"The purpose of this document is to define the technical, functional and performance requirements of the required system/equipment, in order to allow the Supplier to carry out its best offer in accordance with the relevant standards, as well as the laws and rules in force in UK.

Any requirement in this document shown with strik though text, the requirement shall be considered as not applicable."

There shall be on the coupler an indication to confirm the coupler is correctly coupled visible to persons standing in a safe position at the side of the train.

"The supply of the system/equipment in the subject of the present document includes:

• The HW and Software (SW) physical system, as defined in the following of this document,

• The design of the system and of the relevant SW (if applicable),

• The mock-up and prototypes as defined in this document (if applicable)

• The special tools, as defined in this document (if applicable)

• The activities of review and validation of the design

• The design and product documentation as defined in this document

• The training of the HAH-S and of final customer staff as defined in this document."

"The supplier shall detail the time that the following activities will take:

1) time to separate mechanical connection

2) time to separate electrical connection

3) time to retract coupler

4) time to close coupler cover

5) time to open coupler cover

6) time to extend coupler

7) time to make the electrical connection

8) time to make the mechanical connection"

In the scenario of requirement JV-HS2-WPD16-S_IUC-00044, the semi-permanent coupler shall be capable of withstand a load of 100 kN in both vertical and transverse directions simultaneously without significant permanent deformation.

General Definitions

"System

Hardware and Software aggregate of components organized in order to realize specific functions or functions set. The term “System” identifies the entire System including the equipment and all other required and/or recommended components for system’s functions implementation."

"System’s Architecture

Hardware and/or Software structure chosen for system’s requirements implementation."

"Equipment

Set, identified by its Part Number and Serial Number, with performances specified in the system context."

"Component

Separate part, arrangement of parts, subsystems or units that implement a well distinct function. The term component identifies an object, with part number or drawing number, used in the system, but not necessarily designed for it."

"Line Replaceable Unit (LRU)

Whichever unit that can be removed from the system and/or vehicle in a single maintenance action. The term LRU can be applied also to removable connectors, antennas, raceways and pipes for cables."

"Integration

Evaluation of the performances and of the compatibility of an equipment and/or subsystem (Hardware and/or Software), when it is installed and working in a system, in order to assure that the interfaces work as expected and in accordance to documents of interface control."

"System Integration

Performances verification process with respect to specification’s requirements when all components and equipment are integrated, the system is under power supply, loads are applied, under specified and controlled conditions."

"Integration on the Vehicle

Performances and compatibility evaluation of an equipment and/or subsystem (Hardware and/or Software), when it is installed and working on a vehicle, in order to assure that:

No interface problems exist with respect to control documents.

The required performance characteristics are correctly and continuatively generated in accordance with specification’s requirements foreseen for such verification."

"System Integration on the Vehicle

Performances verification process, with respect to specification’s requirements for system and vehicle, when all components and equipment are integrated on the vehicle, the system is under power supply, loads are applied, under specified and controlled conditions."

"Qualification

Verification process of specification’s requirements, made through test execution."

"Formal Qualification of the System

Activity that, following up definition and implementation of a test plan, gives evidence of system's conformity, with its final design configuration, integrated on the vehicle, operating on test truck and/or on line, to all specified requirements at every level."

"Validation

Confirmation of special requirements' fulfilment related to a definite specific utilization, obtained following up tests and supported by objective evidence.

Design validation is an internal activity of the Car builder, coordinated by the function responsible of design development, made through verifications and tests executed on the system and its integration on the vehicle.

Design validation is a complete process, in order to assure the Car builder as concern:

Verification of the system specification requirements' fulfilment, required by the supply contract according to all methods defined in the Requirements' Management Table.

Verification of the requirements' fulfilment related to homologation in accordance with all methods defined in the Requirements' Management Table."

"Requirements' Management Table

Table, realized at system / component level, that:

Lists all requirements, extracted from this SRD

Identifies the method used for the verification of each requirement during design and testing phase."

"Certification

Verification and conformity declaration process with each specification requirement, related to safe putting into circulation of the vehicle (rail worthiness), as a consequence of the Design Formal Validation."

"Homologation

Verification and conformity declaration with requirements of a law or a national or international regulation, as a consequence of the Design Validation, that leads an Authority (National Safety Authority) recognized for this, to the issue of an act of formal declaration of homologation."

"Railworthiness

Condition for which all specification requirements that fix the effectiveness and safe are taken into consideration for putting into circulation of the vehicle."

"Plan

It means the list in sequential order and logic links to the activities to be done."

"System Requirement document (SRD)

Document that fixes the requirements in terms of required results and the criteria for their verification."

"Technical Description

Document that describes how to achieve specification’s requirements"

"Stand-Alone

Equipment and/or system working without being integrated on the vehicle."

"First Article Inspection (FAI)

Verification activity of the first article that is implemented through:

Analysis of technical and recording documents, Design Configuration included.

Congruence evaluation between technical documents (drawings, specifications), recording quality documents (certification) and tested article.

Visual, dimensional and, where applicable, functional inspection, of tested article.

Evaluation of maintainability, ergonomics, productive standards (manufacture quality)

Evaluation of quality assurance pre-requirements (processes and operators qualification, typology of equipping for production and control, material certification, etc.) and certifying the significance of the tested article however it will be afterwards realized.

Test Reports Verification related to the Test Plan (with the exception of integration tests on the vehicle)."

"Test Plan

Document containing the list of the tests to be done, in sequential order and with logic connections.

The document includes the following information, related to each test:

• Reference code of each test

• Reference document

• Reference to the requirement quoted into the Requirements’ Management Matrix

• Reference to the Procedure and/or applicable Test Method

• Information About series a type tests

• Test execution site"

"Design Review

Formal, documented, exhaustive, systematic and critical review of design’s results carried out by HAH-S – Supplier and, if requested, with the Final Costumer.

It allows to evaluate the design’s, and/or parts of it, fitness to the fulfilment of the input requirements considered in the design phase, identifying potential problems and the necessary corrective actions for the fulfilment of the Costumer’s requirements."

"Design freezing

Activity following from the positive result of the design review related to the considered phase or quote of the design. Design freezing consists in the definition of the design’s configuration of the

reviewed design’s (or quotes of it) documentation, formalized through a document list with valid revision date (or index) following from review."

"Design’s Configuration

Design’s Configuration is defined by the state of the design’s documentation, or quotes/parts of it, that has/have received design Freezing.

The configuration must be formalized through a special tree type list of documents, that will be sent to HAH-S on computerized support.

Such a configuration state is the reference for the following activities of configuracion management."

EN15227 must be fullfilled, in particular Annex B: dynamic test to verifiy the performance of the semi-permanent coupler shall be carried out at 15 km/h. Test procedure shall be approved by Hitachi. Hitachi shall attend the test.

Specific HS2 TTS Definitions

Test report shall be shared with Hitachi. All measured data (in ASCII format), pictures and high speed movies of the crash test shall be shared with Hitachi.

Unit - A formation of vehicles, which can operate by itself or coupled to another Unit. A Unit comprises both On-board CCS and Rolling Stock subsystems and requirements referring to 'Unit' apply to both subsystems.

IM Unit - A Unit which has been fitted with infrastructure monitoring equipment.

Train - An operational formation of one or more Units, with all coupled Units controlled from a single Cab. Each Unit may be orientated in either direction.

"200m Train is a Train formed of one Unit

400m Train is a Train formed of two coupled Units"

Vehicle - a carriage or locomotive within the Unit, as defined in the LOC&PAS TSI[4].

On-board CCS - all parts of the Unit that form part of the 'on-board control-command and signalling subsystem' as defined in paragraph 2.4 of Annex II of the Interoperability Directive[1]. The On-board CCS is considered to be composed of the following sub-systems:

Rolling Stock - all parts of the Unit that form part of the 'rolling stock subsystem' as defined in paragraph 2.7 of Annex II of the Interoperability Directive[1]. The following systems, components and areas of the Rolling Stock, and the scope of each item, are defined to ensure clarity of requirements. The systems and components are not required to be procured to align with these scope definitions.

The automatic front coupler must provide interfaces for the shore supply - 400V socket:

Rolling Stock HS2 TTS Subsystems Definitions

Auxiliary Power Supply – all elements of the Unit that supply power to systems other than traction. This includes (if used) auxiliary convertors, main batteries, local batteries, battery chargers, capacitors and cabling from the transformer through to the systems. The definition of 'Auxiliary Power Supply' includes the air supply if this is used to power auxiliary systems such as doors.

Bulk Luggage Storage Area - area for large luggage

Cab - the area of the Unit from where the Train Captain controls the Train.

Cab CCTV System - a CCTV system recording images of the interior of the Cab

Cab Door – a door on the side of the Unit that leads from outside the vehicle to the cab only. Note that the Unit is not required to have dedicated Cab Doors.

Cab HVAC – the HVAC for the Cab.

Call For Aid – a device for summoning help.

Carbody – the assembled structural shell of the Vehicle, excluding Windows and Exterior Doors.

Catering Area – the area of the Vehicle immediately surrounding the catering facilities.

CCTV System – a Unit-based closed-circuit television system

Crew Control Point – a touch screen, handset and other controls (if necessary) that enables Train Crew to access the train management system to give Train Crew a subset of controls and information for on-board systems.

CRN Pantograph – a pantograph to be used on the CRN. This may be the same component as the HS2 Pantograph, provided it is compatible with both networks.

Digital On-board Repeater (D-OBR) - A system for boosting public mobile networks for Passengers on-board the Unit.

Energy Metering System - equipment and software to monitor the energy usage of the Unit. This may be incorporated into traction / line voltage systems.

Evacuation Doors – Exterior Doors that form part of the primary evacuation route for controlled evacuation of all people on the Unit.

Evacuation Wheelchair – a device carried on the Unit, into which a wheelchair user can transfer in order to facilitate evacuation from the Unit

Exterior Doorway – the area of the Vehicle around the Exterior Door including the aperture in the carbody, any trim and flooring.

Forward Facing/Rear Facing (FFRF) CCTV System – a CCTV system showing images looking forward/rear from the Cab

Full Seat Bay: an arrangement of four Passenger Seats around a table.

Full-width Partition – a partition that fully divides a Vehicle, which includes an Interior Door.

Gangway – a flexible connection that allows safe movement of people between Vehicles.

Half Seat Bay – an arrangement of two Passenger Seats opposite each other around a table.

Heating, Ventilation and Air Conditioning (HVAC) – all of the systems and controls that provide heating, cooling and ventilation (including fresh air provision and exhaust of stale air).

HDL Seat – a Passenger Seat used in the HDL

HS2 Pantograph – a pantograph to be used on the HS2 Network. This may be the same component as the CRN Pantograph, provided it is compatible with both networks.

HS2 Seat – a Passenger Seat

Interior CCTV System – a CCTV system recording images of the Saloon, Vestibules and other interior areas

Interior Door – a powered door that separates areas of the Vehicle, including between the Saloon, the Vestibule and the gangway. A Full-width Partition will include an Interior Door. The scope of the Interior Door includes any controls, sensors and drives. Doors for toilets are not part of the Interior Door scope.

Litter Bin – a bin for the collection of waste from Passengers,

Moveable Step – a retractable device integrated into the Vehicle forming a step with the door threshold, fully automatic and activated/controlled in conjunction with the door release and closing sequences to reduce the gap in width and height between Vehicle and platform - as defined by EN 14752 with additional reference to door release.

Multi-Purpose Area – a seating bay which can be converted into an open area for luggage or buggies

On-board Ramp – a manual device that is positioned between the vehicle door threshold and the platform.

Pantograph CCTV System – a CCTV system showing images of the pantograph and pantograph well

Partial Partition – a partition that visually breaks-up the Vehicle into separate spaces but does not block the aisle clearway in any way.

Passenger Alarm – a device for alerting the Train Captain in an emergency.

Passenger HVAC – the HVAC for the Saloon, Vestibule, Toilets and Catering Areas.

Passenger Information System (PIS) – all of the components that provide general audio and visual information to Passengers, including public address functionality.

Passenger Seat – an individual seat for one passenger, including the mounting of that seat to the Vehicle and any facilities provided at that seat.

Premium Seat – a type Passenger Seat

Public WiFi Network - A system that provides WiFi to Passengers on-board the Unit and communicates with the Wayside.

Running Gear – the wheels and suspension that provide support and guidance for the Vehicle.

Saloon – the area of the Unit where passengers will normally sit, bounded by Full-width Partitions at each end.

Saloon Section – a portion of a Saloon, measured between Partitions, for which separate lighting settings can be applied

Sanitary Systems – the toilet bowl, flush, effluent system, fresh water supply and sink facilities. It is assumed that to meet the requirements of this TTS a ‘bio-reactor’ effluent system will be required.

Seating Position – an individual Passenger Seat or Wheelchair Space and the space associated with that seat or space. (Note that Vestibule Seats are not considered Seating Positions).