

# Channel Tunnel Reference Document for Cross-Acceptance

Approved Version 29 July 2013

Version	Description		
29/07/2013	APPROVED following IGC meeting 25/07/2013		

  

Ref.	Parameter of detailed list of parameters in accordance to Decision 2009/965/EC	Explanation	National rules for the UK railways
1.0	General documentation	General documentation (including description of new, renewed or upgraded vehicle and its intended use, design, repair, operation and maintenance information, technical file, etc.)	Heading only, no rule required to be notified
1.1	General documentation	General documentation, technical description of the vehicle, its design and intended use for the kind of traffic (long-distance train, suburban vehicles, commuter services, etc.) inclusive of intended and max design speed, including general plans, diagrams and necessary data for registers, e.g. length of vehicle, axle arrangement, axle spacing, mass per unit, etc..	Compliance with applicable TSIs, no additional requirements
1.2	Maintenance instructions and requirements		Heading only, no rule required to be notified
1.2.1	Maintenance instructions	Maintenance manuals and leaflets, including requirements necessary to maintain design safety level of the vehicle Any appropriate professional qualifications i.e. skills that are requested for equipment maintenance	Compliance with applicable TSIs, no additional requirements Compliance with applicable TSIs, no additional requirements
1.2.2	The maintenance design justification file		Compliance with applicable TSIs, no additional requirements
1.3	Instructions and documentation for operation		Heading only, no rule required to be notified
1.3.1	Instructions for operation in normal and degraded modes of the vehicle		Compliance with applicable TSIs, no additional requirements
1.4	Track-side tests of the complete vehicle		Compliance with applicable TSIs, no additional requirements
2.0	Structure and mechanical parts	Mechanical integrity and interface between vehicles (including draw and buffer gear, gangways, strength of vehicle structure and fittings (e.g. seats), loading capability, passive safety (incl. interior and exterior crashworthiness).	Heading only, no rule required to be notified
2.1	Vehicle structure		Heading only, no rule required to be notified

2.1.1	Strength and integrity	This parameter covers e.g. requirements of the mechanical strength of car body, underframe, suspension systems, couplings, track sweeper and snow plough. Mechanical strength of separate items of this list such as bogie/running gear, axle box, axle, wheel, and pantograph will be defined separately.	Compliance with applicable TSIs, no additional requirements
2.1.2	Load capability		Heading only, no rule required to be notified
2.1.2.1	Load conditions and weighted mass		<p>Passenger vehicles: Compliance with applicable TSIs, no additional requirements</p> <p>Freight vehicles: Eurotunnel Safety Arrangements Volume C2 Annex 2: Freight Trains / Haut Le Pied Trains: The hauled weight must not exceed the maximum weight planned on the Concession depending on the hauling locomotives used. For hauling locomotives in simple unit the maximum weight is 1300 tonnes. For hauling locomotives in multiple units the maximum weight is 1800 tons</p>
2.1.2.2	Axle load and wheel load	For individual wheels/axles in accordance with load conditions of 2.1.2.1	<p>Passenger vehicles: Compliance with applicable TSIs, no additional requirements</p> <p>Freight vehicles: Eurotunnel Safety Arrangements Volume C2 Annex 2: Freight Trains And Haut Le Pied Trains: The maximum permitted axle loading is 22.5 tonnes.</p>
2.1.3	Joining technology		Compliance with applicable TSIs, no additional requirements
2.1.4	Lifting and jacking		Compliance with applicable TSIs, no additional requirements
2.1.5	Fixing of devices to car body structure		Compliance with applicable TSIs, no additional requirements
2.1.6	Connections used between different parts of the vehicle	e.g. connection / suspension between car body and bogie	Compliance with applicable TSIs, no additional requirements
2.2	Mechanical interfaces for End coupling or Inner coupling		Heading only, no rule required to be notified
2.2.1	Automatic coupling		Compliance with applicable TSIs, no additional requirements
2.2.2	Characteristic of rescue coupling	for operational requirements to rescue trains see also 13.1 and 13.3	Compliance with applicable TSIs, no additional requirements
2.2.3	Screw couplings		Compliance with applicable TSIs, no additional requirements
2.2.4	Buffing, innercoupling and draw gear components	Including design, functionality and characteristics e.g. elasticity of buffers	Compliance with applicable TSIs, no additional requirements
2.2.5	Buffer marking		Compliance with applicable TSIs, no additional requirements
2.2.6	Draw hook		Compliance with applicable TSIs, no additional requirements

2.2.7	Gangways		Compliance with applicable TSIs, no additional requirements
2.3	Passive safety	Including e.g. obstacle deflector, limiting deceleration, survival space, structural integrity of occupied areas, reducing the risk of derailment and over-riding, limiting consequences of hitting a track obstruction, interior fittings for passive safety	Compliance with applicable TSIs, no additional requirements
3	Track interaction and gauging	Mechanical interfaces to the infrastructure (including static and dynamic behaviour, clearances and fits, gauge, running gear, etc.)	Heading only, no rule required to be notified
3.1	Vehicle gauge	Compatibility of the vehicle profile with the infrastructure and other vehicles (static and dynamic gauge) based on reference static and dynamic gauge	Heading only, no rule required to be notified
3.1.1	Specific case	specific case (e.g. vehicles to be carried on a ferry)	Compliance with applicable TSIs, no additional requirements
3.2	Vehicle dynamics	Rolling stock dynamic behaviour including equivalent conicity, instability criterion, tilting, safety against derailments on twisted track, track loading, etc.	Heading only, no rule required to be notified
3.2.1	Running safety and dynamics	Incl. tolerance of vehicle to distortion of track, running on curved or twisted tracks, safe running on points and diamond crossings, etc.	Compliance with applicable TSIs, no additional requirements
3.2.2	Equivalent conicity, wheel profile and limits		Compliance with applicable TSIs, no additional requirements
3.2.3	Track loading compatibility parameters	e. g. dynamic wheel force, wheel forces exerted by a wheel set on the track (quasi static wheel force, maximum total dynamic lateral force, quasi static guiding force)	Compliance with applicable TSIs, no additional requirements
3.2.4	Vertical acceleration	e.g. dynamic effects transmitted to bridge decks including resonance in bridges	Compliance with applicable TSIs, no additional requirements
3.3	Bogies / running gear		Heading only, no rule required to be notified
3.3.1	Bogies		Compliance with applicable TSIs, no additional requirements
3.3.2	Wheelset (Axle + wheels)	Including variable gauge wheelsets, axle body, etc.	Compliance with applicable TSIs, no additional requirements
3.3.3	Wheel		Compliance with applicable TSIs, no additional requirements
3.3.4	Wheel/rail interface (including wheel flange lubrication and sanding)	Wheel/rail interface (including wheel flange lubrication, upper sway / wearing track wheel interactions and sanding requirements deriving from traction, braking, train detection)	Compliance with applicable TSIs, no additional requirements

3.3.5	Bearings on the wheelset		Compliance with applicable TSIs, no additional requirements
3.3.6	Minimum curve radius to be negotiated	Values and conditions (e.g. coach coupled/uncoupled)	Compliance with applicable TSIs, no additional requirements
3.3.7	Rail guard	“protection of wheels from obstacles on the rails”	Compliance with applicable TSIs, no additional requirements
3.4	Limit of maximum longitudinal positive and negative acceleration		
4	Braking	Braking-related items (including wheel-slide protection, braking control and braking performance in service, emergency and parking modes)	Heading only, no rule required to be notified
4.1	Functional requirements for braking at train level	e.g. automaticity, continuity, inexhaustibility ...	<p>PAX: With all braking equipment operational, a normally laden train running at 160 km/h which makes an emergency brake application must be able to stop within a distance of 900 m on dry rail without activating the wheel slide protection.</p> <p>FREIGHT: With all braking equipment operational, a train running as MA100/ME100/ME120 which makes an emergency brake application must be able to stop within a distance of (respectively) 1040m/900 m/1070m on dry rail without activating the wheel slide protection.</p>
4.2	Safety requirements for braking at train level		Heading only, no rule required to be notified
4.2.1	Traction/braking interlocking	e.g. traction inhibition	Compliance with applicable TSIs, no additional requirements
4.3	Brake system Recognised architecture and associated standards	Reference to existing solutions e.g. UIC	Compliance with applicable TSIs, no additional requirements
4.4	Brake command	Requirement on brake command per type of brake e.g. number and type of device, allowed delay between command and action on brake ...	Heading only, no rule required to be notified
4.4.1	Emergency braking command		Compliance with applicable TSIs, no additional requirements
4.4.2	Service braking command		Compliance with applicable TSIs, no additional requirements

4.4.3	Direct braking command		Compliance with applicable TSIs, no additional requirements
4.4.4	Dynamic braking command		Compliance with applicable TSIs, no additional requirements
4.4.5	Parking braking command		Compliance with applicable TSIs, no additional requirements
4.5	Brake performance		Heading only, no rule required to be notified
4.5.1	Emergency braking		Compliance with applicable TSIs, no additional requirements
4.5.2	Service braking		Compliance with applicable TSIs, no additional requirements
4.5.3	Calculations related to thermal capacity		Compliance with applicable TSIs, no additional requirements
4.5.4	Parking brake		Immobilise the train on an 11‰ gradient with an adverse 70m/s wind (piston effect) in the Tunnel and 45m/s wind gusts on Terminals.
4.6	Braking adhesion management		Heading only, no rule required to be notified
4.6.1	Limit of wheel rail adhesion profile		Compliance with applicable TSIs, no additional requirements
4.6.2	Wheel slide protection system		Compliance with applicable TSIs, no additional requirements
4.7	Braking force production	Requirement on equipment creating the brake force per type of brake	Heading only, no rule required to be notified
4.7.1	Friction brake	Including material properties e.g. for composite brake blocks	Heading only, no rule required to be notified
4.7.1.1	Brake blocks		Compliance with applicable TSIs, no additional requirements
4.7.1.2	Brake discs		Compliance with applicable TSIs, no additional requirements
4.7.1.3	Brake pads		Compliance with applicable TSIs, no additional requirements
4.7.2	Dynamic brake linked to traction		Compliance with applicable TSIs, no additional requirements
4.7.3	Magnetic track brake		Compliance with applicable TSIs, no additional requirements
4.7.4	Eddy current track brake		Compliance with applicable TSIs, no additional requirements
4.7.5	Parking brake		Compliance with applicable TSIs, no additional requirements
4.8	Brake state and fault indication		Compliance with applicable TSIs, no additional requirements
4.9	Brake requirements for rescue purposes		Compliance with applicable TSIs, no additional requirements
5.0	Passenger-related items	Passenger facilities and passenger environment including passenger windows and doors and requirements for persons with reduced mobility etc.	Heading only, no rule required to be notified

5.1	Access	Functional and technical specifications e.g. for people with reduced mobility	Heading only, no rule required to be notified
5.1.1	Exterior doors		Compliance with applicable TSIs, no additional requirements
5.1.2	Interior doors		Compliance with applicable TSIs, no additional requirements
5.1.3	Clearways		Compliance with applicable TSIs, no additional requirements
5.1.4	Steps and lighting		<p>The step must be suitable to the Tunnel environment so as to be able to evacuate all passengers within a short time.</p> <p>Suitable means of bridging between the train exit step and the Tunnel walkway must be provided.</p> <p>Height from rail head:</p> <ul style="list-style-type: none"> <li>- To evacuation step : 530 mm</li> <li>- To evacuation walkway: 810 mm</li> </ul> <p>Horizontal distance from track centre:</p> <ul style="list-style-type: none"> <li>- To evacuation step : 1861 mm</li> <li>- To evacuation walkway: 2197 mm</li> </ul> <p>Running tunnel walkway is 800mm wide at its narrowest point.</p>
5.1.5	Floor height changes		Compliance with applicable TSIs, no additional requirements
5.1.6	Handrails		Compliance with applicable TSIs, no additional requirements
5.1.7	Boarding aids		Compliance with applicable TSIs, no additional requirements
5.2	Windows	e.g. mechanical characteristics of windows and glass, requirements for emergencies for mechanical characteristics of windscreens see 9.1.3.1	Compliance with applicable TSIs, no additional requirements
5.3	Toilets	See 6.2.1.1 for toilet emissions	Compliance with applicable TSIs, no additional requirements
5.4	Passenger information		Heading only, no rule required to be notified
5.4.1	Public address system		Compliance with applicable TSIs, no additional requirements
5.4.2	Signs and information	Including safety instructions to passengers and emergency markings for passengers	Compliance with applicable TSIs, no additional requirements
5.5	Seats and specific PRM arrangements	except access (covered by 5.1)	For evacuation purposes, wheelchairs adapted to the specificities of the Tunnel evacuation routes must be present on board in sufficient number to allow evacuation of all PRMs on board. Volume G of Eurotunnel Safety Arrangements: the Running Tunnel walkway is 800mm wide (at its narrowest point).
5.6	Specific passenger-related facilities		Heading only, no rule required to be notified
5.6.1	Lift systems	conformity to CE or national regulation if any	Compliance with applicable TSIs, no additional requirements
5.6.2	Heating, ventilation and Air condition systems	e.g. internal air quality, requirement in case of fire (switch off)	Compliance with applicable TSIs, no additional requirements
5.6.3	Other	e.g. beverage dispensing units	Compliance with applicable TSIs, no additional requirements
6.0	Environmental conditions and aerodynamic effects	Impact of the environment on the vehicle and impact of the	Heading only, no rule required to be notified

		vehicle on the environment (including aerodynamic conditions and both the interface between the vehicle and the trackside part of the railway system and the interface to the external environment)	
6.1	Impact of the environment on the vehicle		Heading only, no rule required to be notified
6.1.1	Environmental conditions impacting on the vehicle		Heading only, no rule required to be notified
6.1.1.1	Altitude		Compliance with applicable TSIs, no additional requirements
6.1.1.2	Temperature		Compliance with applicable TSIs, no additional requirements
6.1.1.3	Humidity	e.g. anti-condensation and anti-freezing measures	Compliance with applicable TSIs, no additional requirements
6.1.1.4	Rain		Compliance with applicable TSIs, no additional requirements
6.1.1.5	Snow, ice and hail	e.g. snow cleaning devices, snow plough, ice free heaters, etc	Compliance with applicable TSIs, no additional requirements
6.1.1.6	Solar radiation		Compliance with applicable TSIs, no additional requirements
6.1.1.7	Chemical and particulate matter	Impact upon vehicle equipment and functions due to chemicals and small airborne objects (e.g. ballast)	Compliance with applicable TSIs, no additional requirements
6.1.2	Aerodynamic effects on the vehicle	Aerodynamic impacts upon the vehicle's equipment and functions	Heading only, no rule required to be notified
6.1.2.1	Crosswind effects	Impact upon vehicle equipment and functions due to crosswinds	Passenger vehicles: Compliance with applicable TSIs, no additional requirements  Freight vehicles: Wagons must be designed to withstand peak pressure of $\pm 1000$ pascals without sustaining damage. For the purpose of design, this should be taken over the full height of the wagon and over any 3 m length.
6.1.2.2	Maximum pressure variation in tunnels	Impact upon vehicle equipment and functions due to rapid changes in ambient pressure	Compliance with applicable TSIs, no additional requirements
6.2	Impact of the vehicle on the environment		Heading only, no rule required to be notified
6.2.1	Chemical and particulate emissions	Limits for chemical and particulate emissions from the vehicle	Heading only, no rule required to be notified
6.2.1.1	Toilet emissions	Toilet discharge emissions to the external environment	Compliance with applicable TSIs, no additional requirements
6.2.1.2	Exhaust gas emissions	Exhaust gas emissions to the external environment	Compliance with applicable TSIs, no additional requirements
6.2.2	Limits for noise emissions	Limits for noise emissions from the vehicle to the external environment	Heading only, no rule required to be notified
6.2.2.1	Exterior noise impact	Exterior noise impact caused by the vehicle upon the environment external to the railway system	Compliance with applicable TSIs, no additional requirements
6.2.2.2	Stationary noise impact	Stationary noise impact caused by the vehicle upon the environment external to the railway system	Compliance with applicable TSIs, no additional requirements

6.2.2.3	Starting noise impact	Starting noise impact caused by the vehicle upon the environment external to the railway system	Compliance with applicable TSIs, no additional requirements
6.2.2.4	Pass-by noise impact	Pass-by noise impact caused by the vehicle upon the environment external to the railway system	Compliance with applicable TSIs, no additional requirements
6.2.3	Limits for aerodynamic loads impact	Limits for impact of aerodynamic loads caused by the vehicle upon other parts of the railway system and upon the environment	Heading only, no rule required to be notified
6.2.3.1	Head pressure pulses	Effect of pressure pulses caused by the head of the train at the track side	Compliance with applicable TSIs, no additional requirements
6.2.3.2	Aerodynamic impact on passengers / materials on the platform	Aerodynamic disturbance to passengers / materials on platform including assessment methods and operational loading conditions	Compliance with applicable TSIs, no additional requirements
6.2.3.3	Aerodynamic impact on track workers	Aerodynamic disturbance to Track workers	Compliance with applicable TSIs, no additional requirements
6.2.3.4	Ballast pick-up and projection onto neighbouring property		Compliance with applicable TSIs, no additional requirements
7.0	External warning, marking functions and software integrity requirements	External warnings, marking functions and integrity of software, e.g. safety-related functions with impact on the train behaviour including train bus	Heading only, no rule required to be notified
7.1	Integrity of software employed for safety-related functions	e.g. Integrity of software of train bus	Compliance with applicable TSIs, no additional requirements
7.2	Visual and audible vehicle identification and warning functions		Heading only, no rule required to be notified
7.2.1	Vehicle marking		Compliance with applicable TSIs, no additional requirements
7.2.2	External lights		Heading only, no rule required to be notified
7.2.2.1	Headlights		Compliance with applicable TSIs, no additional requirements
7.2.2.2	Marker lights		Compliance with applicable TSIs, no additional requirements
7.2.2.3	Tail lights		Compliance with applicable TSIs, no additional requirements
7.2.2.4	Lamp controls		Compliance with applicable TSIs, no additional requirements
7.2.3	Warning horn		Heading only, no rule required to be notified
7.2.3.1	Warning horn tones		Compliance with applicable TSIs, no additional requirements
7.2.3.2	Warning horn sound pressure levels	Outside the cab - For internal sound level, see 9.2.1.2	Compliance with applicable TSIs, no additional requirements
7.2.3.3	Warning horns, protection		Compliance with applicable TSIs, no additional requirements
7.2.3.4	Warning horns, control		Compliance with applicable TSIs, no additional requirements
7.2.3.5	Warning horns verification of sound pressure levels		Compliance with applicable TSIs, no additional requirements
7.2.4	Brackets	e.g. requirements for rear end signals: lamps, flags, etc.	Compliance with applicable TSIs, no additional requirements
8.0	On-board power supply and control systems	On-board propulsion, power and control systems plus the	Heading only, no rule required to be notified



		interface of the vehicle to the power supply infrastructure plus EMC (all aspects)	
8.1	Traction performance requirements		Heading only, no rule required to be notified
8.1.1	Residual acceleration at max speed		Compliance with applicable TSIs, no additional requirements
8.1.2	Residual traction capability in degraded mode		Trains must guarantee that a single failure, during their crossing of the Concession and affecting any train equipment contributing to traction systems, will not prevent them from leaving the Concession without assistance. All types of train must have a minimum of 90-minute battery autonomy. In the event of failure of any battery charger, the train must be able to operate at full performance for 30 minutes.
8.1.3	Traction wheel/rail adhesion requirements		Compliance with applicable TSIs, no additional requirements
8.2	Functional and technical specification related to the interface between the vehicle and the energy subsystem		Heading only, no rule required to be notified
8.2.1	Functional and technical specification related to the electric power supply		Heading only, no rule required to be notified
8.2.1.1	Power supply		Compliance with applicable TSIs, no additional requirements
8.2.1.2	Impedance between pantograph and wheels		Compliance with applicable TSIs, no additional requirements
8.2.1.3	Voltage and frequency of overhead contact line power supply		Compliance with applicable TSIs, no additional requirements
8.2.1.4	Energy recuperation		Compliance with applicable TSIs, no additional requirements
8.2.1.5	Maximum power and maximum current that is permissible to draw from the overhead contact line	Incl. maximum current at standstill	Compliance with applicable TSIs, no additional requirements
8.2.1.6	Power factor		Compliance with applicable TSIs, no additional requirements
8.2.1.7	System energy disturbances		Heading only, no rule required to be notified
8.2.1.7.1	Harmonic characteristics and related overvoltages on the overhead contact line		Compliance with applicable TSIs, no additional requirements
8.2.1.7.2	Effects of DC content in AC supply		Compliance with applicable TSIs, no additional requirements
8.2.1.8	Electrical protection	e.g. selectivity of onboard protections and substation protection system	Compliance with applicable TSIs, no additional requirements

8.2.2	Pantograph functional and design parameters		Heading only, no rule required to be notified
8.2.2.1	Pantograph overall design		Compliance with applicable TSIs, no additional requirements
8.2.2.2	Pantograph head geometry		Maximum width of the head of the pantograph is 1,600 mm (horns included) and the minimum width of the carbon pantograph contact strip is 800 mm.
8.2.2.3	Pantograph static contact force		Compliance with applicable TSIs, no additional requirements
8.2.2.4	Pantograph contact force (including dynamic behaviour and aerodynamic effects)	Incl. quality of current collection	Compliance with applicable TSIs, no additional requirements
8.2.2.5	Working range of pantographs		ET Panto uplift : 6030 mm
8.2.2.6	Current capacity		Compliance with applicable TSIs, no additional requirements
8.2.2.7	Arrangement of pantographs		Compliance with applicable TSIs, no additional requirements
8.2.2.8	Insulation of pantograph from the vehicle		Compliance with applicable TSIs, no additional requirements
8.2.2.9	Pantograph lowering		Compliance with applicable TSIs, no additional requirements
8.2.2.10	Running through phase separation sections		Compliance with applicable TSIs, no additional requirements
8.2.2.11	Running through system separation sections		Compliance with applicable TSIs, no additional requirements
8.2.3	Contact strip functional and design parameters		Heading only, no rule required to be notified
8.2.3.1	Contact strip geometry		Compliance with applicable TSIs, no additional requirements
8.2.3.2	Contact strip material		Compliance with applicable TSIs, no additional requirements
8.2.3.3	Contact strip assessment.		Compliance with applicable TSIs, no additional requirements
8.2.3.4	Detection of contact strip breakage		Compliance with applicable TSIs, no additional requirements
8.2.3.5	Current capacity		Compliance with applicable TSIs, no additional requirements
8.3	Electrical power supply and traction system		Heading only, no rule required to be notified
8.3.1	Energy consumption measurement		Compliance with applicable TSIs, no additional requirements
8.3.2	Main electrical circuit configuration		Compliance with applicable TSIs, no additional requirements
8.3.3	High voltage components		Compliance with applicable TSIs, no additional requirements
8.3.4	Earthing		Compliance with applicable TSIs, no additional requirements
8.4	Electromagnetic compatibility	The electromagnetic compatibility between the on-board electrical power supply and control system and: > other parts of the onboard electrical power supply and control system on the same vehicle; > other vehicles; > the trackside part of the railway system; > the external environment.	Heading only, no rule required to be notified

8.4.1	Electromagnetic compatibility within the onboard electrical power supply and control system	The electromagnetic compatibility between parts of the onboard electrical power supply and control system	Compliance with applicable TSIs, no additional requirements
8.4.2	Electromagnetic compatibility with the signalling and telecommunications network	The electromagnetic compatibility between the onboard electrical power supply and control system and the signalling and telecommunications network part of the trackside	Compliance with applicable TSIs, no additional requirements
8.4.3	Electromagnetic compatibility with other vehicles and with the trackside part of the railway system	The electromagnetic compatibility between the onboard electrical power supply and control system and other vehicles and the trackside part of the railway system other than the signalling and telecommunications network	Compliance with applicable TSIs, no additional requirements
8.4.4	Electromagnetic compatibility with the environment	The electromagnetic compatibility between the onboard electrical power supply and control system and the environment external to the railway system (including people in the neighbourhood or on the platform, passengers, drivers/staff)	Compliance with applicable TSIs, no additional requirements
8.5	Protection against electrical hazards		Compliance with applicable TSIs, no additional requirements
8.6	Diesel and other thermal traction system requirements		Compliance with applicable TSIs, no additional requirements
8.7	Systems requiring special monitoring and protection measures		Heading only, no rule required to be notified
8.7.1	Tanks and pipe systems for flammable liquids	Special requirements for tanks and pipe systems for flammable liquids (including fuel)	Compliance with applicable TSIs, no additional requirements
8.7.2	Pressure vessel systems / pressure equipment		Compliance with applicable TSIs, no additional requirements
8.7.3	Steam boiler installations		Compliance with applicable TSIs, no additional requirements
8.7.4	Technical systems in potentially explosive atmospheres	Special requirements for technical systems in potentially explosive atmospheres (e.g. liquid gas, natural gas and battery-powered systems, including protection of transformer tank)	Compliance with applicable TSIs, no additional requirements
8.7.5	Ionisation detectors		Compliance with applicable TSIs, no additional requirements
8.7.6	Hydraulic/pneumatic supply and control systems	Functional and technical specifications, e.g. compressed air power supply, capacity, type, temperature range, air dryers (towers), dew point indicators, insulation, air intake characteristics, fault indicators, etc.	Compliance with applicable TSIs, no additional requirements
9.0	Staff facilities, interfaces and environment	The on-board facilities, interfaces, working conditions and environment for staff (including drivers, drivers	Heading only, no rule required to be notified

		cabs and driver/machine interfaces)	
9.1	Driver's cab design		Heading only, no rule required to be notified
9.1.1	Cab design		Heading only, no rule required to be notified
9.1.1.1	Interior layout	e.g. space availability, cab arrangement and ergonomic requirements	Compliance with applicable TSIs, no additional requirements
9.1.1.2	Desk ergonomics		Compliance with applicable TSIs, no additional requirements
9.1.1.3	Driver's seat		Compliance with applicable TSIs, no additional requirements
9.1.1.4	Means for the driver to exchange documents		Compliance with applicable TSIs, no additional requirements
9.1.1.5	Other facilities to control operation of the train		Compliance with applicable TSIs, no additional requirements
9.1.2	Access to driver's cab		Heading only, no rule required to be notified
9.1.2.1	Access, egress and doors		Compliance with applicable TSIs, no additional requirements
9.1.2.2	Driver's cab emergency exits		Compliance with applicable TSIs, no additional requirements
9.1.3	Windscreen in driver's cab		Heading only, no rule required to be notified
9.1.3.1	mechanical characteristics		Compliance with applicable TSIs, no additional requirements
9.1.3.2	optical characteristics		Compliance with applicable TSIs, no additional requirements
9.1.3.3	equipment	e.g. de-icing, de-misting, external cleaning devices, etc.	Compliance with applicable TSIs, no additional requirements
9.1.3.4	front visibility		Compliance with applicable TSIs, no additional requirements
9.2	Working conditions		Heading only, no rule required to be notified
9.2.1	Environmental conditions		Heading only, no rule required to be notified
9.2.1.1	Heating, ventilation and air condition systems in driver cabs		Compliance with applicable TSIs, no additional requirements
9.2.1.2	Noise in driver cabs	Including horn level inside the cab	Compliance with applicable TSIs, no additional requirements
9.2.1.3	Lighting in driver cabs		Compliance with applicable TSIs, no additional requirements
9.2.2	Others		Compliance with applicable TSIs, no additional requirements
9.3	Driver/machine interface	Equipment in driver's cab to supervise and control safe operation of the train	Heading only, no rule required to be notified
9.3.1	Driver/machine interface		Heading only, no rule required to be notified
9.3.1.1	speed indication	recording of speed covered by 9.6	Compliance with applicable TSIs, no additional requirements
9.3.1.2	driver display unit and screens		Compliance with applicable TSIs, no additional requirements
9.3.1.3	controls and indicators		Compliance with applicable TSIs, no additional requirements
9.3.2	Driver supervision	Driver activity control function e.g. vigilance	Compliance with applicable TSIs, no additional requirements
9.3.3	rear and side view		Compliance with applicable TSIs, no additional requirements
9.4	Marking and labelling in Driver cabs	Static display of basic information for the driver	Compliance with applicable TSIs, no additional requirements
9.5	Equipment and other facilities onboard for staff		Heading only, no rule required to be notified
9.5.1	Facilities onboard for staff		Heading only, no rule required to be notified
9.5.1.1	Staff access for coupling / uncoupling		Compliance with applicable TSIs, no additional requirements

9.5.1.2	External steps and handrails for shunting staff		Compliance with applicable TSIs, no additional requirements
9.5.1.3	Storage facilities for use by staff		Compliance with applicable TSIs, no additional requirements
9.5.1.4	Other facilities		Compliance with applicable TSIs, no additional requirements
9.5.2	Staff and freight access doors	doors equipped with security device for opening only by staff including catering	Compliance with applicable TSIs, no additional requirements
9.5.3	On-board tools and portable equipment	e.g. equipment needed by driver or staff in emergency situation	Compliance with applicable TSIs, no additional requirements
9.5.4	Audible communication system	e.g. for communication between - the train crew, - the train crew and people inside/outside of the train	Compliance with applicable TSIs, no additional requirements
9.6	Recording device	for the purpose of monitoring the behaviour of driver and train	Compliance with applicable TSIs, no additional requirements
9.7	Remote control function		Compliance with applicable TSIs, no additional requirements
10	Fire safety and evacuation		Heading only, no rule required to be notified
10.1	Fire safety		Heading only, no rule required to be notified
10.1.1	Fire protection concept		Heading only, no rule required to be notified
10.1.1.1	Classification of vehicle / Fire categories		Compliance with applicable TSIs, no additional requirements
10.1.2	Fire protection measures		Heading only, no rule required to be notified
10.1.2.1	General protection measures for vehicles		Compliance with applicable TSIs, no additional requirements
10.1.2.2	Fire protection measures for specific kinds of vehicles	e.g. requirements for freight trains or passenger trains on running capability, drivers' protection, etc...	<p>Passenger: Rolling stock intended to be operated in the Channel Tunnel shall be of category B, considering the length of the tunnel.</p> <p>The running capability of passenger rolling stock intended to be operated in the Channel Tunnel shall be demonstrated by application of the specification referenced in EN 50553:2012, in which the system functions impacted by a 'type 2' fire shall be braking and traction; these functions shall be assessed in the following conditions:</p> <p>for a duration of 30 minutes at a minimum speed of 100 km/h.</p> <p>or</p> <p>for a duration of 15 minutes at a minimum speed of 80 km/h (according to clause 4.2.10.4.4) under the condition specified in the national rule notified by the Channel tunnel safety authority for this purpose.</p> <p>Freight: Locomotives must have an equivalent running capability to Category B passenger stock (i.e. 15 minutes) or an extinguishing system on board the locomotive.</p>

10.1.2.3	Protection of driver's cab		<p>Passenger vehicles: The fire control and containment measures must be designed so that the driver is afforded protection for at least 30 minutes.</p> <p>Freight vehicles: For freight locomotives and freight self-propelling units, compliance with the applicable TSIs is sufficient.</p>
10.1.2.4	Fire barriers		<p>Passenger vehicles: In case of fire on board in the engine or in the passenger areas and where it is not possible to move passengers to adjacent carriages, the design of the vehicle shall provide for 30 minutes fire protection. The unit shall be equipped with full cross section partitions within passenger/staff areas of each vehicle, with a maximum separation of 30 meters which shall satisfy requirements for integrity for a minimum of 30 minutes (assuming the fire can start from either side of the partition), or with other Fire Containment and Control Systems (FCCS).</p> <p>The unit shall also be equipped with fire barriers that shall satisfy requirements for integrity and heat insulation for a minimum of 30 minutes at the following locations (where relevant for the concerned unit):</p> <p>Between the driver's cab and the compartment to the rear of it (assuming the fire starts in the rear compartment).</p> <p>Between combustion engine and adjacent passenger/staff areas (assuming the fire starts in the combustion engine).</p> <p>Between compartments with electrical supply line and/or traction circuit equipment and passenger/staff area (assuming the fire starts in the electrical supply line and/or the traction circuit equipment).</p> <p>Verification of conformity shall include testing out in accordance with the requirements EN1363-1 1999.</p>
10.1.2.5	Material properties		<p>Where necessary to support the requirement for running capability (see 10.1.2.1) the currently accepted means of conformity (non-mandatory) is: Construction details must afford 30 minute fire protection for pipes and hoses and wiring and equipment.</p>
10.1.2.6	Fire detectors		<p>Where necessary to support the requirement for running capability (see 10.1.2.1), the currently accepted means of conformity (non-mandatory) is: A system of fire detection and suppression is required to allow the locomotive to continue its journey in the event of fire and to ensure that the driver is protected for at least 30 minutes. Each power compartment must have its own independent fire detection and automatic suppression system.</p>

10.1.2.7	Fire extinction equipment		<p>Where necessary to support the requirements for running capability (see 10.1.2.1) or fire barriers (see 10.1.2.4) or driver's protection (see 10.1.2.3), the currently accepted means of conformity (non-mandatory) is: A system of fire detection and suppression is required to allow the locomotive to continue its journey in the event of fire and to ensure that the driver is protected for at least 30 minutes. Each power compartment must have its own independent fire detection and automatic suppression system.</p> <p>In addition to the special systems in the power compartments, a sufficient number of extinguishers must be available in each vehicle</p>
10.2	Emergency		Heading only, no rule required to be notified
10.2.1	Passenger emergency exits		Compliance with applicable TSIs, no additional requirements
10.2.2	Rescue services' information, equipment and access		Compliance with applicable TSIs, no additional requirements
10.2.3	Passenger alarm		Compliance with applicable TSIs, no additional requirements.
10.2.4	Emergency lighting		Compliance with applicable TSIs, no additional requirements.
10.3	Additional measures		Passenger vehicles: The notified unified safety rules require that there must be a driving position at each end of the train.
11	Servicing	On-board facilities and interfaces for servicing	Heading only, no rule required to be notified
11.1	Train cleaning facilities		Heading only, no rule required to be notified
11.1.1	Train external cleaning facilities	e.g. external cleaning through a washing plant	Compliance with applicable TSIs, no additional requirements
11.1.2	Train internal cleaning		Compliance with applicable TSIs, no additional requirements
11.2	Train refuelling facilities		Heading only, no rule required to be notified
11.2.1	Waste water disposal systems	Including interface to toilet discharge system	Compliance with applicable TSIs, no additional requirements
11.2.2	Water supply system	Conformity to sanitary regulations	Compliance with applicable TSIs, no additional requirements
11.2.3	Further supply facilities	e.g. special requirement for stabling of trains	Compliance with applicable TSIs, no additional requirements
11.2.4	Interface to refuelling equipment for non-electric rolling stock	e.g. nozzles used for diesel fuels and others	Compliance with applicable TSIs, no additional requirements
12.0	On-board control command and signalling	All the on-board equipment necessary to ensure safety and to command and control movements of trains authorised to travel on the network and its effects on the trackside part of the railway system	Heading only, no rule required to be notified
12.1	On-board radio system		Heading only, no rule required to be notified
12.1.1	NON GSM-R radio system		<p>Until GSM-R is installed, all trains using the Channel Tunnel must be equipped with track-to-train communications compatible with the Eurotunnel system (a UHF mobile radio system with possibility to make selective calls).</p> <p>Trains must also be equipped with Concession Radio equipment (a trunked mobile communication system).</p>

12.1.2	GSM-R compliant radio system		Heading only, no rule required to be notified
12.1.2.1	Text messages	Specific requirements for text messages (e.g. in emergency)	Compliance with applicable TSIs, no additional requirements
12.1.2.2	Call forwarding	Requirements and conditions governing call forwarding	Compliance with applicable TSIs, no additional requirements
12.1.2.3	Broadcast calls	Requirements and conditions governing broadcast calls	Compliance with applicable TSIs, no additional requirements
12.1.2.4	Cab-radio related requirements	i.e. other national mandatory cab radio-related requirements not made mandatory by TSI	Compliance with applicable TSIs, no additional requirements
12.1.2.5	Network selection by external trigger		Compliance with applicable TSIs, no additional requirements
12.1.2.6	General purpose radio-related functions	i.e. other national mandatory general purpose radio-related functions not made mandatory by TSI	Compliance with applicable TSIs, no additional requirements
12.1.2.7	Primary controller's MMI functionality	Requirements exported to the cab mobile derived from controller's MMI functionality	Compliance with applicable TSIs, no additional requirements
12.1.2.8	Use of hand portables as cab mobile radio	As primary or fall-back radio	Compliance with applicable TSIs, no additional requirements
12.1.2.9	Capacity of on-board GSMR	e.g. requirement for packet switching capability	Compliance with applicable TSIs, no additional requirements
12.1.2.10	GSM-R-ETCS interface	e.g. train ID synchronisation	Compliance with applicable TSIs, no additional requirements
12.1.2.11	Interconnection and roaming between GSM-R networks	applicable until new release of Eirene target during 2010	Compliance with applicable TSIs, no additional requirements
12.1.2.12	Border crossing	applicable until new release of Eirene target during 2010	Compliance with applicable TSIs, no additional requirements
12.1.2.13	GPRS and ASCI	Covered by change request no national rules expected.	Compliance with applicable TSIs, no additional requirements
12.1.2.14	Interface between rolling stock driver's safety device, vigilance device, and GSM-R onboard assembly.	applicable until new release of Eirene target during 2010	Compliance with applicable TSIs, no additional requirements
12.1.2.15	Test specification for mobile equipment GSM-R	to be closed with additions to Eirene specs	Compliance with applicable TSIs, no additional requirements
12.1.2.16	Directed/automatic network selection		Compliance with applicable TSIs, no additional requirements
12.1.2.17	Registration and deregistration		Compliance with applicable TSIs, no additional requirements
12.1.2.18	GSM-R Version Management	No longer an open point – covered by Agency Procedure - to be removed from open points in TSI. No national rules expected	Compliance with applicable TSIs, no additional requirements
12.2	On-board signalling		Heading only, no rule required to be notified
12.2.1	National on-board signalling systems	Control and warning systems including e.g. "area emergency braking function" and other national requirements for train protection	Traction units are to be fitted with TVM 430 system parameterised for Channel Tunnel infrastructure
12.2.2	Compatibility of signalling system with the rest of the train	Compatibility of on-board signalling equipment with other systems on board of a train e.g. brakes, traction, etc.	Compliance with applicable TSIs, no additional requirements
12.2.3	Compatibility of rolling	Compatibility e.g. with	Heading only, no rule required to be notified



	stock with track infrastructure	track-side detection systems or Hot Axle box detectors, for EMC see 8.4.2	
12.2.3.1	Relation between axle distance and wheel diameter		Compliance with applicable TSIs, no additional requirements
12.2.3.2	Metal free space around wheels		Compliance with applicable TSIs, no additional requirements
12.2.3.3	Metal mass of a vehicle		Compliance with applicable TSIs, no additional requirements
12.2.4	ETCS cab signalling system		Heading only, no rule required to be notified
12.2.4.1	Awakening	to be resolved in Baseline 3	Compliance with applicable TSIs, no additional requirements
12.2.4.2	Train categories	to be resolved in Baseline 3	Compliance with applicable TSIs, no additional requirements
12.2.4.3	Performance requirements for on-board GSM-R equipment related to quality of service	Service quality of GSM-R required for ETCS	Compliance with applicable TSIs, no additional requirements
12.2.4.4	Use of ETCS modes	Requirements on use of ETCS modes that affect vehicle authorisation over and above those in the TSIs	Compliance with applicable TSIs, no additional requirements
12.2.4.5	ETCS requirements when vehicle is driven from outside the cab	Requirements over and above or conflicting with the TSIs in respect of driving outside the cab e.g. radio control by ground staff when shunting	Compliance with applicable TSIs, no additional requirements
12.2.4.6	Level crossing functionality	to be resolved in Baseline 3	Compliance with applicable TSIs, no additional requirements
12.2.4.7	Braking safety margins	to be resolved in Baseline 3	Compliance with applicable TSIs, no additional requirements
12.2.4.8	Reliability – Availability – Safety Requirements	to be resolved by TSI revision	Compliance with applicable TSIs, no additional requirements
12.2.4.9	Marker boards	Requirements exported to vehicle to ensure visibility of boards (e.g. spread of headlight beam, visibility from cab) partially solved in 2.3.0d to be fully resolved in Baseline 3	Compliance with applicable TSIs, no additional requirements
12.2.4.10	Ergonomic aspects of the DMI	to be resolved in Baseline 3	Compliance with applicable TSIs, no additional requirements
12.2.4.11	ETCS values of variables controlled outside UNISIG — Manual	to be resolved in Baseline 3	Compliance with applicable TSIs, no additional requirements
12.2.4.12	KM Conformance Requirements	to be resolved in Baseline 3	Compliance with applicable TSIs, no additional requirements
12.2.4.13	Requirements for pre-fitting ETCS on-board equipment	No longer an open point – covered by Chapter 7 agreed by RISC March 09 - will be removed from the next version of the TSI. No national rules expected.	Compliance with applicable TSIs, no additional requirements
12.2.4.14	ETCS Version Management	No longer an open point – covered by Agency Procedure - to be removed from open points in TSI. No national rules expected	Compliance with applicable TSIs, no additional requirements
12.2.4.15	Specification of ETCS variables	to be resolved in Baseline 3	Compliance with applicable TSIs, no additional requirements
12.2.4.16	RBC – RBC interface	will be covered in 2.3.0d, test specification to be recommended in June 2009 RISC	Compliance with applicable TSIs, no additional requirements

12.2.4.17	Additional requirements on locomotives and multiple units		Compliance with applicable TSIs, no additional requirements
12.2.4.18	Functionality and interfaces of staff protection systems to the signalling system	to be resolved in Baseline 3	Compliance with applicable TSIs, no additional requirements
12.2.4.19	Interface with service brake	to be resolved by TSI CCS revision	Compliance with applicable TSIs, no additional requirements
13	Specific operational requirements	Specific requirements on vehicles for operations (including degraded mode, vehicle recovery, etc)	Heading only, no rule required to be notified
13.1	Specific items to place on-board		Compliance with applicable TSIs, no additional requirements
13.2	Occupational health and safety		Compliance with applicable TSIs, no additional requirements
13.3	Lifting diagram and instructions for rescue	Rescue, lifting and rerailing	Compliance with applicable TSIs, no additional requirements
14	Freight-related items	Freight-specific requirements and environment (including facilities specifically required for dangerous goods)	Heading only, no rule required to be notified
14.1	Design, operation and maintenance constraints for the transport of dangerous goods	e.g. requirements derived from RID, national rules or other regulations for the transport of dangerous goods	Freight vehicles: Eurotunnel Safety Arrangements Volume F - Requirements for the transport of dangerous goods are based on RID but more restrictive.
14.2	Specific facilities for the transport of freight		Compliance with applicable TSIs, no additional requirements
14.3	Doors and loading facilities		Compliance with applicable TSIs, no additional requirements