cove joint (i.e. not visible from pavement level) for heat rejection	**M Call-off**
27.3	Road wheels are not to be repainted and should remain in the OEM"s standard finish	**M Call-off**
27.4	The LBSL Roundel is mandatory and should be fitted in accordance with guidance contained in the latest LBSL booklet.	**M Call-off**
27.5	Should the livery illustration(s) incorporated into your Framework Agreement not include a livery as described above, you should enclose a copy of the rear, front and side illustrations in colour of such a livery. This will be subject to prior approval by LBSL.	**M Call-off**

28. Free Issue Equipment

Free Issue Equipment		
No.	**Description**	**Type**
INFO	The following equipment will be free issued on request by LBSL to operator or manufacturer. Its provision for installation and suitable protection must be provided	**N/A**
28.1	Ticketing machine, base plate and smart card readers. For full details, refer to the installation and provision of electrical supply to the Ticket Machine as described in the document "Guidelines for Bus Builders for the installation of Ticket Machines with Smart Card Readers", published by the ticketing system supplier and available from LBSL. Note: The ticket machine and equipment will be installed after a bus arrives in London.	**M Call-off**
28.2	All Notices as listed in the latest LBSL booklet.	**M Call-off**

29. JIVE Data Collection

<table>
<tr><th colspan="6">JIVE Data Collection</th></tr>
<tr><th>No.</th><th colspan="4">Description</th><th>Type</th></tr>
<tr><td rowspan="16">29.1</td><td colspan="4">The following data is to be collected via on-board telematics of each vehicle in the units and frequencies stated in the table below. Data to be forwarded to Metroline and LBSL on a weekly basis.</td><td rowspan="16">M
Call-off</td></tr>
<tr><td>Data point FC bus operation</td><td>Unit</td><td>Frequency</td><td>Comments</td></tr>
<tr><td>Driven distance</td><td>km</td><td>Daily</td><td></td></tr>
<tr><td>Odometer reading</td><td>km</td><td>monthly</td><td></td></tr>
<tr><td>Operating hours bus (drivetrain hours)</td><td>h</td><td>Daily</td><td>Provided via time stamps for ignition on/off [dd/mm/yyyy] [hh:mm:ss]</td></tr>
<tr><td>Operating hours FC system</td><td>h</td><td>Daily</td><td></td></tr>
<tr><td>Electricity generation FC system</td><td>kWh</td><td>Daily</td><td></td></tr>
<tr><td>Electricity consumption electric engine</td><td>kWh</td><td>Daily</td><td>If available, for determining energy consumption for traction</td></tr>
<tr><td>Electricity generation electric engine</td><td>kWh</td><td>Daily</td><td>If available, for determining recuperation energy</td></tr>
<tr><td>Electricity consumption HVAC</td><td>kWh</td><td>Daily</td><td>If available, separated by heating and AC and for driver and passenger cabin (if separate)</td></tr>
<tr><td>Hydrogen refuelled</td><td>Kg</td><td>Per refuel</td><td></td></tr>
<tr><td>Odometer reading</td><td>Km</td><td>Per refuel</td><td></td></tr>
<tr><td>Refill duration</td><td>dd.mm.yyyy hh:mm:ss</td><td>Per refuel</td><td></td></tr>
<tr><td>Ambient temperature at start of fill</td><td>°C</td><td>Per refuel</td><td></td></tr>
<tr><td>Ambient temperature at end of fill</td><td>°C</td><td>Per refuel</td><td></td></tr>
<tr><td>Tank pressure at start of fill</td><td>bar</td><td>Per refuel</td><td></td></tr>
<tr><td>Tank pressure at end of fill</td><td>bar</td><td>Per refuel</td><td></td></tr>
</table>

29.2	The bus supplier will make available all data points set out in the “JIVE MEHRLIN Performance Assessment Handbook” to LBSL and grant funding bodies FCH-JU and INEA for purposes defined in said document. Document embedded below, double click to open.  JIVE – Joint Initiative for hydrogen Vehicles across Europe Deliverable 3.1 MEHRLIN – Models for Economic Hydrogen RefueLling INfrastructure Activities 2.4, 3.1 and 3.2 Performance Assessment Handbook ZERO EMISSION Co-financed by the European Union Connecting Europe Facility	**M** **Call-off**

30. Miscellaneous Equipment

Miscellaneous Equipment		
No.	**Description**	**Type**
30.1	A nearside camera monitoring system in replacement of wing mirror which complies in full with the most recent publication of the LBSL Bus Safety Standard Specification at the time of vehicle order. Current version – V.10 December 2018	**M Base**
30.2	An offside camera monitoring system in replacement of wing mirror which complies in full with the most recent publication of the LBSL Bus Safety Standard Specification at the time of vehicle order. Current version – V.10 December 2018. This option has not been priced and any difference in price from Default Option A under 30.1 will be applied to the total cost of the bus. Supplier will supply prices to LBSL a minimum of 45 days prior to chassis build stage commencing. .	**M Base**
30.3	Used ticket bins are not considered necessary due to the low level of tickets issued. They should not be fitted to any position on the bus	**M Call-off**
30.4	Running number boards (if utilised) must be positioned and displayed in manner that cannot be misinterpreted as a route number and specifically not in the front windscreen area.	**M Call-off**

31. Fuel

Fuel		
No.	**Description**	**Type**
31.1	Buses must be fuelled by hydrogen, which is stored on board.	**M Base**
31.2	The bus manufacturer is responsible for liaising with the chosen LBSL hydrogen fuelling station manufacturer to check and confirm compatibility of receptacle/nozzle, fuelling protocol and that the refuelling target time requirement in section 31.10 is achieved.	**M Call-off**
31.3	Hydrogen will be dispensed into the buses as a compressed gas at up to 350 bar, required fill pressure of 350bar (at 15 degrees C)	**M Call-off**
31.4	Hydrogen fuel quality will be consistent with SAE J2719.	**M Base**
31.5	Geometry of the refuelling nozzle interface will be consistent with SAE J2600	**M Base**
31.6	Must be fully compatible with TK16 high flow connector unless suitable alternative to optimize fuelling speed is mutually agreed with HRS supplier	**M Call-off**
31.7	Refuelling protocol will be consistent with SAE J2601-2.	**M Base**

31.8	Hydrogen refuelling nozzle attachment is preferred to be installed on the offside rear.	**D Call-off**
	Refuelling Flow Rate and Time	
31.9	Vehicle & hydrogen storage system must be capable receiving a peak refuelling flow rate of at least 100 grams H2 per second (6Kg per minute), to be achieved in co-ordination with HRS supplier.	**M Call-off**
31.10	The bus will have the ability to communicate with the hydrogen fuelling station using an infra-red data connection complying to SAE J2799 IR standard. This has not been priced and any difference will be applied to the total cost of the bus. Supplier will supply prices to LBSL a minimum of 45 days prior to chassis build stage commencing.	**M Call-off**
31.11	Target average refuelling time for 17.8kg refill of a 27Kg storage tank (including connection / leak test) is **less than 5 minutes**.	**M Call-off**
	Fuel Efficiency	
31.11	Tank-to-wheel efficiency should be >42% over SORT 1 & 2 drive cycles. Fuel consumption must not exceed 9.5KgH2/100Km in real-world London operations. Supplier is required to submit their hydrogen consumption per 100Km over SORT 1 & 2 and data from real-world in service testing prior to order. **Documental evidence to provided by Supplier before commencement of chassis build**	**M Call-off**
31.12	The bus should be designed to achieve stated level of performance on a seasonally averaged basis in real world usage. This means manufacturers should pay particular attention to optimising the drivetrain for fuel economy. For example, in cold period's saloon heating can have a significant impact on fuel efficiency and consequently range. Manufactures should look to minimize energy consumption for heating whilst still meeting the necessary requirements. Designs should incorporate efficient heating systems such as making use of the fuel cells waste heat.	**M Base**
31.13	Manufacturers should be aware that the bus may be sat idle for long periods of time (up to an hour). For a conventional vehicle, LBSL specify an automatic engine turn off for periods of long idling. In the case of a fuel cell bus, LBSL are aware that this may not be appropriate (depending on the hybrid strategy). However, we do expect the Supplier to demonstrate that their drivetrain control system has an approach to idle periods which ensures the efficiency of the bus is maximised, including potentially turning off the fuel cell or modulating to very low outputs to charge the battery. The supplier is to explain how their strategy avoids excess consumption during lengthy idle periods.	**M Call-off**

32. Operational Availability

Operational Availability		
No.	**Description**	**Type**
Info	Defined as: Availability (%) = ((P-M)/P) x 100 Where: P = total number "peaks" – points in time which are 15 minutes before the start of each half day period - in the relevant month; and M = number of peaks in the relevant month when the vehicle was not available for service.	**N/A**
32.1	Availability defined in this way must be greater than 85% for each vehicle. If the supplier (Wrightbus) feels that 85% availability is not achievable they should provide their anticipated availability level and requirement for spare vehicles to sustain service requirement.	**M** **Call-off**

33. Operating Climate

Operational Availability		
No.	**Description**	**Type**
33.1	Capable of operating in a range of climatic conditions – ambient temperature range from +40°C to -20°C.	**M** **Base**
33.2	The fuel cell buses will be capable of being kept outdoors and out of operation for extended periods, in all climatic conditions (ambient temperature -20°C to +40°C) subject to overnight heating of the fuel cell if necessary.	**M** **Base**
33.3	The requirement for mains powered overnight freeze protection during normal vehicle operations should be avoided where at all possible.	**M** **Call-off**

34. Service Levels

Service Levels		
No.	**Description**	**Type**
34.1	Service level 1 – Operator requires limited support in their running of fuel cell buses LBSL and Metroline require limited support from the supplier (Wrightbus) to operate and maintain fuel cell buses. Metroline will have personnel in place who are either trained and experienced in maintaining fuel cell buses or will be trained via the approved training plan as set out in the supplier's tender response. Metroline will be responsible for maintaining the entire vehicle, the supplier (Wrightbus) will be required to provide: • Training on the specific vehicle for the maintenance personnel • Spare parts to be made available for the buses if requested, including for all preventative and corrective maintenance within 24 hours of request for VOR components and 48-72 hours for non VOR components. • An expert technician to resolve any issues keeping the vehicles off the road, at the location in person within 48 hours of request. • All special tools for maintenance of the buses • Service technical assistance, including a 24/7 English speaking helpline • Access to engineering and after sales technical staff for any technical service issues which require factory assistance • Annual inspection of the hydrogen fuel cell and storage system, if requested.	**M** **Base**
34.2	Suppliers to provide expected costs and frequency component changes over the lifespan of vehicle. **Documental evidence Annex N supplied and agreed.**	**M** **Call-off**
34.3	Suppliers to provide a planned maintenance schedule over the entire 14 year life-span of the bus **Documental evidence Annex M supplied and agreed.**	**M** **Call-off**

35. Parts

Parts		
No.	**Description**	**Type**
35.1	A comprehensive list of categorised stock parts recommended for all servicing, maintenance & repair (including a defined list of Common Chassis Body parts) of the vehicle over a seven year maintenance programme prior to delivery.	**M Call-off**
35.2	Supplier is required to provide a parts assurance package per vehicle which enables Metroline to fulfil their obligations in line with 34.1 for a period of seven years, this parts assurance package is to exclude Common Chassis Body defined parts of the vehicle. The supplier is required to provide a fixed cost of this package which is applicable per vehicle from the date of registrations issued by the DVSA for the first three years of vehicle operations and to provide an indicative for years four, five, six and seven. Years four, five, six and seven are to be agreed between LBSL and Supplier in year two of vehicle operation.	**M Call-off**
35.3	A written undertaking to carry a stock of essential parts to allow for 14 year life expectancy of the vehicle. **Documental evidence: clause 8, included in the contract.**	**M Call-off**

36. Warranty

Warranty		
No.	**Description**	**Type**
36.1	A minimum of two (2) years whole vehicle warranty is required. A statement of guarantee/warranty must be included with final tender submission identifying the time covered. Suppliers should note that the whole vehicle warranty must be inclusive of all parts.	**M Base**

36.2	**This requirement, 36.2, has been superseded by the seven years parts assurance package.**
	
	An enhanced warranty price for an additional 5 years after the 2 year base warranty for each of the below components along with terms and conditions is required ;
	• Chassis
	  • General Under Frame
	  • Under Frame Structural Integrity
	  • Under Frame Corrosion
	• Body
	  • Body Frame Structural Integrity
	  • Body Frame Corrosion
	  • General Body Frame
	  • Ramp Equipment
	  • Interior Lighting
	  • Floor Covering
	  • Floor Boards
	  • Door Systems
	  • Destination Equipment
	  • Exterior Paint Colour Retention
	• Driveline
	  • Full Drive Line
	  • Fuel cell Module including stacks
	  • Fuel Cell Module Auxiliary Components
	  • Hybrid system major components (e.g. power storage system, generator motor, drive , DC motor, power control
		M
		Call-off

36.3	High Voltage Battery Warranty – LBSL require the supplier to provide an extended warranty of the high voltage battery and for the cost of the extended warranty to be included within the capital purchase price of the vehicle.	**M** **Call-off**
36.4	Wrightbus will supply daily on site assistance until such time as the vehicles are free from defects and operating above the 90% availability mark.	**M** **Call-off**
36.5	A Warranty Variation Agreement that details all variations from the vendor's standard Warranty.	**M** **Call-off**
36.6	Any additional warranties available should be listed with terms and any additional costs (up to the operational life of the vehicle).	**M** **Call-off**

37. Technology Readiness Levels

Technology Readiness Levels		
No.	**Description**	**Type**
37.1	The bus will be required to achieve a technology readiness level of 7. A technology readiness level of 7 is defined as a "System prototype demonstration in an operational environment."	**M** **Call-off**

38. Operating Information

Operating Information		
No.	**Description**	**Type**
Info	Suppliers will be required to provide the below manuals upon delivery of the first bus.	**N/A**
38.1	Service Manual (Whole Vehicle)	**M Base**
38.2	Chassis Manual	**M Base**
38.3	Body Manual	**M Base**
38.4	Electrical Manual	**M Base**
38.5	Hydrogen Fuel Cell Module & Hydrogen Storage Tank Manuals	**M Base**
38.6	Parts Manual (Whole Vehicle)	**M Base**
38.7	Chassis & body diagnostic software/tools & any specialist equipment required to carryout routine service, maintenance and fault diagnosis.	**M Call-off**
38.8	Fuel cell module diagnostic software & any specialist equipment required to carryout routine service, maintenance fault diagnosis	**M Call-off**
38.9	Electric motor and hybrid system controller diagnostic software.	**M Call-off**
38.10	Heating, ventilation and air conditioner diagnostic software.	**M Call-off**
38.11	Any other diagnostic software, tools and specialist equipment (including mechanical tools and software) applicable to the purchased vehicles, required for the purpose of routine service, maintenance and fault diagnosis.	**M Call-off**

39. Training

Diagnostic Software, Tools and Equipment		
No.	**Description**	**Type**
39.1	A training plan to deliver Master & Advanced Technicians for up to 10 people over a set timescale (maximum 2 years) to be in place before first vehicle delivery. Training to cover all aspects of vehicle, including hydrogen fuel cell system, to the competency level of OEM technicians is required. Full OEM onsite technical support, 7 days per week, is required until full training plan is delivered and signed off by operator, Metroline Ltd. **Documental evidence to be submitted**	**M Call-off**
39.2	A familiarisation day for driver instructors and key engineering staff, and sufficient training days in line with the development matrix is required.	**M Call-off**

40. Documental Evidence Required Summary

Documentation		
No.	**Description**	**Type**
40.1	Documentary evidence of vehicle type approval at M3 class. I.e. compliance with ECE regulation 107 prior to order. **Documentary evidence Annex I received and agreed.**	**M Call-off**
40.2	Documentary evidence that hydrogen storage cylinders are tested and approved in accordance with ISO 11439 (Gas cylinders -- High pressure cylinders for the on-board storage of natural gas as a fuel for automotive vehicles). **Documentary evidence Annex A received and agreed.**	**M Base**
40.3	A vehicle swept path analysis must be provided prior to vehicle order. **Documentary evidence Annex C received and agreed.**	**M Call-off**
40.4	The supplier should identify and mitigate all health and safety risks associated with the supply and operation of fuel cell buses in accordance with the FMEA (failure mode and effect analysis) requirements. Analysis should cover a hydrogen leak from any at risk area. **Documentary evidence Annex C received and agreed.**	**M Call-off**
40.5	A full fuel cell bay fire risk assessment must be completed in conjunction with a fire suppression system (FSS) manufacturer who have the necessary expertise in co-ordination with Metroline Ltd. The risk assessment and preventative measures must consider, at a minimum, a hydrogen leakage from any part of the storage of pipework, fire and serious collision scenarios. These scenarios should include the situation when the leak or fire occurs in a tunnel or under a bridge. The risk assessment should also include the maintenance regime and the scenarios which could occur when the vehicle is being worked on in an indoor space. The outputs from the risk assessment should mandate the type and location of any detection device and provide a detailed location for the dispensing tube or nozzles. It should also detail the FSS maintenance requirements. We expect as standard that all potential sources of fire in the fuel cell bay be protected by an effective FSS this includes any at risk areas behind the fuel cell such as electrical ancillaries and high voltage cables. This may increase the length of the trace tube or require additional nozzles. It might also have the affect of having to increase the capacity of the fire suppression cylinder. The suitable extinguisher for engine bay fires, including hydrogen, is deemed to be dry powder. **Documentary evidence Annex E received and agreed.**	**M Base**
40.6	**Fire suppression system must be type approved to meet regulation 107 Revision 6 - Amendment 3** **Documentary evidence Annex E received and agreed.**	**M Call-off**

40.7	Tank-to-wheel efficiency should be >42% over SORT 1 & 2 drive cycles over a 12 month period. Fuel consumption must not exceed 9.5KgH2/100Km in real- world London operations. The supplier is required to submit their Hydrogen consumption per 100Km over SORT 1 & 2 and data from real-world in service testing prior to order. **Documental evidence to be submitted by the Supplier before commencement of chassis build.**	**M Call-off**
40.8	Suppliers to provide expected costs and frequency changes over the ifespan of vehicle. **See section 34.2**	**M Call-off**
40.9	Suppliers to provide a planned maintenance schedule over the entire 14 year life-span of the bus **Documentary evidence Annex M received and agreed.**	**M Call-off**
40.10	A written undertaking to carry a stock of essential parts to allow for 14 year life expectancy of the vehicle. **Documental evidence is not required.**	**M Call-off**
40.11	A training plan to deliver Master & Advanced Technicians for up to 10 people over a set timescale (maximum 2 years) to be in place before first vehicle delivery. Training to cover all aspects of vehicle, including hydrogen fuel cell system, to the competency level of OEM technicians is required. Full OEM onsite technical support, 7 days per week, is required until full training plan is delivered and signed off by operator, Metroline Ltd. **Documental evidence to be submitted by Wrightbus Post Contract Award**	**M Call-off**

End of Specification

ITN tfl_scp_000548 - Volume 1, Appendix 4
HYDROGEN BUS CONFORMANCE MATRIX

SECTION			TYPE	AVAILABLE SCORE		GUIDANCE NOTES	BIDDER TO CONFIRM: 'YES' for COMPLIANCE/ AGREEMENT with the requirement	EVIDENCE: Please demonstrate how you will meet the outlined requirement and provide relevant evidence/documentation. Please note you may provide appendices to support your evidence.	OPTIONS: Please include any alternative relevant options	TfL USE ONLY	
Name	No.	Title								ACTUAL SCORE	SCORING NOTES
Documentation / Documentary Evidence	1.1	National Small Series Type Approval (NSSTA)	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Vehicle will be tested to National Small Series Type Approval (NSSTA). Waiting on final certificate from VCA.			
	1.2	Documentary evidence of M3 type approval	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	Document enclosed - Volume 2 Appendix 1 - Annex I			
	1.3	Legal Drive-by test certificate	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Document enclosed - Volume 2 Appendix 1 - Annex J			
	1.4	Hydrogen Storage Cylinders approved as per ISO 11439	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Certificates Provided - tested to Reg EU 406/2010. Please refer to Volume 2 Appendix 1 - Annex A			
	1.5	Designs in consideration with ECE Regulation 110	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Vehicle Hydrogen system is approved to the requirements of EU 406/2010 to meet vehicle type approval			
	1.6	Hydrogen Fuel System design as per NFPA 52-2006	Discretionary - Base	PASS/FAIL	2	Pass 2 Discretionary Pass 1 Fail 0	YES	Hydrogen fuel system is designed to this standard			
	1.7	Vehicle Design with consideration for SAE J2578	Discretionary - Base	PASS/FAIL	2	Pass 2 Discretionary Pass 1 Fail 0	YES	We comply with SAW J2578 through the compliance of above regulations and vehicle design			
	1.8	Vehicle Design with consideration for ISO 23273-1	Discretionary - Base	PASS/FAIL	2	Pass 2 Discretionary Pass 1 Fail 0	YES	ISO 2373-1/ISO 2372-2/23273-3 have been superseded with ISO 2373 2013. Our fuel cell is manufactured to this standard and the vehicle designed in consideration of this standard			
	1.9	Vehicle Design with consideration for ISO 23273-2	Discretionary - Base	PASS/FAIL	2	Pass 2 Discretionary Pass 1 Fail 0	YES	ISO 2373-1/ISO 2372-2/23273-3 have been superseded with ISO 2373 2013. Our fuel cell is manufactured to this standard and the vehicle designed in consideration of this standard			
	1.10	Vehicle Design with consideration for ISO 23273-3	Discretionary - Base	PASS/FAIL	2	Pass 2 Discretionary Pass 1 Fail 0	YES	ISO 2373-1/ISO 2372-2/23273-3 have been superseded with ISO 2373 2013. Our fuel cell is manufactured to this standard and the vehicle designed in consideration of this standard			
	1.11	Components meet specification in EC Regulations 118	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	A declaration can be provided			
	1.12	Laden and kerb / unladen weight chart by axle	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Kerbweight Front - 4070kg / Kerbweight Rear 8371kg/Total Kerbweight 12441kg. Total Mass laden (allowed) 1800kg. (*Presumed with driver)			
	1.13	Electromagnetic Compatibility (EMC) type approval	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	The vehicle will be tested to EC 10.05 and has full compliance. Certificate can be provided if required			
	1.14	Detailed general arrangement drawing	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	Please refer to Seating Layout Drawing enclosed - CUS 3565-7 (Volume 2 Appendix 1 - Annex B)			
TOTAL Documentation / Documentary Evidence				**28**						**0**	

SECTION			TYPE	AVAILABLE SCORE		GUIDANCE NOTES	BIDDER TO CONFIRM: 'YES' for COMPLIANCE/ AGREEMENT with the requirement	EVIDENCE: Please demonstrate how you will meet the outlined requirement and provide relevant evidence/documentation. Please note you may provide appendices to support your evidence.	OPTIONS: Please include any alternative relevant options	TfL USE ONLY	
Name	No.	Title								ACTUAL SCORE	SCORING NOTES
Bus Design	2.1	Double Deck/Twin Passenger/Two Axle	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	Please refer to Seating Layout Drawing enclosed - CUS 3565-7 (Volume 2 Appendix 1 - Annex B)			
	2.2	Vehicle Length	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	Vehicle length 10.9M. Please refer to Drawing enclosed (Volume 2 Appendix 1 - Annex B)			
	2.3	Vehicle Swept Path Analysis	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	Please refer to enclosed drawing (Volume 2 Appendix 1 - Annex C)			
	2.4	Full power FC	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Full power fuel cell provided powered by Hydrogen			
	2.5	Right hand drive	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Refer to Drawing enclosed - CUS3565-7 (Volume 2 Appendix 1 - Annex B)			
	2.6	Low floor bus	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES				
	2.7	DDA Compliant	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES				
	2.8	Wiring looms integrated	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Wiring looms are integrated on the chassis and body throughout the vehicle			
	2.9	Ease of cleaning and maintenance	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	All materials are selected for easy maintenance and cleaning			
	2.10	Legislative conformance	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES				
		DESIGN CAPABLE OF									
	2.11	High frequency stop start	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Vehicle has been designed to meet high frequency start stop operation. All duty cycle simulations have been based on high frequency stop start scenario			
	2.12	Fully passenger laden PSV operational schedules	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Simulations have been based on a partial and fully laden duty cycle			
	2.13	Operating in adverse traffic conditions during typical UK weather	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Designed to operate in typical UK weather conditions			
	2.14	18 hour day 7 day week 364 day year operation	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Can be achieved provided the documented service requirements are met			
	2.15	6 - 12mph average operational speed	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	The duty cycle simulation is based on a typical City environment where the average operational speed is between 6 to 12 mph			
	2.16	190 miles (304 kilometres) average daily range without refuelling	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	2.17	Quantity of on-board storage	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	2.18	Speed - capable of at least 80 km/hour	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Bus is programmable for a maximum speed of 80kph/50mph			
	2.19	Acceleration - 1.0 - 1.2 m/s2 under all load conditions	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Bus is programmable for a maximum rate of acceleration between 1 & 1.2m/s2 under all load conditions			
	2.20	Gradeability - 11% fully laden	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	11% gradebility will be achieved			
TOTAL Bus Design				40						0	
Operational Design Life	3.1	Bus - Minimum efficient operational life of 14 years	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	Vehicle has been designed to meet an operational life in excess of 14 years. Regular servicing must be carrled out in accordance with Wrightbus Service matrix. Over a 14 year period the batteries will have to be replaced at least once - dependant upon duty cycle. The fuel cell will also require a stack overhaul within the timeframe.			
	3.2	High Voltage Battery - Minimum operational life of 5 years (please state the minimum life expectancy)	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	Battery life has been estimated to be between 6 and 8 years			
TOTAL Operational Design Life				4						0	
Environment	4.1	Vapour fumes	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Exhaust vents to top of offside rear roof			
TOTAL Environment				2						0	

SECTION			TYPE	AVAILABLE SCORE		GUIDANCE NOTES	BIDDER TO CONFIRM: 'YES' for COMPLIANCE/ AGREEMENT with the requirement	EVIDENCE: Please demonstrate how you will meet the outlined requirement and provide relevant evidence/documentation. Please note you may provide appendices to support your evidence.	OPTIONS: Please include any alternative relevant options	TfL USE ONLY	
Name	No.	Title								ACTUAL SCORE	SCORING NOTES
Fire Safety	5.1	Health and Safety Risks	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	Wrightbus are working with an independent Engineering Consultant (MIRA) who have carried out a full safety review of the product. This identified a number of recommendations and we are rectifying these prior to production. Refer to enclosed Report (Volume 2 Appendix 1 - Annex D)			
	5.2	Hydrogen fuel systems in accordance with NFPA 52-2006	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Hydrogen fuel system is designed to this standard			
	5.3	Internal components in EC Regulations 118	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES				
		FIRE RETARDANCY STANDARDS						N/A			
	5.4	BS476 Class 1 - Fuel Cell facing surfaces	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	BS476 Class 1 on fuel cell facing surfaces			
	5.5	BS476 Class 2 Back Surface - GRP Materials	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	GRP BS476 Class 2 back surface			
	5.6	BS476 Class 3 Front Surface - GRP Materials	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	GRP BS476 Class 3 front surface			
	5.7	BS476 Class 2 - Melamine Laminates	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	BS476 Class 2 melamine laminates			
	5.8	BS476 Class 2 Upper Surface - Completed Flooring	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Plywood and floor overing to BS476 Class 2 on upper surface			
	5.9	BS476 Class 3 Lower Surface - Completed Flooring	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Plyood on lower surface to BS476 Class 3			
	5.10	UL94V0 - Seat Frames	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Seat frames to UL94VO			
	5.11	BS5452 Crib 7 - Seat Assemblies	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	5.12	BS476 Class 2 - Body Insulation	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Body insulation to BS476 Class 2			
	5.13	UL94V0 - All Internal ABS Products	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Capping and trims to UL94V0			
	5.14	BS476 Class 2 - Body and Floor Insulation	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Insulation to BS476 Class 2			
	5.15	Achieving standards when suitably cleaned and maintained	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	The materials are selected to achieve the standard over the operational life of the bus			
	5.16	Replacement Components	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Comply parts must come from Wrightbus Customcare			
	5.17	Smoke detector	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Smoke detector wil be fitted as standard			
	5.18	Pressure release valves	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Positioned at top O/S Rear			
	5.19	Hydrogen Leak Detection System	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	Hydrogen detecting system available within the fuel cell and hydrogen storage compartment.			
	5.20	Fuel cell bay fire risk assessment	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	All areas considered at risk are covered by a nozzle. Dry powder system provided			
	5.21	Automatic Venting of Hydrogen Tanks	Discretionary - Base	PASS/FAIL	2	Pass 2 Discretionary Pass 1 Fail 0	YES				
TOTAL Fire Safety				42						0	
Fire Suppression	6.1	Fire Suppression System	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	System designed to ensure on the detection of an alarm that the fuel cell is shut down and hydrogen evalucated from it the tanks are sealed the fire depression system deploys and the risk assessment to confirm target areas has been met. Hydrogen detecting system available within the fuel cell and hydrogen storage compartment			
	6.2	Regulation 107 Revision 6 - Amendment 3	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	See enclosed (Volume 2 Appendix 1 - Annex E)			
	6.3	System recommendation based on FMEA and fire risk assessment	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	6.4	Low pressure announcement	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	6.5	15 Minute minimum suppression time	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
TOTAL Fire Suppression				10						0	
	7.1	Emergency Shut down	Mandatory - Call Off		2	Pass 2 Fail 0	YES	YES			
TOTAL Emergency Shut Down				2						0	

SECTION			TYPE	AVAILABLE SCORE		GUIDANCE NOTES	BIDDER TO CONFIRM: 'YES' for COMPLIANCE/ AGREEMENT with the requirement	EVIDENCE: Please demonstrate how you will meet the outlined requirement and provide relevant evidence/documentation. Please note you may provide appendices to support your evidence.	OPTIONS: Please include any alternative relevant options	TfL USE ONLY	
Name	No.	Title								ACTUAL SCORE	SCORING NOTES
Other Safety	8.1	Tyre blow out protection liners	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Fitted as standard			
	8.2	Anti slip floor covering	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Fitted as per customer requirements			
	8.3	Colour contrasting step nosing - PSVAR 2000	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	As per required regulations			
	8.4	No cross hatching of floor area	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	As per customer requirements			
	8.5	Impact Protection	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Meets all regulation including DDA			
	8.6	Interior panel / corner finishing	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Interior panels designed to meet the life of the vehicle			
	8.7	Near side & off side front tree guard	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	As per customer requirements			
	8.8	Emergency Exits	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	These are documented in our General Arrangement Drawings (Volume 2 Appendix 1 - Annex F)			
	8.9	Bus Safety Standard	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	Cost of compliance with Point 8.9 is highlighted in pricing table based on assumptions noted in supplementary notes. Once final Bus Safety Standards is included into TFL spec a review of these assumptions can be made with TFL			
TOTAL Other Safety				18						0	
General Dimensions	9.1	DOUBLE DECK GENERAL DIMENSIONS		N/A							
	9.2.a	Length 10 - 10.9 Metres	Mandatory	PASS/FAIL	2	Pass 2 Fail 0	YES	Vehicle length 10.9M			
	9.2b	Width 2.5 - 2.55 Metres	Mandatory	PASS/FAIL	2	Pass 2 Fail 0	YES	2.52M			
	9.2c	Height 4.2 - 4.42 Metres	Mandatory	PASS/FAIL	2	Pass 2 Fail 0	YES	4.395M			
	9.2d	Aisle Headroom 1.83 Metres	Mandatory	PASS/FAIL	2	Pass 2 Fail 0	YES	1.83M at lowest point and 2.1M at highest point			
	9.2e	Seat Width 440 Millimetres	Mandatory	PASS/FAIL	2	Pass 2 Fail 0	YES	440mm			
	9.2f	Top of seat back 590 Millimetres	Mandatory	PASS/FAIL	2	Pass 2 Fail 0	YES				
	9.2g	Bottom of seat back 535 Millimetres	Mandatory	PASS/FAIL	2	Pass 2 Fail 0	YES				
	9.2h	Objective Wheelchair Space 1.60 - 2.00 Metres	Mandatory	PASS/FAIL	2	Pass 2 Fail 0	YES	1.713M			
	9.2i	Objective seat pitch 750 - 850 Millimetres	Mandatory	PASS/FAIL	2	Pass 2 Fail 0	YES	Please refer to Seating Layout Drawings enclosed - CUS 3565-7(Volume 2 Appendix 1 - Annex B)			
	9.2j	Entrance & Exit Step Height 320 Millimetres	Mandatory	PASS/FAIL	2	Pass 2 Fail 0	YES	320mm			
	9.2k	Kneeling to 265 - 240 Millimetres	Mandatory	PASS/FAIL	2	Pass 2 Fail 0	YES	245mm			
	9.2l	Entrance &Exit Door Headroom 1840 Millimetres	Mandatory	PASS/FAIL	2	Pass 2 Fail 0	YES	1875mm Entrance door			
	9.2m	Entrance Door Clear Width 1035 Millimetres	Mandatory	PASS/FAIL	2	Pass 2 Fail 0	YES	1055mm between handrails			
	9.2n	Exit Door Clear Width 1200 Millimetres	Mandatory	PASS/FAIL	2	Pass 2 Fail 0	No	Standard opening between handrails 1100mm			
TOTAL General Dimensions				28						0	
Passenger Capacity	10.1	Minimum passenger capacity 80 passengers	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	Refer to Drawing enclosed - CUS 3565-7 (Volume 2 Appendix 1 - Annex B)			
TOTAL Passenger Capacity				2						0	
Noise	11.1	Type Approved drive-by noise test - ECE Regulation 51.02	Discretionary - Base	PASS/FAIL	2	Pass 2 Discretionary Pass 1 Fail 0	YES	Document enclosed - Volume 2 Appendix 1 - Annex J			
	11.2	Provision of artificial operation of engine cooling fans / auxiliary equipment	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	For the purposes of testing Wrightbus will provide details on how to artificially operate cooling fans for engine and auxiliary equipment at maximum RPM			
		PERMITTED NOISE LEVELS									
	11.3	Exterior passby noise test to ECE Regulation 51	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Drive by noise is a mandatory part of our standard homologation process			
	11.4	Interior door buzzer noise	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Meets within specified levels under 11.3			
	11.5	Exterior driver control ramp buzzer	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Meets within specified levels under 11.3			
	11.6	Wide Open Throttle (WOT) acceleration - Exterior	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Meets within specified levels under 11.3			
	11.7	Wide Open Throttle (WOT) acceleration - Interior	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Meets within specified levels under 11.3			
TOTAL Noise				14						0	

SECTION			TYPE	AVAILABLE SCORE		GUIDANCE NOTES	BIDDER TO CONFIRM: 'YES' for COMPLIANCE/ AGREEMENT with the requirement	EVIDENCE: Please demonstrate how you will meet the outlined requirement and provide relevant evidence/documentation. Please note you may provide appendices to support your evidence.	OPTIONS: Please include any alternative relevant options	TfL USE ONLY	
Name	No.	Title								ACTUAL SCORE	SCORING NOTES
Doors	12.1	Twin two door with entrance and exit position as stipulated	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	Refer to Drawing enclosed - CUS 3565-7 (Volume 2 Appendix 1 - Annex B)			
	12.2	Manufacturer of driver operated powered doors	Discretionary - Call Off	PASS/FAIL	2	Pass 2 Discretionary Pass 1 Fail 0	YES	Ventura manufacture			
	12.3	Entrance and front door exit clear width	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Drawings can be provided if required			
	12.4	Exit Door Clear Width 1200 Millimetres	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	No	1100mm between door leaves			
	12.5	Front entrance to be inward glider type	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Inward glider type fitted as standard			
	12.6	Centre or rear doors to be outward slider type	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Outward slide type (Plug & slide type) fitted as standard			
	12.7	Door header panels	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Wrightbus standard design to meet requirements			
	12.8	Door or door partition handrails	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Wrightbus standard design to meet requirements			
	12.9	Emergency door controls	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Wrightbus standard design to meet requirements			
	12.10	Overhead illumination	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	LED lights fitted over entrance door shelf plate			
	12.11	Door closing audible warning device	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Wrightbus standard design to meet requirements			
TOTAL Doors				22						0	
Seating	13.1	Individual passenger seats - Minimum of 440mm	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Comply. Options are available on customer request.			
	13.2	No tip up seats	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	13.3	Seat Type	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	Civic V2 lightweight seat c/w USB socket			
	13.4	Design to restrict pickpockets	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Seats suitably designed to restrict pickpockets			
	13.5	Seat layout	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Please refer to Seating Layout Drawings enclosed - CUS 3565-7 (Volume 2 Appendix 1 - Annex B)			
	13.6	Priority seats	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Please refer to Seating Layout Drawings enclosed - CUS 3565-7 (Volume 2 Appendix 1 - Annex B)			
	13.7	Preferential passenger seats	Discretionary - Base	PASS/FAIL	2	Pass 2 Discretionary Pass 1 Fail 0	YES	Please refer to Seating Layout Drawings enclosed - CUS 3565-7 (Volume 2 Appendix 1 - Annex B)			
	13.8	Under seat space	Discretionary - Base	PASS/FAIL	2	Pass 2 Discretionary Pass 1 Fail 0	YES	Space maximised as much as possible under the priority or preferential seating. Note Forward facing Preferential & Priority double seats do not. Meets legislation			
	13.9	height to top of seat cushion	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Please refer to Seating Layout Drawings enclosed (Volume 2 Appendix 1 - Annex B)			
TOTAL Seating				18						0	
Ramp	14.1	Power Operated by Driver Controls	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	14.2	Telescopic two-stage plane ramp	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	PSV 2 Stage Power Cassette ramp fitted to mid door			
	14.3	Ramp Protection	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	14.4	Ramp deployment audible warning device	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	14.5	Partial operation extending cycle on start up	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	14.6	Permanent warning light on ramp failure	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	14.7	Ramp forward edge recess	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	14.8	Interlock	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
TOTAL Ramp				16						0	
Wheelchair Bay Requirements	15.1	Wheelchair bay location	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	1.63M			
	15.2	CCTV of wheelchair interior manoeuvring & ramp deployment areas	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	15.3	Handpoles	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Please refer to Seating Layout Drawings enclosed - CUS 3565-7 (Volume 2 Appendix 1 - Annex B)			
	15.4	Wheelchair bay alternative uses	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES				
	15.5	Wheelchair security floor to ceiling handrail	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES				
	15.6	No security arm	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0					
	15.7	Wheelchair logo	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	15.8	Wheelchair bay & logo colour	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	15.9	Wheelchair logo style	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	15.10	Wheelchair Logo Position	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	15.11	Centre line of logo	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	15.12	Interlock on kneeling suspension	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
TOTAL Wheelchair Bay Requirements				24						0	
Flooring	16.1	Floor covering material	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
TOTAL Flooring				2						0	

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Name	No.	Title								ACTUAL SCORE	SCORING NOTES
Windows and Glazing	17.1	Windows and glazing to meet ECE Regulation 43	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Glazing meets ECE Reg 43			
	17.2	All side glass windows of identical tinted glass	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Side glass provided as standard with an automative green tint			
	17.3	Solar energy transmittance	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Solare energy transmittance is less than 65%			
	17.4	Light transmittance	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Light transmittance is not more than 80%			
	17.5	Hopper window at full size bays	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Hopper layout can be proivded once positions are agreed with customer			
	17.6	Hopper window sizing	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	17.7	Anti bandit glazing	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Drivers signal unit fitted with anti bandit glazing			
	17.8	Driver's front screen	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Laminated sunstrip to front upper and lower deck windscreen.			
TOTAL Windows and Glazing				16						0	
Staircase	18.1	Forward ascending straight staircase dimensions	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	9 steps fitted at staircase with step tread depth 234mm and a step riser of 245mm			
	18.2	Staircase handrails	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Refer to image in Volume 2 Appendix 2 - Annex G depicting handrail arrangement at the staircase			
	18.3	Additional handrails	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Refer to image in Volume 2 Appendix 2 - Annex G depicting handrail arrangement at the staircase			
	18.4	Exposed butt ends	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Refer to image in Volume 2 Appendix 2 - Annex G depicting handrail arrangement at the staircase			
	18.5	Staircase headroom	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Minimum headroom at lower steps 1831mm			
	18.6	Staircase materials	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Modesty barrier to match internal scheme			
TOTAL Staircase				12						0	
Driver's Cab	19.1	Cab screen demisting system	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Comply parts must come from Wrightbus Customcare			
	19.2	Assault Alarm	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Siren assault alarm with siren sound activated by flick switch at drivers side console. Assault alarm linked to hazzard lights			
	19.3	Driver's vandal screen	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Forward assault screen and a drivers assault door supplied			
	19.4	Passenger PA system	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	Standard PA system to be fitted including microphone and saloon speakers			
	19.5	Space for ticketing equipment	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	19.6	Space for iBus system	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	Presumed to be provided as free issue			
	19.7	Power supply for card reader	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	19.8	Drivers Cab Seat	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
TOTAL Driver's Cab				16						0	

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Name	No.	Title								ACTUAL SCORE	SCORING NOTES
Heating and Ventilation Control	20.1	Passenger saloon ventilation	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	The heating system is a fully automated system			
	20.2	Automatic temperature controlled heating system	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	The heating system is a fully automated system			
		HEATING		N/A							
	20.3	Capable of raising temperature from 0 to 15 degrees in 45 minutes rising to 17 degrees within 90 minutes	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	The system is capable of the temperature ranges demanded			
		CAB/DRIVER SCREEN DEMISTING		N/A							
	20.4	Manual driver selection capable of raising temperature from 0 to 20 degrees in 25 minutes	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	The system is capable of the temperature ranges demanded			
		DRIVERS CAB AIR CONDITIONING		N/A							
	20.5	Manual driver selection capable of independent operation at all times	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
		AIR COOLING		N/A							
	20.6	Off <23 degrees fully shut down On >23 degrees gradual build up to maximum capacity output at 28 degrees.	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	Upper saloon air chill system provided			
	20.7	no safety hazards from installation and positioning	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	20.8	Integration of system	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
		HEATING AND VENTILATION CONTROL		N/A							
	20.9	Blown air heating and ventilation system to both lower and upper deck	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	The system is a blown air system and is capable of supplying heating and ventilation to lower and upper decks automatically			
	20.1	Fully automatic thermostatic control of the system	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0		The system is a blown air system and is capable of supplying heating and ventilation to lower and upper decks automatically			
	20.11	No requirement for adjustment or setting of temperature	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
TOTAL Heating and Ventilation Control				22						0	
Handrails	21.1	Handrail description	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	35mm mild steel smoth poles with matt crackle finish			
	21.2	Staircase handrails	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	As 21.1			
	21.3	Longitudinal waist height handrail	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Refer to enclosed image in Volume 2 Appendix 1 - Annex G denoting location of handpoles at staircase area			
	21.4	Door to door partition handrails	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES				
	21.5	End of rails	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES				
	21.6	Seat-back to ceiling handrails	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Refer to Seating layout drawing Layout CUS3565-7 (Volume 2 Appendix 1 - Annex B)			
	21.7	Bell push buttons	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Saloon bell pushes supplied with a red button with a grey surround supplied with the brail symbol for the letter S			
TOTAL Handrails				14						0	

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Name	No.	Title								ACTUAL SCORE	SCORING NOTES
CCTV	22.1	15 camera system	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	Fully compliant. However the future request for electronic recording of drivers defects via a tablet in place of current monitor is still under development. The supplier does not anticipate any extra hardware/parts being required but has advised if so these are not included in costs.			
	22.2	Comply with CCTV specification listed in 14.3-14.11	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	22.3	Connectivity	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	T1600 system does not have a built in modem/router as standard. Two options are available - Wifi only router (Non 4G). Wifi 3G & 4G Router. We have included costs for the Wifi only Router (Non 4G) as this is what has been requested within the specification. Please advise if alternative 3 & 4G option is required and we will provide price.			
	22.4	Function	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	(J) - The request for the DVR to be dual stream is currently under development with supplier. It will become a standard feature on their next generation product however at present they cannot provide a cost and therefore it is not included in our submission.			
	22.5	Diagnostic Interface	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	22.6	Cameras	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	22.7	Displays	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	22.8	Type Approval	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	22.9	Implementation	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	22.1	Configuration	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	22.11	Camera Frames	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	22.12	Footwell Camera	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
TOTAL CCTV				24						0	
Body Insulation	23.1	Full body insulation	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Insulation to sides front roof and rear as appropriate			
	23.2	Insulation against noise and heat intrusion	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	The vehicle will be insulated against noise and heat by the provision of appropriate materials and window solar glazing			
TOTAL Body Insulation				4						0	
Electrical Systems	24.1	Bus Stopping illuminated signs on both desk	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	24.2	Induction loops and driver microphone	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	24.3	Induction loop for the wheelchair bay area	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	24.4	Sign on cab door and wheelchair bay area identifying T band driver communication as well as linkage with iBus announcements.	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	24.5	Synectics Genius Drive Safe driver monitoring telematics system	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	24.6	Adaptive Intelligent Speed Adaption system	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	24.7	Passenger seat back USB sockets	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	Comply			
	24.8	Day time running lights	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Wrightbus systems will provide control and management of day time running lights			
	24.9	Reversing alarm with drivers cab time delayed isolation override	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Broadband reverse alarm provided to meet requirements			
	24.10	Interior saloon lighting to provide min seats - 150 lux	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES				
	24.11	Interior saloon lighting to provide min aisles - 100 lux	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES				
	24.12	Interior saloon lighting to provide min entrance and exit steps - 100 lux	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES				
	24.13	Interior saloon lighting to provide min double deck stairs - 100 lux	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES				
	24.14	Automaticed system to turn off interior lighting in daylight	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	External automatic light sensor fitted to control saloon lighting			
	24.15	Provision of electrical supply to the ticket machine	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	A power supply for the ticket equipment can be provided to suit the customers needs			
TOTAL Electrical Systems				30						0	

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Name	No.	Title								ACTUAL SCORE	SCORING NOTES
Notices, Labels, Signs & Logos (Internal and External)	25.1	Mandatory Interior Labels	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	25.2	Exterior and interior notices	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	25.3	As described in booklet Manufacturers Application Procedure	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	25.4	Specific Operator notices as permitted	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	25.5	Notices provided by operator fitted in appropriate positions	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	25.6	All notices and signs in "New Johnson" type	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	25.7	Exterior advertising panels	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
TOTAL Notices, Labels, Signs & Logos (Internal and External)				14						0	
Blinds and Destination	26.1	Power operated Mobitech smart blinds with route selection unit	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	Mobitech Smartblind and LED backlit units provided c/w Mobitech ICU 402 controller			
	26.2	Destination blinds	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	26.3	All displays in Classic Johnston font	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	26.4	All displays in white font on black background	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	26.5	All displays to be back illuminated by LED	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	26.6	No light illumination gaps	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
TOTAL Blinds and Destination				12						0	
Exterior Livery	27.1	Buses painted in a livery that is fully London Buses Red with the following exceptions	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	27.2	White roof panels to interior cove joint	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	27.3	Road wheels remain OEM's standard finish	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	27.4	TfL Roundel mandatory	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	27.5	Should the livery illustration(s) incorporated into your framework be different the should be provided	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	Enclosed - Volume 2 Appendix 1 - Annex K			
TOTAL Exterior Livery				10						0	
Free Issue Equipment	INFO	The following equipment will be free issued by LBSL	N/A								
	28.2	Ticketing machine base plate and smart card readers	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	28.3	All notices listed in the LBSL booklet	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
TOTAL Free Issue Equipment				4						0	
JIVE Data Collection	29.1	Data collected and provided in units and frequencies as per table in 29.1 of specification.	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	Subscription will be included price			
	29.2	Bus supplier will make available data set out in "JIVE MEHRLIN Performance Assessment Handbook"	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	Yes				
TOTAL JIVE Data Collection				4						0	
Miscellaneous Equipment	30.1	Driver wing mirrors in full colour yellow with no additional markings	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES				
	30.2	A nearside rear view camera in replacement of nearside rear view mirror	Discretionary - Call Off	PASS/FAIL	2	Pass 2 Discretionary Pass 1 Fail 0	YES				
	30.3	No used ticket bins	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	30.4	Running number boards (if utilised)	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
TOTAL Miscellaneous Equipment				8						0	

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Name	No.	Title								ACTUAL SCORE	SCORING NOTES
Fuel	31.1	Buses must be fuelled by Hydrogen stored on board	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Sufficient on board tankage for route			
	31.2	Liaise with and confirm compatibility refuelling receptacle/nozzle fuelling protocol and target time with Refuelling Station	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
	31.3	Hydrogen dispensed at up to 350 bar (at 15 degrees C)	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	System fitted will be 350 bar			
	31.4	Hydrogen fuel quality consistent with SAE J2719	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Fuel for fuel cell will meet SAE J2719			
	31.5	Refuelling nozzle - receptacle interface consistent with SAE J2600	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Wrightbus fill nozzle and receptacles are to the SAE J2600 amd TN1 requirements			
	31.6	Fully compatible with TK16 high flow connector	Mandatory - Call Off	PASS/FAIL		Pass 2 Fail 0	YES				
	31.7	Refuelling protocol consistent with SAE J2601-2	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	The vehicle will refuel at the appropriate rate and does meet the protocoles consistant with SAE J2601-2			
	31.8	Refuelling nozzle preferred on offside rear	Discretionary - Call Off	PASS/FAIL	2	Pass 2 Discretionary Pass 1 Fail 0	YES				
		REFUELLING FLOW AND TIME						N/A			
	31.9	Capable of receiving a peak Hydrogen flow of at least 6kg H2/minute	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	This is achievable based on the Hydrogen Refuelling System delivery the required hydrogen @ -40°C			
	31.10	Target refuelling time of 20kg refill of a 17.8kg storage tank is less than 5 minutes	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	This is achievable based on the Hydrogen Refuelling System delivery the required hydrogen @ -40°C			
		FUEL EFFICIENCY						N/A			
	31.11	Average fuel consumption must not exceed 9.5kg H2/100 km over the SORT test cycle	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	Documental evidence to provided by Supplier before commencement of chassis build			
	31.12	Drivetrain optimisation	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Wrightbus systems are all optimised to maximise energy and efficiency			
	31.13	Drivetrain control systems approach to idle periods	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	The design approach taken is to maximise hydrogen fuel usage and the management of the fuel cell and fuel cell operation will be fully incorporated into the drive train control systems			
TOTAL Fuel				24						0	
Operational Availability	32.1	Availability must be greater than 85% for each vehicle	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	System designs and component choice to provide a robust and reliable vehicle are part of this tender supported by good maintenance the availability demanded in this tender can be met			
TOTAL Operational Availability				2						0	
Operating Climate	33.1	Capable of operating in a range of climatic conditions – ambient temperature range from +40°C to -20°C.	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Components and drivetrain specified to meet the temperature window			
	33.2	Capable of being kept outdoors and out of operation for extended periods in all climatic conditions	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	The fuel cell management manages the temperature profile and ensure the fuel cell is secure for low temperatures and high temperatures when not operational			
	33.3	Requirement for mains powered overnight freeze protection should be avoided	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	The fuel cell management does not require support from external mains powered overnight protection			
TOTAL Operating Climate				6						0	
Service Levels	34.1	Service Level 1	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	As previously advised this cost is £1500			
	34.2	Expected costs and frequency component changes over the lifespan	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	Enclosed - Refer to Volume 2 Appendix 1 Annex N			
	34.3	Planned maintenance schedule for 14 year life span	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	Enclosed - Refer to Volume 2 Appendix 1 Annex M			
TOTAL Service Levels				6						0	

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Name	No.	Title								ACTUAL SCORE	SCORING NOTES
Parts	35.1	Comprehensive list of stock parts recommended	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	Enclosed - Refer to Volume 2 Appendix 1 Annex P			
	35.2	Pre-paid parts contract for first 7 years	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	Enclosed in pricing tables			
	35.3	Written undertaking to carry stock of essential parts	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
TOTAL Parts				6						0	
Warranties	36.1	Two year (min) whole vehicle warranty	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Wrightbus will provide the appropriate warranties. Standard consumables are not included with this warranty but could be incorporated in a parts assurance pack			
	36.2	Enhanced warranty for an additional 5 years after the 2 year base warranty for all listed components	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	*****	TBC			
	36.3	Exclusions provided	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	*****	TBC			
	36.4	Supply of daily on site assistance until 90% vehicle availability provided	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	*****	TBC			
	36.5	Warranty variation agreement	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	*****	TBC			
	36.6	Additional warranties available	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	*****	TBC			
TOTAL Warranties				12						0	
TRL	37.1	Technology Readiness Levels of 7	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES				
TOTAL Technology Readiness Levels				2						0	
Operating Information		Manuals required upon first bus delivery		N/A							
	38.1	Service Manual (Whole Vehicle)	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Wrightbus manual			
	38.2	Chassis Manual	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Wrightbus manual			
	38.3	Body Manual	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Wrightbus manual			
	38.4	Electrical Manual	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Wrightbus manual			
	38.5	Hydrogen Fuel Cell Module & Hydrogen Storage Tank Manuals	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Hydrogen fuel cell module and hydrogen storage tank manuals will be supplier manuals with Wrightbus control			
	38.6	Parts Manual (Whole Vehicle)	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Wrightbus manual			
		Items required upon delivery of first bus		N/A							
	38.7	Chassis & body diagnostic software/tools & any specialist equipment	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	Wrightbus will supply as appropriate the necessary diagnostic software. Some licences have to be procured from a third party following accredited training price of which is not included			
	38.8	Fuel cell module diagnostic software & any specialist equipment	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	Wrightbus will supply as appropriate the necessary diagnostic software. Some licences have to be procured from a third party following accredited training price of which is not included			
	38.9	Electric motor and hybrid system controller diagnostic software	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	Wrightbus will supply as appropriate the necessary diagnostic software. Some licences have to be procured from a third party following accredited training price of which is not included			
	38.10	Heating ventilation and air conditioner diagnostic software	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	Wrightbus will supply as appropriate the necessary diagnostic software. Some licences have to be procured from a third party following accredited training price of which is not included			
	38.11	Any other diagnostic software tools and specialist equipment (including mechanical tools and software) applicable to the purchased vehicles	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	Wrightbus will supply as appropriate the necessary diagnostic software. Some licences have to be procured from a third party following accredited training price of which is not included			
TOTAL Operating Information				22						0	

SECTION			TYPE	AVAILABLE SCORE		GUIDANCE NOTES	BIDDER TO CONFIRM: 'YES' for COMPLIANCE/ AGREEMENT with the requirement	EVIDENCE: Please demonstrate how you will meet the outlined requirement and provide relevant evidence/documentation. Please note you may provide appendices to support your evidence.	OPTIONS: Please include any alternative relevant options	TfL USE ONLY	
Name	No.	Title								ACTUAL SCORE	SCORING NOTES
Training		Diagnostic Software Tools and Equipment		N/A							
	39.1	Training Plan	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	Sample Traiing Plan enclosed - Volume 2 - Appendix 1 - Annex L. Detailed proposal and pricing to be presented			
	39.2	Familiarisation Day for driver instructors and key engineering staff and sufficient additional training days in line with development matrix	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	TBC			
TOTAL Diagnostic Software, Tools and Equipment Training				4						0	
Documental Evidence Required		Documentation		N/A							
	40.1	Vehicle approval at M3 class	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	Enclosed - Volume 2 Appendix 1 - Annex I			
	40.2	Hydrogen storage cylinders tests and approval in accordance with ISO 11439	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Enclosed - Volume 2 Appendix 1 - Annex A			
	40.3	A vehicle swept path analysis prior to vehicle order	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	Enclosed - Volume 2 Appendix 1 - Annex C			
	40.4	Health and Safety Risk Analysis including hydrogen leak	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	Enclosed - Volume 2 Appendix 1 - Annex D			
	40.5	Fuel cell bay fire risk assessment	Mandatory - Base	PASS/FAIL	2	Pass 2 Fail 0	YES	Enclosed - Volume 2 Appendix 1 - Annex E			
	40.6	Fire suppression system type information	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	Enclosed - Volume 2 Appendix 1 - Annex E			
	40.7	Hydrogen consumption per 100km over SORT 1 & 2 and data from real-world testing	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	TBC			
	40.8	Expected costs and frequency changes over the lifespan of vehicle	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	Ad denoted in Point 34.2			
	40.9	Planned Maintenance schedule	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	Enclosed - Volume 2 Appendix 1 - Annex M			
	40.10	Written undertaking to carry essential parts	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	TBC			
	40.11	Training Plan	Mandatory - Call Off	PASS/FAIL	2	Pass 2 Fail 0	YES	Detailed Proposal and pricing to be presented			
TOTAL Documental Evidence Required				22						0	
TOTAL ALL SECTIONS				568						0	

Guidance Notes:

Failure to pass all Mandatory requirements as identified in the "Type" column will result in an automatic rejection of your tender submission.
Failure to meet a score of 70% on all Discretionary requirements as identified in the "Type" column will also result in a rejection of your tender submission.
In this instance a score of 70% indicates non compliance with a maximum of 13 Discretionary questions.
Please note that a bidders final percentage score will be calculated to represent a percentage of this total section score of 50%
e.g. a score of 70% will equate to a section score of 35%

NSAI Certification

EC TYPE-APPROVAL CERTIFICATE

Communication concerning:
- ~~EC type-approval~~
- extension of EC type-approval
- ~~refusal of EC type-approval~~
- ~~withdrawal of EC type-approval~~

Of a type of Hydrogen component
with regard to Regulation (EC) No 79/2009, as implemented by Regulation (EU) No 406/2010

EC Type-approval No: ***e24*79/2009*406/2010*0003*03***

Reason for extension: ***- See test report EC79-114-074-18-003 for details***

SECTION I

0.1	Make (trade name of manufacturer's):	***G-Stor™ H2***
0.2	Type:	***3W-C350 Series consisting of:*** *- 3W205C350G5-DSSA* *- 3W205C350G8N-DSSA* *- 3W322C350G8N-DSSA* *- 3V074C350G8-ESSA* *- 3W150C350G8N-ESSA* *- 3W205C350G8N-ESSA* *- 3W322C350G8N-ESSA*
0.3	Means of identification of type, if marked on the component:	***See 0.2 above.***
0.3.1	Location of that marking:	***On the container.***
0.5	Name and address of manufacturer:	***Luxfer Canada Limited,*** ***4410-46th Avenue, S.E.,*** ***Calgary, Alberta T2B 3N7,*** ***CANADA.***
0.7	In the case of components and separate technical units, location and method of affixing of the EC approval mark:	***See technical report EC79-114-074-18-003 for details.***
0.8	Address(es) of assembly plant(s):	***Luxfer Canada Limited,*** ***4410-46th Avenue, S.E.,*** ***Calgary, Alberta T2B 3N7,*** ***CANADA.***
0.9	Name and address of the manufacturer's representative (if any):	***Luxfer Gas Cylinders Ltd.*** ***Nottingham, Colwick,*** ***Nottingham NG4 2BH, UK***

EC Type-approval No: ***e24*79/2009*406/2010*0003*03***

SECTION II

1.	Additional information (where applicable):		***See Addendum.***
2.	Technical service responsible for carrying out the tests:		***Arrowhead Industrial Services Ltd Meadow Drove Business Centre, Meadow Drove Bourne, PE10 0BP, United Kingdom.***
3.	Date of test report:		***As before and 15.05.2018***
4.	Number of test report:	*New:* *Former:*	***EC79-114-074-18-003*** ***10-00103-UA-GBM-up to 02 Rev.1***
5.	Remarks (if any):		***See Appendix.***
6.	Place:		***Dublin.***
7.	Date:		***05th June, 2018.***
8.	Signature:		

NATIONAL STANDARDS AUTHORITY OF IRELAND
NSAI Certification
TRANSPORT DEPARTMENT

Attachments:

- Information package.
- Test report.

NSAI Certification

Addendum

to EC Type Approval Certificate No.: ***e24*79/2009*406/2010*0003*03***
relating to EC component type-approval of a hydrogen component or system.

1.	Additional information	
1.1.	~~Hydrogen system designed to use liquid hydrogen / Hydrogen system designed to use compressed (gaseous) hydrogen / Hydrogen component designed to use liquid hydrogen~~ / Hydrogen component designed to use compressed (gaseous) hydrogen	
2.	Specifications and test results:	***See technical report EC79-114-074-18-003 and manufacturer's documentation.***
2.1.	Containers designed to use compressed (gaseous) hydrogen:	***See technical report EC79-114-074-18-003 and manufacturer's documentation.***
2.1.1.	Container material specifications:	***See technical report EC79-114-074-18-003 and manufacturer's documentation.***
2.1.2.	Container material test result:	***See technical report EC79-114-074-18-003 and manufacturer's documentation.***
2.1.3.	Container test results:	***See technical report EC79-114-074-18-003 and manufacturer's documentation.***
3.	Restriction of use of the device (if any):	***See technical report EC79-114-074-18-003 and manufacturer's documentation.***
4.	Remarks:	***N/A.***

NSAI, 1 Swift Square, Northwood, Santry, Dublin 9, Ireland. Telephone: (+353+1) 807 3800, Facsimile: 01-807 3844

NSAI Certification

EC Type-approval No: ***e24*79/2009*406/2010*0003*03***

Index to the Information Package

Date of issue:	***23rd December, 2010.***
Date of latest amendment:	***05th June, 2018.***
Reason for extension/revision:	***See top of page 1 of certificate for details***

1. Test report(s)

- numbers(s):	*New:*	***EC79-114-074-18-003***
	Former:	***10-00103-UA-GBM-up to 02 Rev.1***
- date of issue:		***09.12.2010***
- date of latest amendment:		***15.05.2018***

2. Information document

- number(s):	*Former:*	***3W205H350G5-EL & 3W205H350G8N-EL 3W-H350 Series***
	New:	***Information Document***
- date of issue:		***23.11.2010***
- date of latest amendment:		***09.04.2018***

Documentation: ***470 pages***

NSAI, 1 Swift Square, Northwood, Santry, Dublin 9, Ireland. Telephone: (+353+1) 807 3800, Facsimile: 01-807 3844

NSAI Certification

EC Type-approval No: ***e24*79/2009*406/2010*0003*03***

Appendix: **Additional conditions, and advisory notes on legal alternatives**

A: Additional conditions:

1. The attached technical report, with any of its attachments, forms part of this Type Approval certificate.
2. Each type from series production shall be to the measurements specified in the attached drawings, and shall be manufactured only from the materials specified in the Approval documents.
3. Changes in the type are permitted only with the explicit permission of NSAI. Breaches of this requirement will lead to a withdrawal of the Type Approval, and in addition may be subject to criminal prosecution.
4. At regular intervals, any tests or associated checks prescribed by the applicable legislation to verify continued conformity with the approved type shall be carried out. The manufacturer shall demonstrate compliance with this by submitting to NSAI evidence of adequate arrangements and documented control plans for each type approved.
5. Any set of samples or test pieces showing evidence of non-conformity shall give rise to further sampling and testing and all steps shall be taken to restore conformity of production.
6. This Type Approval will expire when it is surrendered by the holder, or withdrawn by NSAI, or when the approved type no longer conforms to legal requirements. The recall of the Type Approval can be issued by NSAI when the conditions required for the issuing or continuation of the Type Approval are no longer current, or when the Approval holder is in breach of the duties attached to the Type Approval, or when it is established that the approved type no longer meets the requirements of traffic safety.
7. Changes in the company name, address or manufacturing site, as well as in any of the sales or other agents specified in the issuing of the approval must immediately be notified to NSAI.
8. The duties imposed by the issuing of this certificate are not transferable. The legal protection of third parties is not affected by this certificate.
9. When the manufacture or sale of the system, component or separate technical unit has not been started within one year of the date of issue of this certificate, then NSAI is to be informed. This requirement also applies when the manufacture or sale has been halted for more than one year, or when it ought to have been halted for more than one year. The initial commencement of manufacture or sale, or the resumption of manufacture or sale, shall then be notified to NSAI within one month of commencement or resumption.

B: Legal Options:

Any objection to the requirements set out in this certificate shall be made within one month of the date of issue. The objection shall be made, in writing, to NSAI in Dublin.

NSAI, 1 Swift Square, Northwood, Santry, Dublin 9, Ireland. Telephone: (+353+1) 807 3800, Facsimile: 01-807 3844

STREETDECK H2 10.9

Fuel Cell Vehicle

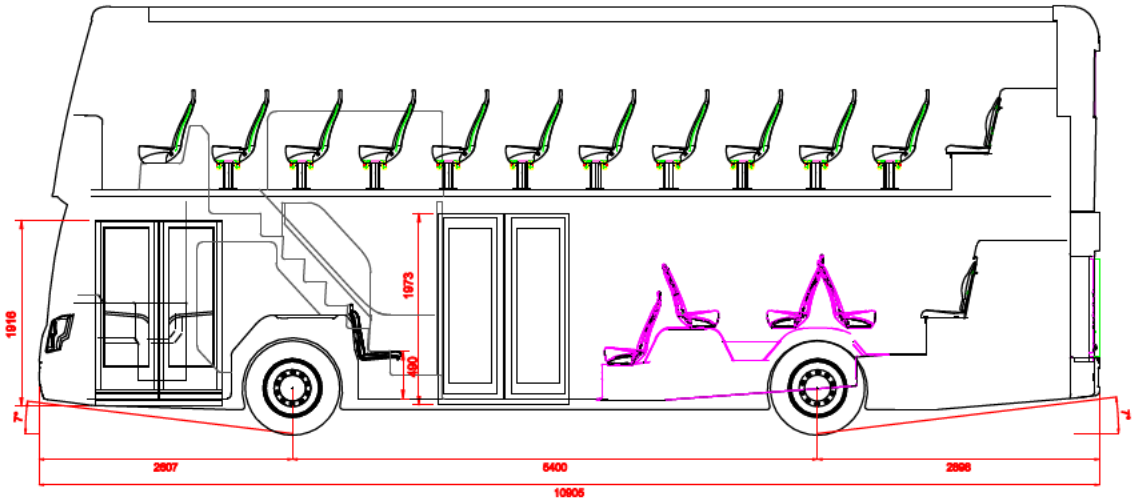
SPECIFICATION LAYOUT

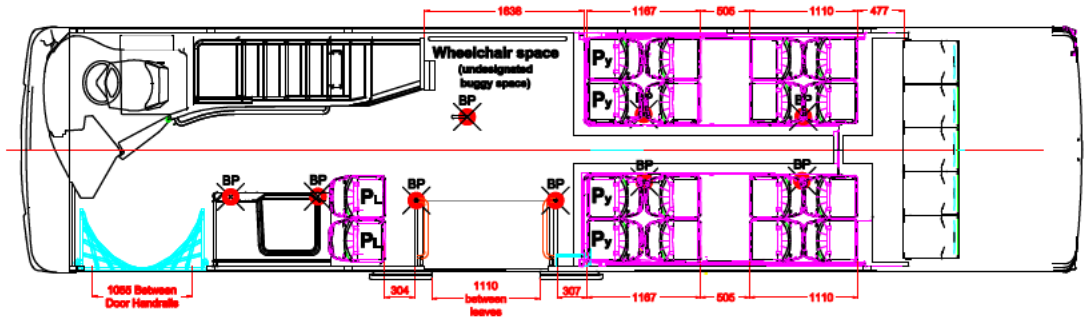
CUSTOMER DRAWING No. CUS-03565-7

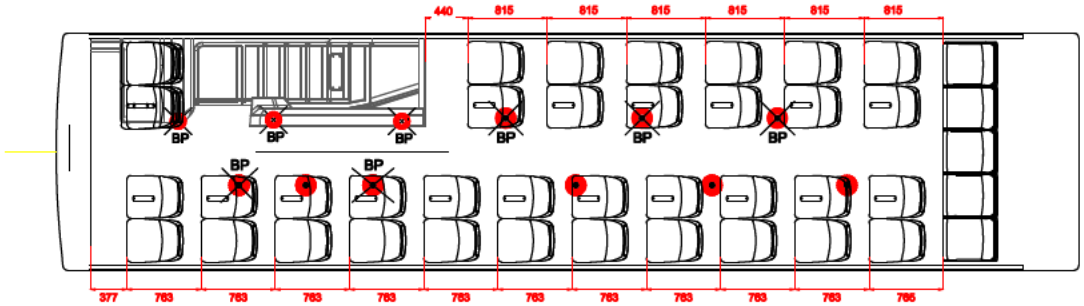
March 2019

= Handrail

= Handrail & Bell Push (BP)







Py = Priority seating / PI = Preferential seating

- Maximum Capacity — 85
- Maximum Seated — 41 Top
- Maximum Seated — 23 Btm
- Maximum Standing — 21
- Body Length — 10905mm
- Body Width — 2520mm
- Overall Vehicle Height (unladen) — 4395mm
- Wheel base — 5400mm
- Front Overhang — 2607mm
- Rear Overhang — 2898mm
- Entrance step height — 320mm
- Entrance step kneeled — 245mm
- Aisle Width (between arch & stairs) — 870mm
- Aisle Width (between seats) — 605mm btm / 535mm top
- Gangway Height (@ gangway centre) — 2100mm btm / 1830mm top
- Seat Manufacturer — Esteban
- Seat Type — Civic V2
- Entance door height — 1916mm
- Exit door height — 1973mm

Provisional drawing
Uncontrolled document

- This Version Drawn By / Date — C.M.B 04/10/18

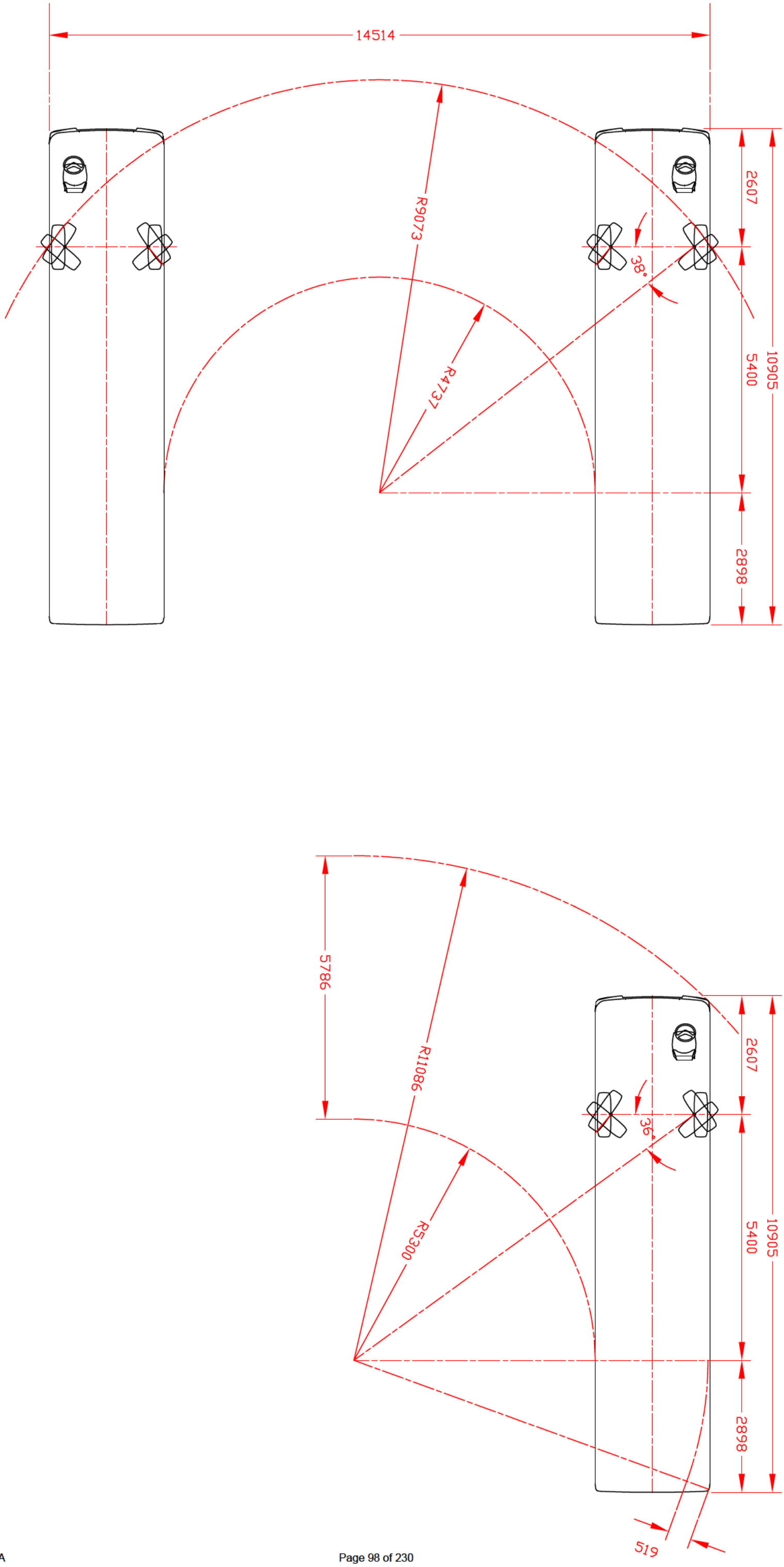
Page 97 of 230

TfL_scp_01548 COA

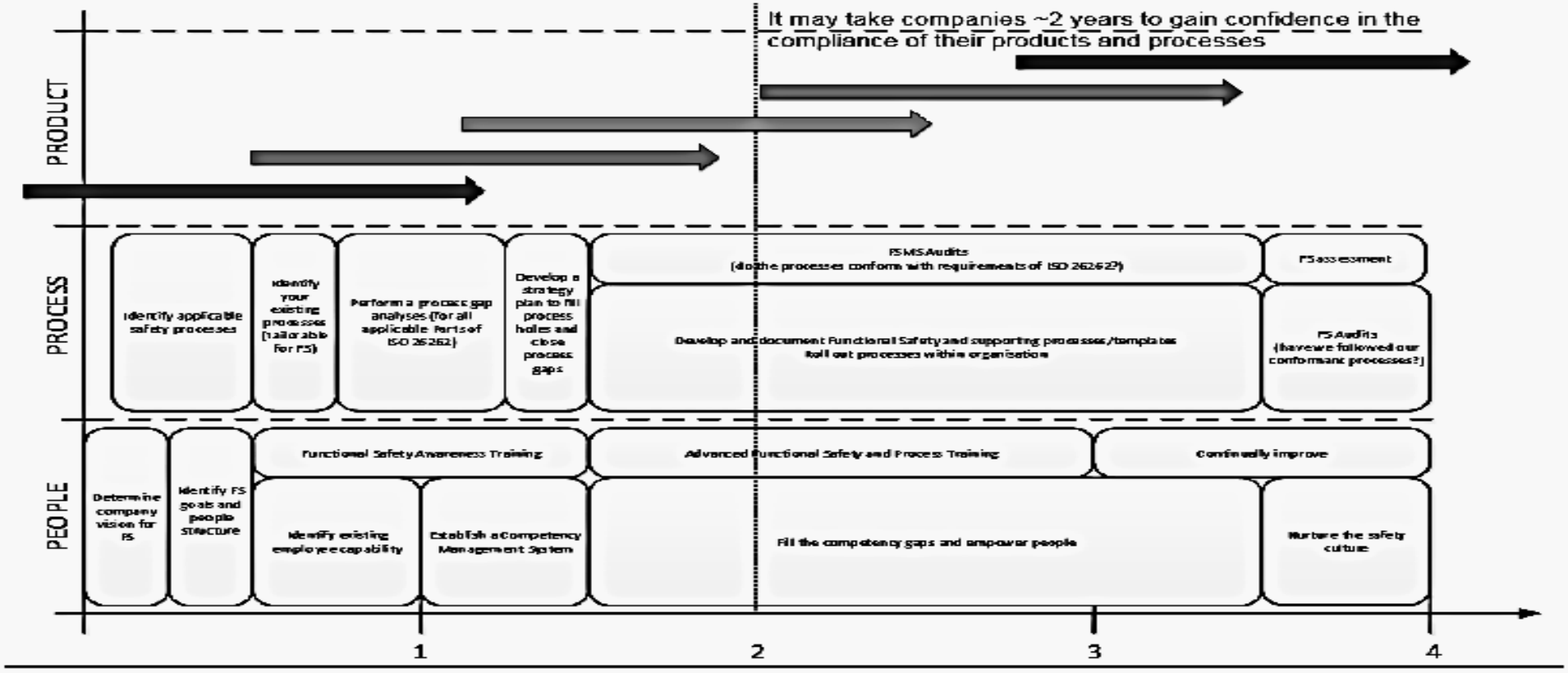
** Maximum capacity to be confirmed with final body weight & options

All above dimensions are for reference only and may vary. Seat pitches may vary depending on chosen seat type.

Wright Bus reserve the right to alter specifications as deemed necessary due to continuous improvement initiatives.


14514
R9073
38°
2607
5400
10905
2898
R4737
5786
R11086
R5300
36°
519

Appendix 5 A Typical ISO 26262 "Journey"



Mira		
3.1 Design		
Point	**Item**	**Action**
1	Leak Detection	
3	Earth bonding	
18	Verify solenoid valves shut off together	
19	No detection of E stop fail	
22	PRV's unseat	
26	WMP opening manual vent valves	
27	Minus 40 deg limit luxfer	Check specification
31	FCS exhaust location review	
33	Hot cold labels	
34	Plan for crash safety measures verification	
35	Oct 17 incident LP solenoid confirm valve capability	
36	Verify all shutdowns lock out the driver	Software

3.2 Process		
Point	**Item**	**Action**
71		
72		
73		
74		
75		
76		
77		
78		
79		
80		
81		
82		
83		
Meeting required to discuss		

Firetrace Ltd
Unit 22
Knightsdale Road
Ipswich
SUFFOLK IP1 4JJ
GB

Test of Fire Suppression system according to ECE Regulation No. 107, Revision 6, Amendment 5, Annex 13

(3 appendices)

1. Background

The department of Safety - Fire Research at RISE has been commissioned by Firetrace Ltd to perform a fire suppression test of a system from Firetrace Ltd. The tests were performed according to ECE Regulation No. 107, Revision 6, Amendment 5, Annex 13. The test was conducted between March 6-7, 2017. The test results presented in this report refer only to the tested objects, under the test conditions described below.

RISE provides Technical Service for the above mentioned regulation.

2. Test set-up

2.1 Test apparatus

The testing was performed in accordance with ECE Regulation No. 107, Revision 6, Amendment 5, Annex 13 in a test apparatus (inventory number 902079) which is a full scale engine compartment mock-up containing mock-ups of some typical engine features (engine block, exhaust system) and complemented with obstructions (Figure 1), aiming to represent a generally obstructed engine compartment interior.

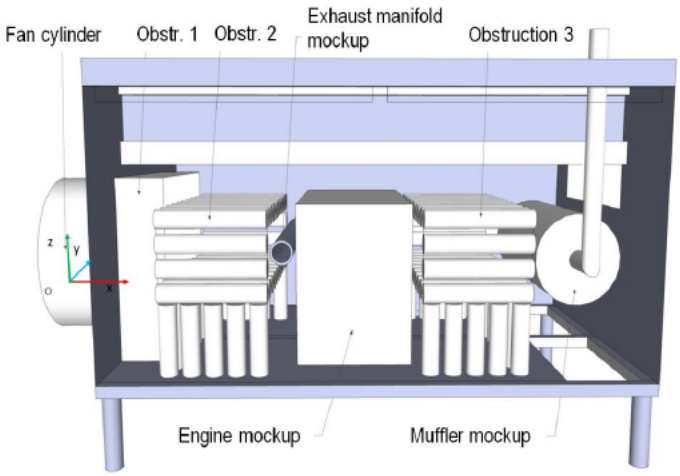


Figure 1. Engine compartment mock-up in accordance with ECE Regulation No. 107.

The obstructions constitute two identical modules placed on both sides of a centrally located engine block mock-up, each module consisting of a series of spaced steel tubes. The tubes form four obstructed zones in two floors, in which the fire sources are inserted. An air flow through the test apparatus of 1.5 m^3/s is produced by an axial fan (inventory number 902080) controlled by a control unit (inventory number 902081) and mounted on the left side of the test rig. The reference volume of the test rig is 4 m^3 while the net internal gas volume (volume not occupied by solid structures) is 3.1 m^3.

2.2 Test scenarios

Four types of fire sources are used: pool fire, pool fire with diesel soaked fibreboards, diesel spray fire and dripping oil fire (hot surface ignition). There is in total 4 fire test scenarios, towards which the system is tested and which differ from each other with respect to combination of fire sources, grade of obstruction and air flow rate applied. The scenarios are: *High-load fire, Low-load fire, High-load fire with fan and Re-ignition*. The different scenarios are described in more detail in the standard ECE Regulation No. 107, Revision 6, Amendment 5, Annex 13.

The objective of the method is to test suppression performance and not detection ability. The suppression system was thus activated manually at the stipulated times according to the test procedures specified in Annex 13.

Figure 2. Example of the experimental test set-up: *High-load fire with fan* prior to activation of the fire suppression system.