

EuroSpec



Specification for toilets of railway vehicles



Mobility
Networks
Logistics



Specification for toilets of railway vehicles

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Paris, London, Munich (München), Utrecht, Kopenhagen (København), Vienna (Wien), Bern

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Issue Record

Issue	Date	Comments	Source
1	April 2012	void	EuroSpec “ Specification for Toilets of Railway Vehicles”
1.1	September 2012	Updated after consultation with UNIFE and additional improvements by specialists	
2.0	August 2014	New requirements added. Verification for several requirements added.	

List of open points / non-agreed items

No.	Chap.	Open point / non-agreed item	Finalisation
1	-	void	-

Foreword

EuroSpec is a group of European train operating companies providing harmonised product specifications for use in train procurement and refurbishment.

The main target is to improve the reliability and quality of trains by using common and standardised functional and non-functional specification and verification methods.

The benefits of using EuroSpecs:

- Increase of reliability by sharing good practice and experience;
- Simplification of the tender process in time and cost as a result of fewer variations in requirements between tenders;
- Standardised products and cost reduction due to harmonisation of train operators' requirements.

The EuroSpec specifications comprise merged functional and product basic requirements. All EuroSpec specifications focus on technical aspects exclusively based on the existing national requirements.

A EuroSpec specification is a voluntary standard designed to be used within the European region. The primary field of application is the European rolling stock domain and all associated interfaces.

Regarding the hierarchy this common specification can be positioned as follows, in order of prevalence:

- EN standards
- UIC/ UNIFE Technical Recommendations (TecRecs)
- UIC Codes (leaflets)
- EuroSpec Specifications
- Company Specifications

Introduction

This document is a voluntary standard, produced by Société nationale des chemins de fer français (SNCF), Association of Train Operating Companies (ATOC), Deutsche Bahn (DB), Nederlandse Spoorwegen (NS), Danske Statsbaner (DSB), Österreichische Bundesbahnen (ÖBB) and Schweizerische Bundesbahnen (SBB).

Individual companies may choose to mandate it through internal instructions/procedures or contract conditions.

Purpose of this document

- This document provides a voluntary specification for sanitary facilities for use by companies in the rail sector if they so choose.
- The document is set out in the same format than EN standards including, where appropriate, normative and informative annexes in order to facilitate the interface with ENs.

Application of this document

- This standard is voluntary. Individual companies may however elect to mandate all or part of its use through company procedures or contract conditions. Where this is the case, the company concerned must specify the nature and extent of application.
- Specific compliance requirements and dates of application have therefore not been identified since these will be the subject of the internal procedures or contract conditions of those companies that choose to adopt this standard.

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Approval and authorisation of this document

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1 SCOPE

This specification is applicable for rolling stock units that are equipped with toilets.

In this updated specification new requirements are added and for several requirements is described how compliance to the requirement will be verified.

The purpose of this document is to provide a common specification for toilets in rolling stock units between operators. This document is to replace individual company specific functional requirements and constitutes a common reference being used for tendering and verification.

This specification is an add-on to the Technical Specifications of Interoperability (TSI). Besides this specification additional operator specific specifications might be defined. The specification contains requirements on system level of the sanitary systems and its interfaces, and unifies the requested performances of the different operators.

This specification is not intended to block innovation or to prevent improvement in hygiene or aesthetic aspects. For this purpose each requirement is preceded by an objective.

If applicable, the requirements are referenced to the EN 15380 structure. It is foreseen that more requirement sets and European standards will make use of this common reference structure.

2 NORMATIVE REFERENCES

The following referenced documents are indispensable for the application of this document. ENs are developed by CEN¹ or CENELEC² and are made available from their members.

¹ Comité Européen de Normalisation/ European Committee for Standardization - www.cen.eu

² Comité Européen de Normalisation Électrotechnique/ European Committee for Electrotechnical Standardization - www.cenelec.eu

For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

3 TERMS, DEFINITIONS AND ABBREVIATIONS

- 3.1 Fresh water: Water from the fresh water tank
- 3.2 Black water: Waste water from the toilet
- 3.3 Grey water: Waste water from the sink
- 3.4 Waste water: All waste water, grey water and black water
- 3.5 Freeze drain: A freeze drain is the draining of a part of the toilet system initiated automatically by a specific temperature or manually to prevent damage to the system caused by the freezing of water.
- 3.6 LV: Low Voltage
- 3.7 mm: Millimetre
- 3.8 MMI: Man Machine Interface
- 3.9 N: Newton
- 3.10 On-board maintenance: Maintenance activities that can take place independent of the location of the train (typically not performed in a workshop).
- 3.11 RIC: International Coach Regulations
- 3.12 Standard tooling: Tooling set available for on-board maintenance
- 3.13 TCMS: Train Control and Monitoring System
- 3.14 Toilet: The complete toilet module including the toilet system.
- 3.15 Toilet system: Technical system needed for operating the toilet. LV supply, compressed air supply and train signals are excluded
- 3.16 UIC: International Union of Railways (Union Internationale des Chemins de Fer)
- 3.17 UNIFE: Association of the European Rail Industry (Union des Industries Ferroviaires Européennes)
- 3.18 Train set: A train set is a fixed formation that can operate as a train; it is by definition not intended to be reconfigured, except within a workshop environment. It is composed of only motored or of motored and non-motored vehicles.
- 3.19 RAMS LCC: Reliability, Availability, Maintainability, Safety and Life Cycle Costs
- 3.20 Adjustable software parameters: Software parameters that can be adjusted by the customers technicians.

4 SPECIFICATIONS

This chapter describes the requirements and their objectives. For several requirements verifications are included. A verification describes how compliance to the requirement will be verified.

The indication in the first column defines the specification **type**:

- RE: Required. These requirements are mandatory.
- OP: Optional. The customer shall inform which options are applicable, applicable options shall be treated as requirements.
- DR: Design Recommendation. Design recommendations are mandatory, but supplier is allowed to propose other designs to comply with the objective.
- TX: Text provided as introductory or expository remarks preceding the statement of requirements, design recommendations or options. This to aid the supplier in comprehension.

The last two columns indicate the **classification** according to EN15380-2.

- MPG: Main Product Group.
- SPG: Sub Product Group.

The requirements are listed in the addendum.



5 BIBLIOGRAPHY

EN15380-2	Designation system for railway vehicles - Part 2: product groups
UIC Code 563	Fittings provided in coaches in the interests of hygiene and cleanliness
EN 13272	Electrical lighting for rolling stock in public transport systems
EN 997	WC pans and WC suites with integral trap
EN 16362	Railway applications - Ground based services - Water restocking equipment
TSI PRM	technical specification of interoperability relating to 'persons with reduced mobility'



EuroSpec

“EuroSpec” stands for European Specifications for railway rolling stock. The activity is an initiative of several European train operating companies (TOC). The main focus is on trains consisting of self-propelled carriages, using electricity as the motive power (EMU).

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Specification for Toilets of Railway Vehicles

Addendum

Type [RE, OP, DR, TX]	Nb.	Chapter product- structure	Chapter objective structure	Requirement	Objective	EN 15380-2 MPG	EN 15380-2 SPG	Verification
4.01								
				Scope				
RE	4.01.01	Scope	Scope	Each toilet shall be equipped with: <ul style="list-style-type: none"> • a toilet bowl with a seat and a lid; • a toilet paper dispenser; • a wash bowl unit including a water tap; • a soap dispenser; • a facility for drying hands; • a waste bin; • two hooks which can be used for coats and bags; • a mirror. 	Toilet use shall be convenient to passengers.	C	A	
OP	4.01.02	Scope	Scope	Each toilet shall be equipped with an electric hand dryer.	Passengers shall be able to dry their hands.	C	A	
OP	4.01.03	Scope	Scope	Each toilet shall be equipped with a hand paper dispenser.	Passengers shall be able to dry their hands.	C	A	
RE	4.01.04	Scope	Maintainability	The supplier shall supply complete maintenance instructions for all maintenance activities during the life of the toilet.	The toilet shall be designed to facilitate maintenance and to align with the existing maintenance regime of the operator. Detailed maintenance instructions includes all preventive- and corrective maintenance activities, including replacement of broken components caused by vandalism.	D	D	
4.02								
				Toilet system				
RE	4.02.01	Toilet system	Safety & health	The toilet system shall prevent contamination of fresh water with waste water.	Bacteria contamination of fresh water shall be prevented.	D	D	
RE	4.02.02	Toilet system	Safety & health	The fresh water and the waste water systems shall be separate discrete systems.	Bacteria contamination of fresh water shall be prevented.	D	D	
RE	4.02.03	Toilet system	General	Leaked waste water from the toilet bowl or its connections shall be detected automatically.	Leaked waste water from the toilet system shall be detected before the waste water pollutes or damages the carbody.	D	D	What: system description and test. How: leakage shall be simulated. Leakage shall be detected before the waste water pollutes the car body.
RE	4.02.04	Toilet system	General	Leaked waste water that is detected shall initiate a failure message. This failure message shall alert the staff and if a TCMS is available, these signals shall be reported to it.	Leaked waste water from the toilet system shall be detected before the waste water can pollute or damage the carbody.	J	C	
RE	4.02.05	Toilet system	Availability	It shall be possible to flush the toilet system every 90 seconds. A second flush shall be possible within 30 seconds after the first flush.	The flushing capacity shall be sufficient for normal use as well as during peak use and cause no limitations on the availability. This number of flushes is not to be used for calculating capacity for fresh- and waste water tanks.	D	D	

Type [RE, OP, DR, TX]	Nb.	Chapter product- structure	Chapter objective structure	Requirement	Objective	EN 15380-2 MPG	EN 15380-2 SPG	Verification
RE	4.02.06	Toilet system	Availability	The toilet system shall start up automatically after maintenance, failure signals have been resolved or events such as refilling fresh water, emptying full waste water tanks, etc. have been carried out; unless a manual reset is required.	The toilet system shall start up automatically as much as possible. A manual reset should only be used if necessary.	D	D	
RE	4.02.07	Toilet system	Availability	The supplier shall indicate which specific failures of the toilet system would require a manual reset.	The toilet system shall start up automatically, a manual reset should only be used if necessary.	D	D	
RE	4.02.08	Toilet system	Reliability	The toilet system shall have a mean number of flushes between failures of at least 120.000. Failures of the toilet bowl and the flushing system shall be considered as part of this total.	The flushing system of the toilet shall be highly reliable.	D	D	What: reliability calculation matrix. How: the reliability of all individual components that influence the reliability of the toilet system shall be included. The total reliability of the system shall comply with the requirement. The actual reliability shall be verified during a RAMS LCC verification period.
RE	4.02.09	Toilet system	Availability	If the internal and external temperature of the vehicle is -10°C and higher, the toilet system shall be able to operate within 1 hour after the heating system of the train is turned on.	When the train is heated up from -10°C degrees, the toilet shall be ready for service within the start up time for the train. Within this start up time, the temperature of the critical components of the toilet system shall be above the temperature at which the automatic freeze protection (draining) function is deactivated.	D	D	What: test How: test complete coach in climate chamber. If a climate chamber tests of the complete coach is not foreseen, alternative methods can be used after approval by the customer.
RE	4.02.10	Toilet system	Maintainability	With the vehicle subjected to an external temperature of -10°C and with the vehicle heating operative with the interior at +20°C the vehicle heating system is then switched off. The toilet system shall remain functional and undamaged for a subsequent period of 12 hours. It is not permitted to have an automatic freeze drain for the water tank in this period.	The toilet shall be designed with a high resistance against damage caused by freezing.	D	D	
OP	4.02.11	Toilet system	Maintainability	With the vehicle subjected to an external temperature of -10°C and with the vehicle heating operative with the interior at +20°C the vehicle heating system is then switched off. The toilet system shall remain functional and undamaged for a subsequent period of 24 hours. It is not permitted to have an automatic freeze drain for the water tank in this period.	The toilet shall be designed with a high resistance against damage caused by freezing.	D	D	
RE	4.02.12	Toilet system	Maintainability	After a system drain process, the toilet system shall generate the signals to confirm whether or not the draining process was performed as intended. If a TCMS is available, these signals shall be reported in the TCMS.	The emptying process shall be monitored. Damage by freezing shall be prevented.	J	C	
RE	4.02.13	Toilet system	Availability	The toilet shall function under all inclination angles of the vehicle that can occur during service.	The toilet shall be fully functional under all conditions that can occur during service. Inclination angles, cant, forces due to lateral and longitudinal accelerations shall be taken into account.	C	A	

Type [RE, OP, DR, TX]	Nb.	Chapter product- structure	Chapter objective structure	Requirement	Objective	EN 15380-2 MPG	EN 15380-2 SPG	Verification
DR	4.02.14	Toilet system	Availability	The toilet shall function with the vehicle being in an inclination of at least 11 degrees in all directions. (Design Recommendation for RE 4.02.13)	The toilet shall be fully functional under all conditions that can occur during service. Inclination angles, cant, forces due to lateral and longitudinal accelerations shall be taken into account.	C	A	What: test How: the mechanical functions of the toilet shall be tested at an inclination level of 11° in 4 directions. The following shall be included: <ul style="list-style-type: none"> • Doors (excluded is the self closing mechanism of manual operated doors); • flush system; • grey water system. During the test it is permitted that water can remain behind in pipes of the fresh water system and the waste water system.
TX	4.02.15	Toilet system	Maintainability	Technicians dedicated to rectifying technical problems on board have a limited, standard set of tools at their disposal.	n.a.	D	D	
RE	4.02.16	Toilet system	Maintainability	On-board maintenance shall be possible with a standard set of tools. The standard set of tools to be agreed between customer and supplier.	On-board corrective maintenance shall be possible with the limited set of tooling as available to the technician.	D	D	
RE	4.02.17	Toilet system	Maintainability	The interval for preventive maintenance shall be at least 4 months.	The toilet shall be designed to facilitate maintenance and to align with the existing maintenance regime of the operator. Cleaning and daily/weekly inspections are not included.	D	D	
RE	4.02.18	Toilet system	Maintainability	Components that are difficult to clean shall not be located directly under the waste water level sensors.	Waste water shall not drop on other components in the vicinity external to the waste water tank while removing the waste water sensor(s).	D	D	What: drawing. How: a cone-shaped area directly below the waste water level sensor(s) shall be free of components that are difficult to clean. The top point of the cone(s) is on the centerline of the sensor(s) and the sides of the cone(s) shall have an angle of 20° to the vertical.
RE	4.02.19	Toilet system	Maintainability	Quick release connectors shall be used for electric, pneumatic and hydraulic connections which are needed to be disconnected for regular maintenance.	The time frame for regular maintenance jobs shall be minimized.	D	D	
RE	4.02.20	Toilet system	Maintainability	Quick release connectors shall prevent incorrect re-assembly. This is valid for electrical, pneumatic and hydraulic connectors.	It shall not be possible to mix-up connectors, all connections shall be fool proof.	D	D	
RE	4.02.21	Toilet system	Maintainability	Quick release connectors shall be operable with one hand.	Plugging and un-plugging connectors shall be convenient.	D	D	
RE	4.02.22	Toilet system	Maintainability	A service flush routine shall be initiated by operating the flush button while the toilet is out of order due to a blocked toilet bowl.	Initiating a service flush shall be easy and intuitive also for non technical personnel.	D	D	
RE	4.02.23	Toilet system	Availability	An unsuccessful automatic unblocking routine shall be repeated after a specific period for a specific number of attempts.	Increased availability by an automatic unblocking routine. Valves blocked by hand towels or excessive use of toilet paper can sometimes be unblocked if the unblocking routine is repeated after a certain time period.	D	D	
RE	4.02.24	Toilet system	Availability	The period between the unblocking routines and the number of unblocking routines of requirement 4.02.23 shall be adjustable software parameters.	Increased availability by optimising the automatic unblocking routine to the customer needs.	D	D	

Type [RE, OP, DR, TX]	Nb.	Chapter product- structure	Chapter objective structure	Requirement	Objective	EN 15380-2 MPG	EN 15380-2 SPG	Verification
RE	4.02.25	Toilet system	Maintainability	The following functions shall be available only for train staff and maintenance personnel: - Service flushing (flushing without fresh water); - Reverse flushing, including increasingly intensive reverse flushing. These functions shall be available also in case of the toilet being blocked or degraded. The control for these functions shall be close to the toilet and the local diagnostic information display.	The train staff shall be able to solve blocked toilets.	D	D	
RE	4.02.26	Toilet system	Interfaces	If a failure of the external electric train energy supply occurs, the toilet shall be functional for at least 30 flushing cycles. Under such circumstances battery supply shall be available for at least 90 minutes. Electric hand-dryer does not need to be operational. There shall be a sufficient reserve of compressed air capacity available for the toilet system to permit the requisite number of flushes to be performed.	When the ETS (Electric Train Supply) fails, the toilet shall be available for passengers.	D	D	What: calculation for air consumption and electric scheme showing that the toilet system is connected to the battery. How: The minimum working pressure of the toilet system and realistic air consumption of the toilet and all other air consumers which influence the available air capacity for the toilet, during a period of 90 minutes shall be taken into account.
OP	4.02.27	Toilet system	Interfaces	If a failure of the external electric train energy supply occurs, the toilet shall be functional for at least 50 flushing cycles. Under such circumstances battery supply shall be available for at least 180 minutes. Electric hand-dryer does not need to be operational. There shall be a sufficient reserve of compressed air capacity available for the toilet system to permit the requisite number of flushes to be performed.	When the ETS (Electric Train Supply) fails, the toilet shall be available for passengers.	D	D	What: calculation for air consumption and electric scheme showing that the toilet system is connected to the battery. How: The minimum working pressure of the toilet system and realistic air consumption of the toilet and all other air consumers which influence the available air capacity for the toilet, during a period of 180 minutes shall be taken into account.
RE	4.02.28	Toilet system	Passenger satisfaction	If a vacuum pump is used, the air outlet of the vacuum pump shall not enter into the waste water system. An exception may be made for the air outlet going into the overflow pipe of the waste water tank.	The air output of a vacuum pump shall not pollute passenger areas with bad odours. The length of the ejector outlet shall be minimised, and preferably have an open connection to the outside to minimise pressure built-up at the vacuum pump outlet.	D	D	
RE	4.02.29	Toilet system	Passenger satisfaction	If a vacuum pump is used, the air outlet of the vacuum pump shall not be close to the inlet of the HVAC fresh-air supply or to passenger doors.	The air output of a vacuum pump shall not pollute passenger areas with bad odours.	D	D	
RE	4.02.30	Toilet system	Availability	If multiple toilets are located in the same vehicle the only common parts permitted are fresh water and/or waste water tanks, provided that the availability and reliability of these toilet systems will not be compromised.	The availability of at least one toilet per vehicle shall not be significantly reduced by the use of shared parts between the toilet systems.	D	D	What: reliability calculation matrix. How: the reliability of all individual components influencing the reliability of the toilet system shall be included. The influence of the parts shared by both toilets shall be made clear and shall not reduce the reliability by more than 5%.
4.03				Toilet module				
RE	4.03.01	Toilet module	Passenger satisfaction	The toilet system shall limit the presence of unpleasant odours within the toilet module.	Unpleasant odours in the toilet module shall be prevented.	D	D	What: calculation. How: calculation showing an airflow of a minimum of 20 m ³ per hour.

Type [RE, OP, DR, TX]	Nb.	Chapter product- structure	Chapter objective structure	Requirement	Objective	EN 15380-2 MPG	EN 15380-2 SPG	Verification
RE	4.03.02	Toilet module	Passenger satisfaction	When the toilet door is closed, the toilet system shall prevent unpleasant odours to escape to other passenger areas.	When the toilet door is closed, the escape of unpleasant odours into surrounding passenger areas, including vestibules, shall be prevented. The passenger saloon shall be free from toilet odours as much as possible.	D	D	What: calculation or test. How: calculation of air inlet and air outlet flow rates or smoke or pressure test.
DR	4.03.03	Toilet module	Passenger satisfaction	When the toilet door is closed, the air pressure inside the toilet shall be lower than the air pressure of the area outside the toilet. (Design Recommendation for RE 4.03.02)	The interior of the passenger saloon shall be free from sanitary odours.	C	A	What: calculation or test. How: calculation of air inlet and air outlet flow rates or smoke or pressure test.
RE	4.03.04	Toilet module	Passenger satisfaction	Passengers shall be able to exit the toilet under all degraded situations of the toilet, degraded situations of the vehicle or other emergency conditions.	Passengers can exit the toilet under all circumstances.	N	C	What: overview of all relevant degraded situations and emergency conditions. How: for each degraded situation or emergency condition the supplier shall indicate how exiting the toilet is guaranteed.
RE	4.03.05	Toilet module	Safety & health	The train staff shall be able to view the entire toilet area while standing in the door opening.	The toilet shall allow supervision and assistance by train staff.	C	A	
RE	4.03.06	Toilet module	Passenger satisfaction	When the toilet door is closed, the interior of the toilet module shall not be visible from the passenger area.	Passengers shall experience privacy when using the toilet. When the door is closed, there shall be no gaps between the toilets interior and the passenger area.	D	D	
RE	4.03.07	Toilet module	Passenger satisfaction	The toilet interior shall not be visible from the outside of the train.	Passengers shall experience privacy when using the toilet. Windows shall not be transparent.	C	A	
RE	4.03.08	Toilet module	Maintainability	If a mirror is used as a maintenance hatch, it shall be designed to prevent damage to the mirror when opened completely.	Damage to the mirror resulting from maintenance activities shall be prevented.	D	D	What: test. How: when opening the mirror to its limits, it shall not bang into any objects other than the device intended for this purpose (bump stop or other opening limiter).
RE	4.03.09	Toilet module	Safety & health	A broken mirror shall not result in access to train equipment located behind the mirror.	Passengers shall not have access to technical equipment.	D	D	
RE	4.03.10	Toilet module	Maintainability	Adjustable fixings shall be accessible for re-adjustments without the need to remove any other items. It is permitted to cover adjustable fixings with a hatch.	Adjustable fixings shall be accessible for adjustments. Adjustable fixings can be used for example to adjust hinges or latches or for alignment of panels,	D	D	
RE	4.03.11	Toilet module	Maintainability	The floor of the toilet module shall be a single water-tight unit with a vertical side to a height of 100 mm. This does not apply to the floor at the door opening.	Cleaning the floor shall be easy and straightforward. The floor shall be water tight.	C	C	
RE	4.03.12	Toilet module	Maintainability	The interface between the toilet floor and the connecting train floor shall be watertight.	Cleaning the floor shall be easy and straightforward. The floor shall be water tight.	C	C	
RE	4.03.13	Toilet module	Maintainability	The transition between the horizontal part and the vertical part of the floor shall be rounded with a radius of at least 50 mm.	Cleaning the floor shall be easy and straightforward. The floor shall be water tight.	C	C	
OP	4.03.14	Toilet module	Maintainability	The floor of the toilet shall have a gradual slope and a flush drain at the lowest point.	Liquids on the toilet floor shall be drained and shall not form puddles on the toilet floor.	C	C	

Type [RE, OP, DR, TX]	Nb.	Chapter product- structure	Chapter objective structure	Requirement	Objective	EN 15380-2 MPG	EN 15380-2 SPG	Verification
RE	4.03.15	Toilet module	Passenger satisfaction	If the floor has a drain, the drain shall prevent outside air and noise from entering the toilet module.	To stop draughts and noise entering the toilet.	D	D	
RE	4.03.16	Toilet module	Sustainability	Materials used for the toilet interior shall not be affected by urine.	The complete interior of the toilet shall be resistant against urine	C	A	
RE	4.03.17	Toilet module	Passenger satisfaction	Materials used for the toilet interior shall not absorb liquids.	Preventing bad odours inside the toilet. Urine or waste water leakage shall be easy and straightforward to clean. Prevent the use of materials like open cell rubbers which can absorb liquids.	C	A	What: datasheets How: datasheets of the materials.
RE	4.03.18	Toilet module	Maintainability	If removing the toilet bowl can lead to spillage from the black water pipe, for instance if the flow of the black water pipe from the toilet bowl is upwards, the area where this spillage occurs shall be easy and straightforward to clean without the need for demounting other parts.	Cleaning spilled waste water after removing a toilet bowl shall be easy and straightforward.	D	D	
4.04				Toilet paper dispenser				
OP	4.04.01	Toilet paper dispenser	General	The toilet paper dispenser shall fit rolls of toilet paper according to UIC Code 563.	Standard toilet paper rolls shall fit in the toilet paper dispenser.	D	D	
RE	4.04.02	Toilet paper dispenser	Availability	If standard rolls of toilet paper are used, the toilet paper dispenser shall have space for at least two rolls of toilet paper.	There shall be a sufficient amount of toilet paper available for passengers.	D	D	
RE	4.04.03	Toilet paper dispenser	Availability	If standard rolls of toilet paper are used, the second roll of toilet paper shall only become available to passengers when the first roll is finished.	There shall be a sufficient amount of toilet paper available for passengers. Misuse of toilet paper shall be prevented.	D	D	
4.05				Wash bowl unit				
RE	4.05.01	Wash bowl unit	Scope	The wash bowl unit shall have a drain with a mesh.	The wash bowl outlet shall be designed to prevent it becoming blocked. A mesh prevents larger objects passing into the drain.	D	D	
RE	4.05.02	Wash bowl unit	Scope	The wash bowl unit shall prevent odours entering the toilet through the grey water system.	Bad odours from the waste water system shall not enter the toilet trough the wash bowl unit.	D	D	
RE	4.05.03	Wash bowl unit	Scope	The wash bowl unit shall prevent outside noise entering the toilet through the grey water system.	Outside noise shall not enter the toilet through the wash bowl unit.	D	D	
RE	4.05.04	Wash bowl unit	Scope	The wash bowl unit shall not be provided with a plug.	A bowl-overflow shall be prevented.	D	D	
RE	4.05.05	Wash bowl unit	Sustainability	The washbowl unit and its fixings shall withstand a static force of 1000 N without damage. The load may be applied at any accessible part of the washbowl unit. The size of the load application point to be used shall be approximately 50 mm x 50 mm or Ø 55 mm.	The washbowl unit shall be of sufficient strength and vandalism proof.	D	D	What: calculation or test. How: the critical positions shall be identified for applying the static force. The calculation or test shall show compliance to the requirement.

Type [RE, OP, DR, TX]	Nb.	Chapter product- structure	Chapter objective structure	Requirement	Objective	EN 15380-2 MPG	EN 15380-2 SPG	Verification
4.06				Soap dispenser				
RE	4.06.01	Soap dispenser	Maintainability	The soap dispenser shall be accessible with a square socket key according to RIC (i.e. a Berne key).	The soap dispenser tank shall be accessible for stocking.	D	D	
RE	4.06.02	Soap dispenser	Maintainability	For liquid soap dispensers intended to be refilled whilst on board the vehicle, it shall be possible to refill by pouring soap from above from a separate container, without removing the soap dispenser tank.	The soap dispenser tank shall be accessible for stocking.	D	D	What: test. How: It shall be possible to fill the soap dispenser tank from a commercial 5 litre refill container. For this test, the container contains approximately 0,5 litre of soap. It is not permitted to use any additional equipment. Filling the soap tank without spilling shall be easy and straightforward.
RE	4.06.03	Soap dispenser	Maintainability	Components that are difficult to clean shall not be located directly under the filling opening of the liquid soap dispenser tank.	Spilling liquid soap shall not lead to additional cleaning activities.	D	D	What: drawing How: a cone-shaped area directly below the liquid soap dispenser shall be free of components that are difficult to clean. The top point of the cone is on the centerline of the filling point of the soap dispenser tank and the sides of the cone shall have an angle of 20° to the vertical.
RE	4.06.04	Soap dispenser	Maintainability	The soap dispenser outlet shall be positioned directly above the washbowl.	Pollution by dripping soap from the soap dispenser outlet shall be prevented. Soap dripping from the soap dispenser outlet shall fall into the washbowl.	D	D	
4.07				Hand paper dispenser				
RE	4.07.01	Hand paper dispenser	Availability	If the toilet is equipped with a hand paper dispenser, it shall dispense paper on the basis of a single sheet of paper at a time.	An unintentional supply of more than one sheet of paper to the passenger shall not occur. To prevent overconsumption and blocking of the toilet bowl.	D	D	
4.08				Waste bin				
RE	4.08.01	Waste bin	Availability	The waste bin shall be located in front of a passenger standing facing the wash bowl.	Passengers shall be encouraged to use the waste bin instead of the toilet bowl for disposal of waste.	D	D	
RE	4.08.02	Waste bin	Maintainability	The waste bin shall be removable only by authorised personnel.	Removal of the waste bin shall not be possible by passengers.	D	D	
RE	4.08.03	Waste bin	Maintainability	The waste bin shall be accessible for emptying by the use of a square socket key according to RIC (i.e. a Berne key).	Removing the waste bin shall only be possible by authorised personnel.	D	D	
RE	4.08.04	Waste bin	Maintainability	Emptying the waste bin shall be possible by the use of only one hand.	Emptying the waste bin shall be as efficient as possible for the cleaning staff. It shall be possible to empty the waste bin with one hand since the other hand is used for holding the collecting bag.	D	D	
RE	4.08.05	Waste bin	Sustainability	The waste bin shall withstand typical waste originating from the use of the toilet.	The waste bin shall not be affected by human waste and cleaning agents.	D	D	

Type [RE, OP, DR, TX]	Nb.	Chapter product- structure	Chapter objective structure	Requirement	Objective	EN 15380-2 MPG	EN 15380-2 SPG	Verification
4.09				Toilet bowl				
RE	4.09.01	Toilet bowl	Maintainability	The toilet bowl shall be cleanable in a wash machine and with a high pressure water cleaner.	Once removed from the train, It shall be possible to clean the toilet bowl in a wash machine or with a high pressure water cleaner without the need to remove further components and without them being damaged.	D	D	<p>What: test</p> <p>How: 1. the toilet bowl shall be cleaned in the customer's wash machine for a period of 8 h 2. the toilet bowl shall be cleaned with a high pressure water cleaner (min. distance 0,5 meter)</p> <p>the bowl and components shall not be damaged nor the electrical and pneumatical components shall not contain any water after the above mentioned tests. The toilet bowl shall be functional after these tests.</p>
RE	4.09.02	Toilet bowl	Passenger satisfaction	The operating elements for flushing the toilet shall not be covered by a toilet seat or lid when these are in the raised position.	Operating elements for passengers shall be visible and reachable for passengers.	D	D	
RE	4.09.03	Toilet bowl	Passenger satisfaction	The toilet system shall prevent unintentional reversing of the waste water into the toilet bowl.	Passengers shall not be exposed to waste water.	D	D	<p>What: FMEA and MTBF calculation.</p> <p>How: all unintentional back flush scenarios shall be included. An unintentional reverse flush shall not be possible if one component fails. If an unintentional reverse flush can happen when more components fail simultaneously, the MTBF of these simultaneous failures shall be calculated.</p>
RE	4.09.04	Toilet bowl	Passenger satisfaction	The toilet bowl seat and lid shall be stable in the upright position for the entire range of train running conditions.	The toilet bowl cover and lid shall not fall down due to movements of the train.	D	D	
DR	4.09.05	Toilet bowl	Passenger satisfaction	The angle between the closed and raised position of the toilet lid and seat shall exceed 98°. (Design Recommendation for RE 4.09.04)	The toilet bowl cover and lid shall not fall down due to movements of the train.	D	D	
RE	4.09.06	Toilet bowl	Sustainability	In the closed position, the toilet lid and seat shall withstand a static vertical force of 1000 N at any point without damage. The size of the load application point to be used shall be approximately 50 mm x 50 mm or Ø 55 mm.	The toilet seat and lid shall be of sufficient strength and be vandalism-proof.	D	D	<p>What: calculation or test</p> <p>How: the critical positions shall be identified for applying the static force. The calculation or test shall show compliance to the requirement.</p>
RE	4.09.07	Toilet bowl	Sustainability	The toilet bowl shall withstand a force of 4000 N applied according to EN 997 - Paragraph 5.7.4 "Load Test" without damage.	The toilet bowl shall be of sufficient strength and be vandalism-proof.	D	D	

Type [RE, OP, DR, TX]	Nb.	Chapter product- structure	Chapter objective structure	Requirement	Objective	EN 15380-2 MPG	EN 15380-2 SPG	Verification
4.10				Fresh water system				
RE	4.10.01	Fresh water system	General	The fresh water system shall incorporate design features to prevent water leaking into the car body.	Leakage of water shall not damage the car body. Measures shall be taken to minimise the contaminated area and consequential damage. All critical components and connections shall be considered.	D	D	
RE	4.10.02	Fresh water system	Availability	All fresh water pipes shall be protected from damage due to freezing.	Damage of pipes by freezing shall be prevented.	D	D	
DR	4.10.03	Fresh water system	Availability	Pipes of the fresh water system shall continuously decline with a gradient of at least 3%. (Design Recommendation for RE 4.10.02)	Damage of pipes by freezing shall be prevented. Water filling pipes shall only contain water during the filling process. It shall not be possible for water to remain behind in pipes after a freeze drain or fresh water tank refill.	D	D	
RE	4.10.04	Fresh water system	Availability	The fresh water system shall prevent water from the water tank flowing back into the filler pipes as a result of movements of the train during service.	Freezing of filler pipes and the filling interfaces shall be prevented.	D	D	What: test or simulation How: 1. Level the water tank(s) 2. Fill water tank to maximum level (overflow level). 3. Water tank(s) shall be inclined to 11° in the most critical directions. (If more than one water tank is used, the water tanks shall be inclined together, as a fixed combination). No water shall flow from the filler pipes (or from the filler pipe connections of the tank).
RE	4.10.05	Fresh water system	Availability	Inside the fresh water tank, the outlet of the filler pipes shall be positioned at a higher level than the entrance of the overflow pipe.	Water from the fresh water tank shall not flow back into the filler pipes, nor during filling of the water tank or by movements of the train during service.	D	D	
RE	4.10.06	Fresh water system	Maintainability	Fresh water tanks shall have a hatch for inspecting and cleaning the fresh water tanks.	To be able to visually inspect the inside of the fresh water tank and to have access to the inside of the fresh water tank for manual cleaning.	D	D	
RE	4.10.07	Fresh water system	Maintainability	The access hatch of the fresh water tank shall have an opening of at least 40.000 mm ² .	To be able to visually inspect the inside of the fresh water tank and to have access to the inside of the fresh water tank for manual cleaning.	D	D	What: drawing How: drawing with relevant dimensions to determine the access hatch area.
RE	4.10.08	Fresh water system	Maintainability	The access hatch of the fresh water tank shall be accessible without removing the fresh water tank.	To be able to visually inspect the inside of the fresh water tank and to have access to the inside of the fresh water tank for manual cleaning without removing the fresh water tank.	D	D	
RE	4.10.09	Fresh water system	Maintainability	The access hatch of the fresh water tank shall be accessible without removing any other parts. In case the fresh water tank is located inside a cabinet or behind a panel, it is permitted to have access to the hatch of the fresh water tank by opening a door or other hatch.	To have easy access to the fresh water tank for inspection and cleaning	D	D	

Type [RE, OP, DR, TX]	Nb.	Chapter product- structure	Chapter objective structure	Requirement	Objective	EN 15380-2 MPG	EN 15380-2 SPG	Verification
RE	4.10.10	Fresh water system	Maintainability	For trainsets and trains of multiple trainsets, emptying the fresh water tanks, pipework and toilets shall be possible from a single location on the train.	The emptying of systems holding water shall be optimised. In case of a trainset or a train of multiple trainsets, it shall be possible to empty all the watertanks, pipework and toilets on a train from a single location in the train. This functionality shall not influence automated freeze drain systems. Damage by freezing shall be prevented.	D	D	
RE	4.10.11	Fresh water system	Maintainability	For train sets, draining the pipework and toilets shall be possible from a single location on the train without emptying the fresh water tanks.	The draining of systems holding water shall be optimized. This functionality shall not influence automated freeze drain systems. Damage by freezing shall be prevented.	D	D	
RE	4.10.12	Fresh water system	Maintainability	Draining the fresh water tanks, pipework and toilet shall be possible per system, by operating a single control.	The draining of systems holding water shall be optimised. This functionality shall not influence automated freeze drain systems. Damage by freezing shall be prevented.	D	D	
RE	4.10.13	Fresh water system	Maintainability	Draining the pipework and toilet shall be possible per system, by operating a single control.	Draining systems holding water shall be optimized. This functionality shall not influence automated freeze drain systems. Damage by freezing shall be prevented.	D	D	
RE	4.10.14	Fresh water system	Maintainability	Draining the fresh water tank manually shall be possible without the presence of LV supply and/or compressed air.	Manual draining shall be possible under all circumstances. Damage by freezing shall be prevented.	D	D	
RE	4.10.15	Fresh water system	Maintainability	The draining flow of the fresh water tank shall be compliant with EN 16362:2013 clause 4.1.4.	Process time shall be limited, in order to reduce maintenance effort and costs.	D	D	What: test. How: 1. fill tank to maximum level (water tank is levelled straight). 2. Drain the tank manually and measure the time until water stops flowing. 3. The average measured flow rate shall be at least 1 litre per second.
RE	4.10.16	Fresh water system	Sustainability	The fresh water tank shall not be damaged by the process of filling with water.	The filling of fresh water tanks shall not damage the water tanks, i.e. no damaging pressure shall build up in the water tanks during filling.	D	D	What: test or the design is according design recommendation 4.10.19. How: one filling pipe is to be used, the other shall be blocked. The maximum filling flow rate shall not cause a pressure built up exceeding the maximum working pressure of the water tank. Filling with maximum flow rate shall continue after fresh water tank overflows.
RE	4.10.17	Fresh water system	Maintainability	The fresh water tank shall have an open connection to the atmosphere.	Damage to the fresh water tank shall be prevented. There shall be no pressure difference between the inside and the outside of the water tank.	D	D	
RE	4.10.18	Fresh water system	Maintainability	The fresh water tank shall be equipped with an overflow pipe.	Overflow shall not occur through the filling pipes.	D	D	
DR	4.10.19	Fresh water system	Sustainability	The overflow pipe shall have a cross section exceeding twice the cross section of the filler pipe. (Design Recommendation for RE 4.10.16)	The filling of fresh water tanks shall not damage the water tanks, i.e. no damaging pressure shall build up in the water tanks during filling.	D	D	What: drawing How: drawing shall contain relevant dimensions to determine the cross section of the filler and overflow pipes and their connections.

Type [RE, OP, DR, TX]	Nb.	Chapter product- structure	Chapter objective structure	Requirement	Objective	EN 15380-2 MPG	EN 15380-2 SPG	Verification
RE	4.10.20	Fresh water system	Maintainability	The overflow pipe shall be located such that water from the overflow pipe shall flow between the rails onto the ballast	Overflow water shall not flow out from the side of the train. Prevention of ice build-up on the train.	D	D	
TX	4.10.21	Fresh water system	Maintainability	The fresh water tank and the filler pipes will be cleaned periodically with acid. For this purpose it is needed to connect flushing equipment to the filler pipes and to the fresh watertank. Cleaning these parts will be done in a single process.	n.a.	D	D	
RE	4.10.22	Fresh water system	Maintainability	The fresh water tank shall be equipped with a separate connection for cleaning the fresh water tank and filler pipes.	In order not to have to disconnect any pipes a separate connection to allow cleaning of the fresh water system shall be provided. The interface for the maintenance equipment shall be standardised.	D	D	
RE	4.10.23	Fresh water system	Maintainability	The separate connection for cleaning the fresh water system shall be placed between the tank and the drain valve as close as possible to the drain valve.	In order not to have to disconnect any pipes a separate connection to allow cleaning of the fresh water system shall be provided. The interface for the maintenance equipment shall be standardised.	D	D	
DR	4.10.24	Fresh water system	Maintainability	The drain valve of the fresh water tank shall be a three way valve. The third connection shall be used for the cleaning process. (Design Recommendation for RE 4.10.22. and 4.10.23)	To prevent residue from cleaning being left behind above the drain valve, the complete circuit above the drain valve of the fresh water tank shall be included in the rinsing circuit.	D	D	
RE	4.10.25	Fresh water system	Maintainability	The separate connection for cleaning the fresh water system shall have an internal 1 inch thread and a blanking plug.	In order not to have to disconnect any pipes a separate connection to allow cleaning of the fresh water system shall be provided. The interface for the maintenance equipment shall be standardised.	D	D	
RE	4.10.26	Fresh water system	Maintainability	The connector with internal 1" inch thread for cleaning and rinsing the fresh water tank and the filling pipes shall be accessible with a 1" service hose without dismantling other parts.	Connecting the equipment for cleaning and rinsing shall be easy and straightforward.	D	D	What: test How: demonstration of installed situation, all components adjacent to the water tank shall also be mounted.
RE	4.10.27	Fresh water system	Maintainability	Pipes of the fresh water system that are included in the circuit of the cleaning process of the fresh water tank as mentioned in requirements 4.10.22, 4.10.23, 4.10.24, 4.10.25 and 4.10.26 shall have an internal diameter of at least 25 mm.	To be able to realise a sufficient flow of acid during the cleaning process.	D	D	
RE	4.10.28	Fresh water system	Maintainability	After the cleaning process is finished, the system shall be ready for operation and no residue from the cleaning process shall be left behind in the fresh water system.	Prevent additional rinsing and additional cleaning of the system. Prevent damage caused by cleaning residue.	D	D	
TX	4.10.29	Fresh water system	Maintainability	The fresh water circuit of the toilet bowl and the water tap system will be cleaned periodically with acid. For this process the toilet bowl needs to be flushed repeatedly and the water tap needs to be operated repeatedly.	n.a.	D	D	

Type [RE, OP, DR, TX]	Nb.	Chapter product- structure	Chapter objective structure	Requirement	Objective	EN 15380-2 MPG	EN 15380-2 SPG	Verification
RE	4.10.30	Fresh water system	Maintainability	The toilet system shall have a functionality for cleaning the fresh water circuit of the toilet bowl and the water tap with acid. After starting this function, the toilet bowl shall initiate an automated series of flushes and the water tap shall initiate an automated series of cycles.	Easy and straightforward cleaning and rinsing process for the toilet and the water tap. Prevent intensive manual operating of the toilet and water tap during maintenance.	D	D	
RE	4.10.31	Fresh water system	Maintainability	The number of flushes of the automated series of flushes and the number of water tap cycles as mentioned in requirement 4.10.30 shall be adjustable software parameters.	Optimising the maintenance process to the customer needs.	D	D	
4.11				Waste water system				
RE	4.11.01	Waste water system	General	The waste water system shall incorporate design features to prevent waste leaking into the car body.	Leakage of waste water shall not damage or pollute the car body. Measures shall be taken to minimise the contaminated area and consequential damage. All critical components (toilet bowl , filters for constant vacuum systems, etc.) and all connections shall be considered.	D	D	
RE	4.11.02	Waste water system	General	Waste water shall not remain behind in the pipes of the waste water system.	Prevent damage caused by freezing.	D	D	
DR	4.11.03	Waste water system	Reliability	Pipes of the waste water system shall continuously decline with a gradient of at least 3%. (Design Recommendation for RE 4.11.02)	Prevent damage caused by freezing.	D	D	
RE	4.11.04	Waste water system	Reliability	Pipe bends in the waste water system shall have a radius of at least 3 times the pipe diameter.	Prevent blockage of waste water pipes.	D	D	
RE	4.11.05	Waste water system	Reliability	In the flow of waste water from the toilet bowl to the waste water tank, the cross section and the diameter of the opening at the exit of the toilet bowl shall be the smallest of the entire system.	Prevent blockage of waste water pipes.	D	D	What: test. How: A rigid ball with a smooth surface and a diameter equal to the diameter of the exit of the toilet bowl (tolerance 0/-0,5 mm) shall pass the piping of the waste system until it ends in the waste tank. It is permitted to use pressurised air for this test.
RE	4.11.06	Waste water system	Reliability	In the direction of flow, the inner diameter of the pipes of the waste water system shall not reduce.	Prevent blockage of waste water pipes.	D	D	
RE	4.11.07	Waste water system	Maintainability	The pipes for black waste water and their connections shall withstand inside cleaning with a high pressure water cleaner.	Cleaning with commercial high pressure water cleaners shall not damage the waste water pipes and the connections of the waste water pipes.	D	D	What: statement and test How: the supplier shall state that the system withstands inside cleaning with a high pressure water cleaner. A demonstration shall be done.
RE	4.11.08	Waste water system	Maintainability	The waste water pipes and the connections of the waste water pipes shall withstand a static pressure of at least 10 bar.	To be able to unblock the waste water pipes with air pressure as available in the workshop.	D	D	What: datasheets and test How: datasheets of all connections and flexible hoses. A test of the complete piping shall be done.
RE	4.11.09	Waste water system	Maintainability	Inspecting and cleaning the inside of the waste water tank shall be possible without removing the tank.	To have easy access to the inside of the waste water tank for inspection and cleaning.	D	D	What: test How: demonstration in built-in situation, all components adjacent to the waste tank shall be mounted.

Type [RE, OP, DR, TX]	Nb.	Chapter product- structure	Chapter objective structure	Requirement	Objective	EN 15380-2 MPG	EN 15380-2 SPG	Verification
RE	4.11.10	Waste water system	Maintainability	Waste water tanks shall have a hatch for inspecting and cleaning the waste water tanks.	To be able to visually inspect the inside of the waste water tank and to have access to the inside of the waste water tank for manual cleaning.	D	D	
RE	4.11.11	Waste water system	Maintainability	The access hatch of the waste water tanks shall have an opening of at least 40.000 mm ² .	To have a sufficient opening for a visual inspection of the inside of the waste water tank and to have access to the inside of the waste water tank for manual cleaning.	D	D	
RE	4.11.12	Waste water system	Maintainability	The access hatch of the waste water tank shall be accessible without removing any other parts. In case the waste water tank is located inside a cabinet or behind a panel, it is permitted to have access to the hatch of the waste water tank by opening a door or other hatch.	To have easy access to the waste water tank for inspection and cleaning	D	D	What: test How: demonstration of installed situation, all components adjacent to the waste water tank shall also be mounted.
RE	4.11.13	Waste water system	Maintainability	The level sensor(s) and inlet pipe-end(s) inside the waste water tank shall be directly visible, when the access hatch is removed.	To be able to visually inspect the level sensors and inlet pipe ends inside the waste tank when the hatch is removed.	D	D	What: test How: demonstration of installed situation, all components adjacent to the waste water tank shall also be mounted.
RE	4.11.14	Waste water system	Maintainability	The access hatch shall give direct access to the inside of the waste water tank to be able to remove any blocking objects. It is permitted to have an additional hatch to comply with this requirement.	To have good access to the inside of the tank for manual cleaning and removing any blocking objects.	D	D	
RE	4.11.15	Waste water system	Maintainability	Rinsing the pipework and the waste water tank shall be possible without dismantling the waste water tank.	To be able to rinse the piping and the waste water tank on an easy and straightforward manner in a limited amount of time.	D	D	
RE	4.11.16	Waste water system	Reliability	The level sensors inside the waste water tank shall not be exposed to the ejected waste coming directly from the inlet pipe.	To prevent pollution of the level sensors.	D	D	What: drawing How: the sensor shall not be located in the trajectory area of the waste coming from the inlet pipe-end inside the waste tank.
RE	4.11.17	Waste water system	Reliability	For gravity operated grey water systems, the cross section of the grey water outlet (hoses and piping) shall be at least 800 mm ² . The shape shall be circular or elliptical.	Prevent blockage of grey water drain pipes.	D	D	
RE	4.11.18	Waste water system	Interfaces	The free space around the interfaces for servicing the waste water tanks shall be according to Appendix 12 and 13 of UIC Code 563.	To have sufficient working space for connecting emptying equipment.	D	D	
RE	4.11.19	Waste water system	Interfaces	The waste water system shall facilitate emptying from both sides of the vehicle.	To be able to empty waste water from both sides of the vehicle.	D	D	
RE	4.11.20	Waste water system	Sustainability	All components that come into contact with waste water shall be resistant to waste water.	To prevent degradation of components.	D	D	
RE	4.11.21	Waste water system	Safety & health	The grey water system shall be connected to the waste water tank with a dedicated pipe.	To prevent a flush back in the wash bowl.	D	D	

Type [RE, OP, DR, TX]	Nb.	Chapter product- structure	Chapter objective structure	Requirement	Objective	EN 15380-2 MPG	EN 15380-2 SPG	Verification
4.12				Diagnostic system				
RE	4.12.01	Diagnostic system	Scope	Each toilet shall be equipped with a diagnostic system.	A diagnostic system shall monitor the toilet's functions and detect and store failures of the system. The stored information shall be easily accessible.	J	C	
RE	4.12.02	Diagnostic system	Scope	Each diagnostic system shall have a local MMI with an information display.	The stored information shall be easily accessible locally.	J	C	
RE	4.12.03	Diagnostic system	Availability	The diagnostic system shall combine the signals from fresh water system, waste water system, toilet module and toilet flush system.	System diagnostics shall combine signals of different connected systems for improved diagnostics.	J	C	What: diagnostic logic scheme and test. How: The required signals shall be used for the diagnostic input.
RE	4.12.04	Diagnostic system	Availability	The diagnostic system shall detect degraded conditions of the toilet system.	System diagnostics shall detect failures of the toilet system.	J	C	What: A FMEA and a diagnostic logic scheme. How: all input signals and all outputs i.e automated corrective actions and trouble shooting solutions shall be included in the diagnostic logic scheme.
RE	4.12.05	Diagnostic system	Availability	The diagnostic system shall initiate corrective actions and provide trouble shooting solutions.	System diagnostics shall detect failures of the toilet system and if possible correct these automatically.	J	C	
RE	4.12.06	Diagnostic system	Maintainability	Trouble shooting solutions provided by the diagnostic system shall be presented in text and/or pictograms and shall identify the defect part and the necessary action to solve the failure.	Diagnostic information shall be clear and complete.	J	C	
RE	4.12.07	Diagnostic system	Availability	As a minimum the following undesired conditions shall lead to corrective actions from the toilet system itself: - Blocking of the toilet bowl; - Overflow of the toilet bowl. A reverse flushing shall not be initiated automatically.	System diagnostics shall correct failures, if possible automatically.	J	C	
RE	4.12.08	Diagnostic system	Maintainability	The following user data shall be continuously stored: ● The total number of flushing cycles per toilet module; ● The total number of flushing cycles per toilet module since last overhaul; ● The total number of flushing cycles per toilet module per day.	The user data shall be recorded.	J	C	
RE	4.12.09	Diagnostic system	Maintainability	User data and diagnostic information about the toilet bowl unit shall be available and accessible on-board.	It shall be possible to read out the user data and the diagnostic information from the toilet bowl unit whilst powered from the vehicle LV supply.	J	C	
RE	4.12.10	Diagnostic system	Maintainability	User data and diagnostic information about the toilet bowl unit shall be available and accessible when the toilet bowl is removed from the train (diagnostic memory read-out). It is permitted to use a standard laptop for this purpose.	When the toilet bowl unit is removed from the vehicle, it shall be possible to interrogate the user data and diagnostic information from the toilet bowl unit. It is permitted to use a standard laptop for this purpose.	J	C	
RE	4.12.11	Diagnostic system	Maintainability	The functionality described in 4.12.09 and 4.12.10 shall also be applicable for other sanitary systems with dedicated controllers.	Diagnostic information shall be available on-board and in the workshop.	J	C	

Type [RE, OP, DR, TX]	Nb.	Chapter product- structure	Chapter objective structure	Requirement	Objective	EN 15380-2 MPG	EN 15380-2 SPG	Verification
RE	4.12.12	Diagnostic system	Maintainability	The diagnostic and user data shall be accessible at the vehicles MMI. If a TCMS is available, this data shall be reported in the TCMS.	Data shall be available for on-board access without external pc or other tools.	P	B	
RE	4.12.13	Diagnostic system	Availability	In the event of a failure of the flush function of the toilet system, an indication to the on-board train staff shall be provided.	To restore the availability of the toilet, a non-available toilet shall be detected by the train staff as soon as possible.	J	C	
RE	4.12.14	Diagnostic system	Availability	If a TCMS is available, a non-availability of the toilet due to failure, shall be reported in the TCMS.	A non-functional toilet system shall be detected and reported in the TCMS.	J	C	
RE	4.12.15	Diagnostic system	Maintainability	If a TCMS is available, the state "fresh water tank empty" shall be reported in the TCMS.	Empty fresh water tanks shall be detected and recorded in the TCMS.	J	C	
RE	4.12.16	Diagnostic system	Passenger satisfaction	The toiletsystem shall indicate to passengers if the toilet is vacant.	An vacant toilet shall be indicated to the passengers so that it is clear that the toilet is vacant.	P	B	
RE	4.12.17	Diagnostic system	Passenger satisfaction	The toiletsystem shall indicate to passengers if the toilet is occupied.	An occupied toilet shall be indicated to the passengers so that it is clear that the toilet is occupied.	P	B	
RE	4.12.18	Diagnostic system	Passenger satisfaction	The toiletsystem shall indicate to passengers if the toilet is out of order.	A non-availability of the toilet due to failure shall be indicated to the passengers so that it is clear that the toilet is out of order.	P	B	
4.13				Controller				
RE	4.13.01	Controller	Maintainability	Software parameters related to the operation of the toilet shall be adjustable. This shall be possible using a standard laptop that has been installed with the required software.	It shall be possible to optimise the operation of the toilet by adjusting the controller parameters.	D	D	
RE	4.13.02	Controller	Maintainability	If software for adjusting controller parameters is required, it shall be provided.	It shall be possible to optimise the operation of the toilet by adjusting the controller parameters.	D	D	
RE	4.13.03	Controller	Maintainability	The definition of the controller, including equipment design, input and output definition and documentation, shall be provided.	Function modifications of the controller shall be possible during the lifetime of the train. New development of toilet controllers or future upgrades shall be possible.	D	D	
OP	4.13.04	Controller	Maintainability	The source code and compilation tool of the controller shall be provided.	Function modifications of the controller shall be possible, during the lifetime of the train. New development of toilet controllers or future upgrades shall be possible.	D	D	
RE	4.13.05	Controller	Maintainability	Spare input and output channels of the controller shall be provided.	To cater for future (as yet unspecified) requirements, extension of the functionality of the controller shall be possible.	D	D	
DR	4.13.06	Controller	Maintainability	20% spare channel capacity of the controller shall be provided. (Design Recommendation for RE 4.13.05)	To cater for future (as yet unspecified) requirements, extension of the functionality of the controller shall be possible.	D	D	
RE	4.13.07	Controller	Maintainability	Spare power capacity of the controller shall be provided.	To cater for future (as yet unspecified) requirements, power reserve shall be available.	D	D	
DR	4.13.08	Controller	Maintainability	30% spare power capacity of the controller shall be provided. (Design Recommendation for RE 4.13.07)	To cater for future (as yet unspecified) requirements, power reserve shall be available.	D	D	

Type [RE, OP, DR, TX]	Nb.	Chapter product- structure	Chapter objective structure	Requirement	Objective	EN 15380-2 MPG	EN 15380-2 SPG	Verification
4.14				Doors and locks				
RE	4.14.01	Doors and locks	General	The on-board train staff shall be able to lock the toilet door from the outside under all circumstances (including all degraded situations of the toilet and train).	The train staff shall be able to lock the toilet door out of service to prevent passengers entering the toilet.	N	C	
RE	4.14.02	Doors and locks	Safety & health	The on-board train staff shall be able to unlock and open the toilet door from the outside under all circumstances (including all degraded situations of the toilet and train).	The train staff shall be able to access the toilet under all circumstances.	N	C	
RE	4.14.03	Doors and locks	General	The lock as described in requirements 4.14.01 and 4.14.02 shall be operable with a square socket key according to RIC (i.e. a Berne key).	The train staff shall be able to lock the toilet door out of service to prevent passengers entering the toilet. The train staff shall be able to unlock and open the toilet door from the outside.	N	C	
RE	4.14.04	Doors and locks	Passenger satisfaction	In case of a failure of the door drive, it shall be possible to open and close the toilet door by hand and to lock and unlock the door.	To increase the availability of the toilet. Toilet shall be available to passengers in the event of a door drive failure.	N	C	What: test. How: simulate a broken belt and simulate a power loss of the motor.
RE	4.14.05	Doors and locks	Availability	The toilet door shall only be locked automatically when there is a temporary failure to flush. This shall not prevent egressing from the toilet.	The toilet module shall have a high availability. The toilet door shall be locked only in case of a non-functional flushing function. This to prevent excessive pollution of the toilet module.	N	C	
RE	4.14.06	Doors and locks	Availability	A temporary failure to flush shall only be caused either by critical failures of the toilet system or by one of the following conditions: - Lack of fresh water; - Waste water reservoir full.	The toilet module shall have a high availability. The toilet door shall be locked only in case of a non-functional flushing function. This to prevent excessive pollution of the toilet module.	N	C	
RE	4.14.07	Doors and locks	Passenger satisfaction	Pulling an automatic toilet door in the opening or closing direction manually shall not damage the door drive system.	To prevent that operating an automatic door manually will not lead to any damage.	N	C	
RE	4.14.08	Doors and locks	Passenger satisfaction	If the toilet module has a hinged door, it shall rotate into the toilet module when opened.	Passengers outside the toilet shall not be hindered by the opening and closing movement of the toilet door.	N	C	
RE	4.14.09	Doors and locks	Passenger satisfaction	Where a hinged door is used and for its complete rotation movement, the free space inside the toilet between the toilet door and the toilet bowl shall comply with the dimensions of the clearway width through the vehicle according the TSI PRM.	There shall be sufficient space inside the toilet, to open and close the door from the inside of the toilet. (a hinged door rotates into the toilet module and reduces the free space inside the toilet).	D	D	
RE	4.14.10	Doors and locks	Passenger satisfaction	If the toilet has a manual sliding door, it shall be self-closing.	When the toilet is not used, the door shall be closed.	N	C	What: test. How: a complete representative door and door mechanism including interfacing components shall be tested. The self closing function shall work at an inclination angle of 2,5° in the most critical directions.
RE	4.14.11	Doors and locks	Passenger satisfaction	The self closing function of the manual sliding door shall work at an inclination angle of 2,5° in the most critical directions.	The door shall be closed when the toilet is not used.	N	C	What: test. How: a complete representative door and door mechanism including interfacing components shall be tested. The self closing function shall work at an inclination angle of 2,5° in the most critical directions.