






**DTRF 150900  
General Engineering Conditions  
with Supplier**

**Confidentiality :  
Restricted**

**Document Status :  
Applicable**

<b>A1</b>	<b>First Issue</b>		Weight	Size	Site	Business
<b>B</b>						 Alstom Head Quarter 48 rue Albert Dhalenne, Sigma 4A F-93482 Saint Ouen Cedex
		N° Original doc	N° Replacement		N° Replaced	
<b>Index</b>	<b>Revision notification number</b>					
Scale :	Executed		<b>DTRF 150900 General Engineering Conditions with Supplier</b>			
	Verified					
	Approved					
 <i>Designing fluidity</i>	<b>Date</b>	<b>Name</b>	<b>DTRF150900</b>	<b>B</b>	Nbr of pages: NA	
	En					



	<b>ALSTOM AVVA</b>					
				<b>Signature + Date</b>		
		<b>Name</b>	<b>Function</b>			
	<b>Discussed by</b>					
	<b>Verified by</b>					
	<b>Verified by</b>					
	<b>Verified by</b>					
	<b>Approved by</b>					
	<b>SUPPLIER</b>					

		<b>Name</b>	<b>Functions</b>	<b>Signature + Date</b>	
	<b>Approved by</b>				
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	<b>Section</b>	<b>Title</b>	<b>Fully Compliant</b>	<b>Compliant with Commer</b>	<b>To be clarified</b>	<b>Not Compliant</b>
			<b>0%</b>	<b>0%</b>	<b>0%</b>	<b>0%</b>
	1.4.1	Applicable Standards	0	0	0	0
	1.4.2	Alstom References	0	0	0	0
	2	Project Management	0	0	0	0
	2.5	Design on Specification	0	0	0	0
	2.6	Change Management	0	0	0	0
	2.7	Technical Assistance	0	0	0	0
	2.8	Mean of Proof Activities	0	0	0	0
	3.1	Deliverables	0	0	0	0
	3.1.2	Deliverables management	0	0	0	0
	3.1.3	Engineering Documentation	0	0	0	0
	3.1.4	Software Documentation	0	0	0	0
	3.1.5	Validation Documentation	0	0	0	0
	3.1.6	Maintenance Documentation	0	0	0	0

	C	Fully compliant
	CwC	Compliant with comment
	NC	Not compliant
	NA	Not applicable

rev	Term	Definition
A1	BA	Business Award
B	BOG	Bogie
A1	BTMS	Battery thermal management system
A1	CDR	Critical Design Review
A1	CGR	Critical Gate Review
B	C&IS	Communication and Info System
A1	Commodity	A commodity is a subset of (typically several) components that can be considered as one product, usually purchased from an internal or external supplier.
A1	DFQ	Design for Quality
A1	DRCL	Design Review Check List
	DTRF	Directive for Transversal Requirements and Features : Those documents are transverse Alstom standards/code of practices and define the technical conditions for a specific domain. They are based on standards, completed with specific instructions respecting the standard practice for railway construction and Return on Experience (REX).
A1	ECP	Engineering Change Proposal
B	EPD	Electric and Fluid Distribution
B	Equipment	Same definition than the generic frame agreement
A1	FAI	First Article Inspection
B	FEI	First Equipment Inspection
A1	FMI	Functional Mock-Up Interface
B	FOA	Final Qualification Acceptance
A1	HMI	Human-Machine Interface
B	IDR	Interface Design Review
B	IGR	Interface Gate Review
A1	IPC	Illustrated Parts Catalog
A1	ILS	Integrated Logistic Support refers to the engineering activities consisting in defining the items necessary to maintain Commodity depending on associated characteristics (Reliability and maintainability) in defined conditions while optimizing global cost.
B	IQA	Initial Quality Approval
A1	KOM	Kick Off Meeting
B	LGR	Launch Gate Review
A1	LOB	Life on Board
A1	LRU	Line Replaceable Unit
A1	PDR	Preliminary Design Review
A1	PGR	Preliminary Gate Review
A1	PWT	Power Train
A1	QCDT	Quality Cost Delivery Technical
A1	RAMP	Risk Assessment and Mitigation Plan
A1	RAMS	Or "Reliability, Availability and Safety" refers to the engineering activities consisting in defining the items necessary to maintain Commodity in safe and reliable conditions depending on associated characteristics in defined conditions while optimizing global cost.
A1	RC	Recurring Cost
A1	NRC	Non-Recurring Cost
A1	SDR	Specification Design Review
A1	SGR	Specification Gate Review
A1	SE	The system engineer (or sub-system engineer) is the only Alstom representative responsible to centralize all the technical discussions with Supplier.
A1	SIL	Safety Integrated Level
A1	SPP	Supplier Project Plan
A1	SRS	Software Requirements Specification
A1	SSE	Sub System Engineer
B	SSM	Sub System Manager (PM2020)
B	Subsystem	Secondary or subordinate system within a larger system (as per IEC24765)
A1	System	For Rolling Stock, the top-level system is normally equivalent to the train itself. This is split into a set of sub-systems that covers all functions and components of the train. System is split into a set of sub-systems that covers all functions and components of the train.
A1	SW	Software
B	TAM	Train Architect Manager (PM2020), former TDE
B	TPM	Train Performance Manager (PM2020), former TSE
A1	TTM	Technical Team Manager
A1		Technical Purchase Specification describes all the technical requirements applicable to a system / sub-system.
B	TPS	- vk: prioritization of RSL1 cascading on critical parameters used to launch RFQ under LGR derogation
B		- v1: full cascading from RSL1 used to launch RFQ
B		- v2: final clause by clause, reference for supplier contract
A1	TSS	Train Sub System including Brakes, Air Supply, Sanding, Entrance Systems, Toilet System, HVAC, auxiliary Battery, Pantograph, Master controller, Fire System, Floor, Seat, Glazing, Gangway, Coupling

3

## TERMS AND DEFINITIONS

Note : this part is only for information, no clause by clause is expected

	<b>1.4.1 Applicable Standards</b>						
	<i>Nota Bene : clause by clause of each document must be provided separately from this one</i>						
	For the design, the supplier shall consider and apply the following Alstom Standards / Code of Practices. The following international standards are applicable.						
<b>rev</b>	<b>DESCRIPTION</b>	<b>REFERENCE</b>	<b>APPLICABILITY</b>	<b>Supplier Comments</b>	<b>Alstom Comments</b>	<b>Alstom Acceptance</b>	
A	Information technology - Automatic identification and data capture techniques - QR Code bar code symbol specification	ISO/IEC 18004	All system if requested by project.				
A	Railway Applications - The specification and Demonstration of Reliability availability, maintainability, and Safety	EN 50126	All system				
A	Railway Applications - Rolling Stock Applications - Software on board Rolling Stock	EN 50657	All sub-system with embedded software				



1.4.2	<b>Alstom Specification</b>						
	<i>Nota Bene : clause by clause of each document must be provided separately from this one</i>						
	For the design, the supplier shall consider and apply the following Alstom Standards / Code of Practices. The following international standards are applicable.						
rev	DESCRIPTION	REFERENCE	APPLICABILITY	Supplier Comments	Alstom Comments	Alstom Acceptance	
B	Modelling based on the Functional Mock-up Interface (FMI)	ENG-RSC-EN-RC-STD-0002	Rolling stock on-board electronics				
B	TCMS Maintenance Interface Description	ENG-RSC-EN-CR-STD-0017	Rolling stock on-board electronics				
B	Rolling Stock Ethernet Interface Specification for Cybersecurity	ENG-RSC-EN-CR-STD-0019	Rolling stock on-board electronics				
B	Cybersecurity Transverse Requirements Specifications	ENG-RSC-EN-CR-TEM-0063	Rolling stock on-board electronics				



2 Project Management							
2.1 Design Development Schedules							
rev	#	Req subject	Req statement	CbC	Supplier Comments	Alstom Comments	Alstom Acceptance
A	1		Before contract is awarded to the supplier, a preliminary schedule shall be provided for development and engineering activities.				
A	2		After contract award, the Supplier will provide a detailed schedule indicating the development and industrialization main phases of the Commodity. The Design Phase will be organized in several milestones in accordance with deliverables defined in Appendix B to F of this document.				
2.2 Project Team							
rev	#	Req subject	Req statement	CbC	Supplier Comments	Alstom Comments	Alstom Acceptance
A	1		At the beginning of the Design phase, the Supplier shall identify the team members during the Kick of Meeting. • the project manager, • the key account manager, • the technical responsible, • the quality responsible, • The names for the other Métiers (mechanics, electronics, electricity, software, etc...).				
A	2		This list will be indicated in the DRCL. The supplier must inform Alstom, if any change occurs in the flowchart during the development phase, and afterwards during the serial phase.				
A	3		A communication matrix between Alstom and the Supplier focal points shall be set up accordingly to define relevant entry points and distribution lists for communications.				
2.3 Organization of Reviews							
rev	#	Req subject	Req statement	CbC	Supplier Comments	Alstom Comments	Alstom Acceptance
A	1	Delivery Date	As specified in the appendixes B to G, the documentation shall be received by the SE/SSE in due time for analysis at least two weeks before relevant design review.				
A	2	Review Cycle	The SE/SSE will send to the supplier all necessary comments on the documentation 1week before the review as basis. The periodicity will be adjusted depending of the project context. The supplier shall answer all comments before this review.				
B	3	Review Cycle	Number of cycles must be defined and agreed according to project context and complexity.				
A	4	Technical Critical Meeting	In case of need, the SE/SSE will organize a dedicated meeting regarding all critical points with the relevant stakeholders of the project (supplier, TTM, TSE, TDE, etc.). The periodicity will be adjusted depending of the project context during the KOM.				
A	5	Design Review Check List	The DRCL (see appendix A) will be used by SE/SSE to validate each Design Review. It must be fulfilled prior to design review meeting - all the references of the evidences must be recorded in the DR checklist - For question with deliverables expected, if not evidences are recorded then answer must be Not ok. The supplier shall check this DRCL before the review and update it if necessary.				
A	6	Design Review Check List - OIL	All actions from Design review must be tracked in the OIL sheet by the SE/SSE - For every DR questions with NOT OK answer an action must be added to the OIL. The supplier will take this OIL as reference for project follow-up.				
A	7	Review Schedule	After agreement between the SE/SSE and the supplier on the documentation, and at least two weeks before the review, the agenda and date of the review shall be notified to Supplier.				
A	8	Review Schedule	The reviews will be planned, organized and managed by Alstom. These reviews will be held at the supplier's or car builder's premises and this same supplier allows his experts to attend and to provide the documentation, drawings, reports and Commodity required for the reviews.				
2.4 Design, Verification and Gate Reviews on V-lifecycle							
rev	#	Req subject	Req statement	CbC	Supplier Comments	Alstom Comments	Alstom Acceptance
A	1	Before Supplier Award (TDR phase)	Before any supplier award, the main outcomes expected are:				
B			- A committed Clause by Clause of SPP				
A			- A definition of design schedule, which shall be consistent with the global planning of project (DFQ cycle)				
A			- A Technical assessment as per Technical proposal form supplier.				
A			- A full Clause by Clause of TPS.				
A			- A preliminary version of drawings.				
A			- A commitment on LCC				
A			- A commitment on service reliability performances				
A	2	Kick Off Meeting (KOM)	The Kick Off meeting takes place at the beginning of the development.				
A			The objective of this meeting is to ensure:				
A			- Commodity specification review (updated specification following RFP process if necessary).				
A			- Review of the Technical documentation.				
A			- Definition of a roadmap regarding design schedule in accordance with project needs.				
A			- Delivery Schedule Update.				
B			- Assumptions, Risk & Challenges considered in Project				
B			- Preliminary version of Validation Plan.				
A	3	Specification Design Review (SDR)	The Specification Design Review takes place at the beginning of the development and after the business award (internal meeting):				
B			- On completion of the definition of specification at train and sub-system group level.				
A			- Prior undertaking preliminary design work.				
A			The objectives are:				
B			- To confirm requirements including allocations on performance and interfaces				
A			- Commitment on deliverables (appendix B to F): defined and agreed.				
A			- To define engineering detailed schedule, scope of supply and identify critical path				
A			- To establish technical Risk Assessment and Mitigation Plan on Alstom side (RAMP)				
B	5	Interface Design Review (IDR)	The Interface Design Review takes places :				
B			- On completion of the definition of interfaces with Train.				
B			- Prior undertaking detailed design work				
B			The objectives are:				
A			- To achieve Interfaces maturity as defined in Interfaces Freeze Management Plan.				
A			- To freeze Technical Purchasing Specification (TPSV2) and to sign it.				
B			- To establish technical Risk Assessment and Mitigation Plan on Supplier side (RAMP)				
B			A minute of meeting will be agreed between Alstom and the supplier, giving the status of the design review.				
A	5	Preliminary Design Review (PDR)	The PDR takes place:				
A			- On completion of the general design and testing concept				
A			- Prior undertaking detailed design work				
A			The objective is to ensure:				
A			- To achieve Interfaces maturity as defined in Interfaces Freeze Management Plan.				
A			- Compliance of the preliminary design with the technical specification.				

A			- To update critical product characteristics				
A			- To update technical Risks Assessment and Mitigation Plans (RAMP)				
B			A minute of meeting will be agreed between Alstom and the supplier, giving the status of the design review.				
A	6	Critical Design Review (CDR)	The CDR takes place:				
A			- When detailed design is essentially complete and in accordance with level of maturity defined in DRCL				
A			- Prior undertaking qualification tests.				
A			The objective is to ensure that:				
A			- The detailed design is in accordance with the technical specification				
A			- The validation plan is complete with Mean of Proof and in accordance with the technical specification				
A			- Be ready for validation and close to Serial unit configuration				
B			A minute of meeting will be agreed between Alstom and the supplier, giving the status of the design review.				
A	6	First Article Inspection (FAI)	The FAI is a quality Milestones and takes place:				
A			- After manufacturing of a qualification test specimen / prototype / first serial unit				
A			- Prior to undertaking the serial production.				
A			- Check the maintenance (accessibility, MTRR, etc...)				
A							
A			The main objective is to ensure the compliance of the built standard with its Definition, Production and Inspection Files and validate that product & process are mature to launch serial production.				
A			The built standard must be kept under configuration control.				
	2.5	Design on Specification Audit					
rev	#	Req subject	Req statement	CbC	Supplier Comments	Alstom Comments	Alstom Acceptance
A	1	Objectives	Before any business award, Alstom could retain the right to perform a design on specification audit according to its own standard which purpose is to:				
A			- Assess the ability of the supplier to conduct a product development according to DTRF and AT's standards.				
A			- Ensure that Supplier processes are under control as per Alstom Supplier Quality Manual.				
A		Topics	This design on specification audit is divided in three main topics:				
A			- Project Management capability.				
A			- Product / process development capability & Engineering Workload				
A			- Skills and training capability.				
			<del>4-6 Intellectual property – Background check</del>				
			<i>Note : this part is deleted in revision B</i>				
	2.6	Technical Changes Management					
rev	#	Req subject	Req statement	CbC	Supplier Comments	Alstom Comments	Alstom Acceptance
A	1	Introduction	Regarding change management, a way of working between the Supplier and Alstom shall be defined and agreed at the beginning of the development (KOM). The main objective of the changes management procedure is to define the way to manage evolution of the component/Commodity modifications.				
B	2	Notification	The notification and agreement with ALSTOM include the changes affecting the ALSTOM requirements based on the TPS committed as well as to the processes / manufacturing processes as part of the validation/qualification of the product.				
B		Existing Product	In case of already qualified products or products developed on the basis of previous validations/qualifications, changes in subcomponents (e.g. change of design, change of supplier, etc...) shall also be declared and documented in order to find agreement on the applicability of previous validation/qualification tests or need to re-perform them				
A	3	Information Detail	The supplier will provide sufficient information on: - Components, sub-components and sub-assemblies identification in order to trace the implementation of agreed changes, - Delivered assemblies (if applicable), in order to follow the configurations, - Correspondence between agreed changes and revised configuration index.				
A	4		For software, Alstom and Supplier shall agree on a method to determine the cost involved by any software requirement modification requested by the SE/SSE. The Supplier shall propose this method on the RFP answer. The Purchaser and the supplier shall agree on this method during the kick off meeting.				
	2.6.1	SPECIFICATION CHANGES REQUESTED BY THE PURCHASER					
rev	#	Req subject	Req statement	CbC	Supplier Comments	Alstom Comments	Alstom Acceptance
A	1		If any specification changes are requested by the SE/SSE, the following procedure shall apply: - The Purchaser shall issue an Engineering Change Proposal as per attached form under Appendix J that includes: the specification requirement changes, the applicability of the modification on deliverable Commodity, time schedule requirements.				
A	2		- The Supplier shall answer to the ECP in writing with 7 days with the following information: Technical feasibility, technical impact (function, weight, volume, interfaces, MTBF, safety,...), documentation impacts, planning and cost impacts (RC, NRC) if any.				
A	3		- The ECP answer provided by The Supplier needs to be formally approved in writing by The Purchaser.				
A	4		- All ECP formally approved between two gate reviews as defined previously shall lead to an update of The Commodity specification by The SE/SSE and The Supplier may proceed with The Commodity changes requested on The ECP according to The applicability requirements.				
	2.6.2	SPECIFICATION CHANGES REQUESTED BY THE SUPPLIER					
rev	#	Req subject	Req statement	CbC	Supplier Comments	Alstom Comments	Alstom Acceptance
A	1		If any specification changes are requested by the SE/SSE, the following procedure shall apply: - The Purchaser shall issue an Engineering Change Proposal as per attached form under Appendix J that includes: the specification requirement changes, the applicability of the modification on deliverable Commodity, time schedule requirements.				
A	2		- The Supplier shall issue an ECP as per attached form under Appendix J that includes: The proposed specification requirement changes, the proposed applicability of the modification on deliverable Commodity, time schedule requirements. This ECP shall include in addition: technical feasibility, technical impact (function, weight, volume, interfaces, MTBF, safety,...), documentation impacts, planning and cost impacts (RC, NRC) if any.				
A	3		- The ECP proposed by the Supplier needs to be formally approved in writing within 7 days by the Purchaser.				
A	4		- All ECP formally approved between two gate reviews as defined previously shall lead to an update of the Commodity specification by the SE/SSE and the Supplier may proceed with the Commodity changes requested on the ECP according to the applicability requirements.				
	4.8	Marking and Packaging					

			<b>Note : this part is deleted in revision B</b>					
		2.7	Technical Assistance of Supplier					
<b>rev</b>	<b>#</b>	<b>Req subject</b>	<b>Req statement</b>	<b>CbC</b>	<b>Supplier Comments</b>	<b>Alstom Comments</b>	<b>Alstom Acceptance</b>	
B	1	Introduction	Technical assistance of the supplier party is due, on request, for all general work. This technical assistance covers all phases of development and serialization and must be quoted as an option for all tenders and projects.					
A	2		The Supplier party undertakes to provide the SE/SSE and the Purchaser with the qualified personnel required to provide effective technical assistance, in a short delay (1 day to 1 week depending upon the phases).					
B	3	Car builder request	The Purchaser may ask the Supplier, at no additional costs, to be present (up to five (5) calendar days maximum per phase) to be present during Customer Reviews, First Mounting Inspection, Tests and Commissioning of the Train-Sets.					
A	4	Critical Issue Management	When a critical issue occurs (problem that blocks the integration or testing) the supplier shall give a commitment in less than 48h (target 24h) about the delivery date of a configuration solving the problem. To satisfy these objectives the Supplier shall organize a team that will be sufficient to cover all situations even during holiday's periods.					
A	5	Customer Design Review	At the request of project responsible, the Supplier shall attend Customer Design Review to present its scope of supply.					
A	6	First Mounting	At the request of project responsible, the Supplier shall ensure technical assistance on Alstom manufacturing site for its scope of supply first mounting inspection on Trainset.					
A	7	First Commissioning	The Supplier shall ensure technical assistance on Alstom manufacturing site for its scope of supply first commissioning on Trainset.					
A	8	Train Routine Test	At the request of project responsible, the Supplier shall ensure technical assistance on Alstom manufacturing site for Trainset routine test involving its scope of supply.					
A	9	Validation Test	The Supplier shall ensure technical assistance on Alstom validation site for Trainset (static and/or dynamic) validation tests / fine tuning activities involving its scope of supply.					
A	10	Trainset Testing	At the request of project responsible, the supplier shall ensure technical assistance under Alstom request during Trainset testing and commissioning on Alstom manufacturing site or in the case of commissioning on site.					
A	11	Maintenance Demonstration	In order to comply with a maintainability target, the Supplier shall support Alstom by participating to the maintainability demonstrations organized with the final customer of the Rolling Stock.					
B	12	Maintenance Training	At the request of project responsible, the Supplier shall ensure training on Alstom manufacturing site or to customer at customer's location					
A	13	Hardware Tool	At the request of project responsible, the supplier shall provide list and details of all the necessary tools needed for troubleshooting (including special tools -if any- needed to access components to check), monitoring (auto-test) and software upload-upgrade (cables, codes, uploaders...)					
B	14	Software Tool	At the request of project responsible, the supplier shall provide Alstom with its scope of supply executable application software (uploadable file) and with the software and tools needed to upload the scope of supply software.					
A	15	Phone assistance	Phone assistance from Monday to Friday during seven (7) working hours per day during the period starting from the Delivery of the first Commodity to the date of commissioning of the last delivered Commodity.					
A	16	Site Technical assistance	Technical assistance within twenty four (24) hours from the Purchaser's notice, on sites defined by the Purchaser. Technical assistance, upon request of the Purchaser, during night and holidays in order to implement modification or adaptation on the Commodity, Parts on the Customer's sites.					
		2.8	Mean of Proof Activities					
<b>rev</b>	<b>#</b>	<b>Req subject</b>	<b>Req statement</b>	<b>CbC</b>	<b>Supplier Comments</b>	<b>Alstom Comments</b>	<b>Alstom Acceptance</b>	
B	1		A mean of proof (MoP) activities must be conducted to demonstrate to the requirements defined in the TPS.					
B	2	MoP Support Leading	This activity will be performed by the Alstom Engineer in charge of the development.					
B	3	MoP Support Activity	Between the Business Award and the IGR, the system Engineer will organize dedicated meetings with supplier to confirm MoP identification.					
B	4	MoP Type	The supplier will have to provide a support to the System Engineer to define the type of MoP:					
B	5		- Test: type or routine test					
B	6		- Analysis: Calculation note, Numerical simulation, Justification Note...					
B	7		- Demonstration: Qualitative exhibition of functional performance, usually accomplished with no or minimal instrumentation and physical mock-up.					
B	8		- Certificate: Fire/Smoke certificate, SIL 2, ....					
B	9		- Inspection: Review of technical documents (drawing, scheme, tech description...) with Alstom & the supplier to assess the conformity to some requirements, Visual inspection on first manufactured product.					
B	10	Type of Product	If a standard product is used, only requirements in gap will have to be assessed.					
B	11	Type of Product	If a new development is necessary, the complete analysis of TPS must be done.					
B	12	Evidence	Ultimately, the supplier will have to provide for each requirement the evidence proving compliance (before FAT).					

		<b>2</b>	<b>Project Management</b>				
		2.5	Design on Specification Audit				
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A			- Assess the ability of the supplier to conduct a product development according to DTRF and AT's standards.				
A			- Ensure that Supplier processes are under control as per Alstom Supplier Quality Manual.				
A		Topics	This design on specification audit is divided in three main topics:				
A			- Project Management capability.				
A			- Product / process development capability & Engineering Workload				
A			- Skills and training capability.				

		<b>2</b>	<b>Project Management</b>				
		2.6	Technical Changes Management				
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B	2	Notification	The notification and agreement with ALSTOM include the changes affecting the ALSTOM requirements based on the TPS committed as well as to the processes / manufacturing processes as part of the validation/qualification of the product.				
B		Existing Product	In case of already qualified products or products developed on the basis of previous validations/qualifications, changes in subcomponents (e.g. change of design, change of supplier, etc...) shall also be declared and documented in order to find agreement on the applicability of previous validation/qualification tests or need to re-perform them				
A	3	Information Detail	The supplier will provide sufficient information on: <ul style="list-style-type: none"> <li>- Components, sub-components and sub-assemblies identification in order to trace the implementation of agreed changes,</li> <li>- Delivered assemblies (if applicable), in order to follow the configurations,</li> <li>- Correspondence between agreed changes and revised configuration index.</li> </ul>				
A	4		For software, Alstom and Supplier shall agree on a method to determine the cost involved by any software requirement modification requested by the SE/SSE. The Supplier shall propose this method on the RFP answer. The Purchaser and the supplier shall agree on this method during the kick off meeting.				
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A	2		- The Supplier shall answer to the ECP in writing with 7 days with the following information: Technical feasibility, technical impact (function, weight, volume, interfaces, MTBF, safety,...), documentation impacts, planning and cost impacts (RC, NRC) if any.				
A	3		- The ECP answer provided by The Supplier needs to be formally approved in writing by The Purchaser.				
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rev	#	Req subject	Req statement	CbC	Supplier Comments	Alstom Comments	Alstom Acceptance
A	1		If any specification changes are requested by the SE/SSE, the following procedure shall apply: <ul style="list-style-type: none"> <li>- The Purchaser shall issue an Engineering Change Proposal as per attached form under Appendix J that includes: the specification requirement changes, the applicability of the modification on deliverable Commodity, time schedule requirements.</li> </ul>				
A	2		- The Supplier shall issue an ECP as per attached form under Appendix J that includes: The proposed specification requirement changes, the proposed applicability of the modification on deliverable Commodity, time schedule requirements. This ECP shall include in addition: technical feasibility, technical impact (function, weight, volume, interfaces, MTBF, safety,...), documentation impacts, planning and cost impacts (RC, NRC) if any.				
A	3		- The ECP proposed by the Supplier needs to be formally approved in writing within 7 days by the Purchaser.				
A	4		- All ECP formally approved between two gate reviews as defined previously shall lead to an update of the Commodity specification by the SE/SSE and the Supplier may proceed with the Commodity changes requested on the ECP according to the applicability requirements.				

		<b>2</b>	<b>Project Management</b>				
		2.7	Technical Assistance of Supplier				
rev	#	Req subject	Req statement	CbC	Supplier Comments	Alstom Comments	Alstom Acceptance
B	1	Introduction	Technical assistance of the supplier party is due, on request, for all general work. This technical assistance covers all phases of development and serialization and must be quoted as an option for all tenders and projects.				
A	2		The supplier party undertakes to provide the ST/SSE and the Purchaser with the qualified personnel required to provide effective technical assistance, in a short delay (1 day to 1 week depending upon the phases).				
B	3	Car builder request	The Purchaser may ask the Supplier, at no additional costs, to be present (up to five (5) calendar days maximum per phase) to be present during Customer Reviews, First Mounting Inspection, Tests and Commissioning of the Train-Sets.				
A	4	Critical Issue Management	When a critical issue occurs (problem that blocks the integration or testing) the supplier shall give a commitment in less than 48h (target 24h) about the delivery date of a configuration solving the problem. To satisfy these objectives the Supplier shall organize a team that will be sufficient to cover all situations even during holiday's periods.				
A	5	Customer Design Review	At the request of project responsible, the Supplier shall attend Customer Design Review to present its scope of supply.				
A	6	First Mounting	At the request of project responsible, the Supplier shall ensure technical assistance on Alstom manufacturing site for its scope of supply first mounting inspection on Trainset.				
A	7	First Commissioning	The Supplier shall ensure technical assistance on Alstom manufacturing site for its scope of supply first commissioning on Trainset.				
A	8	Train Routine Test	At the request of project responsible, the Supplier shall ensure technical assistance on Alstom manufacturing site for Trainset routine test involving its scope of supply.				
A	9	Validation Test	The Supplier shall ensure technical assistance on Alstom validation site for Trainset (static and/or dynamic) validation tests / fine tuning activities involving its scope of supply.				
A	10	Trainset Testing	At the request of project responsible, the supplier shall ensure technical assistance under Alstom request during Trainset testing and commissioning on Alstom manufacturing site or Customer commissioning site.				
A	11	Maintenance Demonstration	In the event of non-compliance with a maintainability target, the Supplier shall support Alstom by participating to the maintainability demonstrations organized with the final customer of the Rolling Stock.				
B	12	Maintenance Training	At the request of project responsible, the Supplier shall ensure training on Alstom manufacturing site or to customer at customer's location				
A	13	Hardware Tool	At the request of project responsible, the supplier shall provide list and details of all the necessary tools needed for troubleshooting (including special tools -if any- needed to access components to check), monitoring (auto-test) and software upload-upgrade (cables, codes, uploaders, ...)				
B	14	Software Tool	At the request of project responsible, the supplier shall provide Alstom with its scope of supply executable application software (uploadable file) and with the software and tools needed to upload the scope of supply software.				
A	15	Phone assistance	Phone assistance from Monday to Friday during seven (7) working hours per day during the period starting from the Delivery of the first Commodity to the date of commissioning of the last delivered Commodity.				
A	16	Site Technical assistance	Technical assistance within twenty four (24) hours from the Purchaser's notice, on sites defined by the Purchaser. Technical assistance, upon request of the Purchaser, during night and holidays in order to implement modification or adaptation on the Commodity, Parts on the Customer's sites.				



	<b>2</b>	<b>Project Management</b>					
	2.8	Mean of Proof Activities					
rev	#	Req subject	Req statement	CbC	Supplier Comments	Alstom Comments	Alstom Acceptance
B	1		A mean of proof (MoP) activities must be conducted to demonstrate to the requirements defined in the TPS.				
B	2	MoP Support Leading	This activity will be performed by the Alstom Engineer in charge of the development.				
B	3	MoP Support Activity	Between the Business Award and the IGR, the system Engineer will organize dedicated meetings with supplier to confirm MoP identification.				
B	4	MoP Type	The supplier will have to provide a support to the System Engineer to define the type of MoP:				
B	5		- Test: type or routine test				
B	6		- Analysis: Calculation note, Numerical simulation, Justification Note...				
B	7		- Demonstration: Qualitative exhibition of functional performance, usually accomplished with no or minimal instrumentation and physical mock-up.				
B	8		- Certificate: Fire/Smoke certificate, SIL 2, .....				
B	9		- Inspection: Review of technical documents (drawing, scheme, tech description...) with Alstom & the supplier to assess the conformity to some requirements, Visual inspection on first manufactured product.				
B	10	Type of Product	If a standard product is used, only requirements in gap will have to be assessed.				
B	11	Type of Product	If a new development is necessary, the complete analysis of TPS must be done.				
B	12	Evidence	Ultimately, the supplier will have to provide for each requirement the evidence proving compliance (before FAT).				

		<b>3</b>	<b>DELIVERABLES MANAGEMENT AND FOLLOW-UP</b>				
		3.1	Deliverables				
rev	#	Req subject	Req statement	CbC	Supplier Comments	Alstom Comments	Alstom Acceptanc
A	1	Introduction	Deliverables consist of hardware (Commodity, subsystem, test equipment or tools), software and documentation, or any part of it, in accordance with the specified requirements. The deliverable items are summarized in the Appendix B and Appendix F. The principle is described in the sub-sections of this chapter.				
B	2	Introduction	This paragraph presents the possible Commodity models to be produced under the project contract (including, if applicable, the equipment software developed by the supplier).				
A	3	Mechanical MOCK-UP	Mechanical mock-up identical with allocated volume of TPS (electrical connectors, mechanical interfaces, aerolic interfaces, pneumatic interfaces, etc...). It can be used for validation of installation in the train, and of provisions and harness routing, as well as for human-machine interface (HMI) and maintainability/accessibility assessment.				
B	4	Simulation MOCK-UP Train Lab HIL	A functional and representative electronics shall be delivered and keep up to date. For tests preparation, the supplier shall provide the following information 8 months before delivery : - Number of I/O. - Volume. - Constraints of integration.				
B	5	Simulation MOCK-UP Train Lab SIL	A Functional model shall be delivered and keep up to date with clear definition about level of detail embedded in the model. Refer to document ENG-RSC-EN-RC-STD-0002				
B	6	Simulation MOCK-UP	The supplier must provide the devices for the connection between the laptop and the equipment (maintenance operation). Refer to document ENG-RSC-EN-RC-STD-0002				
B	7	Simulation MOCK-UP	The Supplier must be present during the integration and commissioning of the deliverables (software / hardware and models) Refer to document ENG-RSC-EN-RC-STD-0002				
B	8	Simulation MOCK-UP	If specifically defined in project phase, upstream tuning could be perform by using the TCMS suitcase at the supplier facilities. The detail of the interfaces of the supplier test bench must be provided 4 weeks before to allow the harness manufacturing. Refer to document ENG-RSC-EN-RC-STD-0002				
A	9	Ergonomics MOCK-UP	Ergonomics mock-up identical with allocated volume of the TPS without functional components. It can be used for validation of ergonomics accessibility and finishing aspects of interiors parts.				
A	10	Prototype	Design similar in term of mechanical, electrical and functional interfaces with the specified Commodity (TPS as reference). It is used mainly on system test, covering the full range of operation and functionality.				
A	11	Serial unit	Final Design, representative of serial production model, compliant with all interfaces and performances specified by Alstom and agreed between Supplier and Alstom. Acceptance cleared, used in the train for the running test.				
A	12	Serial unit	For type of sub-system, the exact configuration -hardware and possibly software - required (in term of characteristics, functionalities, performances...) shall be delivered by the supplier.				
A	13	Serial unit	If changes occur in the functional definition between any phases of DFQ cycle, a retrofit shall be applied on the products already delivered, in the latest configuration, by the supplier, in accordance with the configuration management. Modalities of retrofit and cost allocation shall be agreed between parties.				

		3.1.2	General					
			The following requirements apply for all documents to be provided as per predefined delivery dates:					
rev	#	Req subject	Req statement	CbC	Supplier Comments	Alstom Comments	Alstom Acceptance	
A	1	Evaluation	Documentation that requires evaluation from Alstom before intended use. In the event of failure to meet Schedule requirements, the comments shall be taken into consideration. Justification of rejected comments shall be provided by the Supplier and reviewed by the SE/SSE.					
A	2	Approval	Documentation that requires written approval from Alstom before intended use. Approval of any documentation is understood to mean "permission to proceed", but is not to be construed in any way as relieving the Supplier of any contractual obligation. If the Supplier proceeds without the Purchaser approval, it does so at its own risk.					
A	3	Revision	Revision to any contractually deliverable document shall be subject to the same submission criteria as applied to the initial release of that document.					
A	4	Resubmission	Alstom may request a resubmission of all or part of any document not conforming to its contractual definition. Resubmission requires the same type of concurrence as the original document.					
A	5	Language	All deliverable documents shall be written at least in English.					
B	6	International System	The International System (SI) of units and quantities shall be used in the documentation.					
A	7	Identification	The minimum identifications required on the documentation are the following: - Date of issue in the form dd/mm/yy - Issue (letter or number) of the document - Subject of the document - Author and signature - References - Traceability of text modifications - Correspondence with the DRL - Abbreviations list					
A	8	Information	The SE/SSE shall have access to all data and information related to the product design which is generated by the supplier and its subcontractors.					
A	9	Monitoring	In order to monitor the development status, the supplier shall use and update the DRCL on a regular basis according to its progress.					

rev	#	Req subject	Req statement	CbC	Supplier Comments	Alstom Comments	Alstom Acceptance
3.1.3 Content for Engineering Documentation							
A	1	DRL 2.1: Technical Description	The design documentation includes: - Scope of supply. - The detail of performances. - Components sizing. - Environment conditions consideration. - List of design changes in regard to eventual existing equipment. - basis configuration - existing option configuration				
A	2	DRL 2.2: Functional Description	The design file shall be structured as an answer point by point to the TPS - Principle of working - System composition if applicable - Operation in normal conditions - Operation in degraded condition - Interaction with other sub-system and main functionality at train level				
A	3	DRL 2.3 : Mounting and adjustment procedure	This document shall be detailed in accordance with TPS in order not to let any doubt or personal interpretation to the technicians. Each part shall be identified thanks to pictures and identification number provided in Bill of Material or Kitting definition (Toilets). The supplier shall also include the time needed operation per operation in accordance with the document.				
A	4	DRL 2.3 : Mounting and adjustment procedure	This document describes the needed operations and the various steps in order to be able to install the sub-system and/or component on train (this is limited to the supplier's scope = do not explain how to install the pieces Alstom is responsible for).				
A	5	DRL 2.3 : Mounting and adjustment procedure	This part describes the needed operations and the various steps in order to be able to adjust mounting of each part with one another in order to reach functionality and gap and flushness requirements.				
A	6	DRL 2.4: 3D model	This file shall include the following information / documents according allocated volume provided by Alstom: - An external interface file for assemblies and sub-assemblies (electrical, mechanical, pneumatic, aerolic interfaces). - Including any special mounting brackets or any assemblies associated with supplied equipment that's necessary for the installations. - Center of gravity. - Centering points.				
A	7	DRL 2.4: 3D model	The Supplier shall provide the 3D models in STEP format and, if possible, in CATPART.				
A	8	DRL 2.4: 3D model	The 3D model shall be an exact representation of the product provided and respect the positions given by the allocated volume. The model shall follow the product breakdown structure with possibility to hide/show some minor parts.				
A	9	DRL 2.4: 3D model	The 3D model shall allow a correct mechanical allocation on the rolling stock, including a complete definition of the electric/pneumatic/hydraulic applicable connections as per 3D Loan definition.				
A	10	DRL 2.4: 3D model	For Toilets commodity, 3D structure shall respect the kitting definition.				
A	11	DRL 2.5: Assembly Drawings	An Assembly Drawing shall be provided in two possible formats : • 3DXML (CATPART/FTA if possible) is preferred, • 2D drawing (PDF, DWG are preferred).				
A	12	DRL 2.5: Assembly Drawings	An Assembly Drawing shall be provided for each assembly included in the Commodity scope of supply.				
A	13	DRL 2.5: Assembly Drawings	The physical features of the Commodity: weight, dimensions, etc...				
A	14	DRL 2.5: Assembly Drawings	An Assembly Drawing shall have an internal (or external) Components List				
A	15	DRL 2.5: Assembly Drawings	This file shall include the following information / documents: - Item position (number displayed on the drawing); - Part number (Alstom); - Supplier reference; - Description; - Quantity (of the item applied on the relevant assembly); - Drawing number (if different from part number); - Header: - Supplier logo; - Drawing number; - Drawing revision index (Alstom and Supplier); - Drawing revision index date				
B	16	DRL 2.5: Assembly Drawings	Drawings specifications shall be express according to ISO 8015 or ASME Y14.5 (tolerancing language). Ambiguous dimensional specification should be avoided <u>Focus on main GD&amp;T characteristics to ensure functional control principle.</u>				
A	17	DRL 2.5: Assembly Drawings	All the tightening torques with their relevant tolerances of the assembly shall be indicated on the drawing. <u>All settings needed for a correct mounting of the assembly shall be indicated on the drawing.</u>				
B	18	DRL 2.5: Assembly Drawings	If assembly has an internal mobility (kitting, bolting with oblong, adjustment, or floating contact), each mobility should be indicated on drawing according to mounting				
A	19	DRL 2.5: Assembly Drawings	Any other details needed for a correct mounting of the assembly shall be indicated on the drawing.				
A	20	DRL 2.5: Assembly Drawings	A sub-assembly drawing shall be provided for each sub-assembly included in the Commodity scope of supply down to a level where the Lists of Components are made by Elementary Components only. Exact list shall defined during project phase.				
A	21	DRL 2.6: Sub-Assembly Drawings	A sub-assembly drawing is needed for modeling purpose and proven design concern.				
A	22	DRL 2.7: Electrical Schemes	This file shall include the following information / documents: - PDF Native completed of all the information necessary to understand the system functions. - Additional information in the schematics as the size of the protection (fuses, circuit breaker, etc.) and all the cross-section of the cables. - Each device must be named (part number) and his meaning shall be defined clearly in the file - EIS file: definition of interfaces on equipment and train with naming, type, sizing, point numbers, modular or no, etc...				
B	23	DRL 2.7.1: Electrical Schemes	The numerical values and tolerance that must potentially be checked during troubleshooting (such as impedance of resistance, capacitors, inductances, the thresholds of pressure switches, temperature of thermal protections...) must be indicated as a minimum in metric units and in addition, in the local unit system of the rolling stock customer if not metric.				
B	24	DRL 2.7.1: Electrical Schemes	The mnemonic or identification must be consistent across the electric, pneumatic, hydraulic schematics and must match with the ones shown on the labels in the train.				
B	25	DRL 2.7.1: Electrical Schemes	It must be possible to search for any text or value in the document with the search function of a PDF reader. PDF schematics must not be provided as images.				
B	26	DRL 2.7.1: Electrical Schemes	Connectors and pin of each LRU of the sub-system must be shown on the sub-system schematic.				

B	27	DRL 2.7.1: Electrical Schematics	Terminal blocs if any must also be shown with the corresponding signals going through.				
B	28	Electrical Interface Specification (EIS)	This file shall include definition of interfaces on equipment and train with naming, type, sizing, point numbers, modular or no, etc...				
A	29	DRL 2.8: Electric consumption	This file shall include the following information / documents: - The electrical consumption of the complete system in nominal mode, splitted and detailed per component. - The electrical consumption of the complete system in emergency mode, splitted and detailed per component. - The electrical consumption of the complete system in stand-by mode, splitted and detailed per component.				
A	30	DRL 2.9 : Pneumatic Schematic	This file shall include the following information / documents: - PDF Native completed of all the information necessary to understand the pneumatic system. - Each device must be named (part number) and in the schematic must be explained his meaning/function.				
B	31	DRL 2.9 : Pneumatic Schematic	The piping diagram must be done according to ISO 1219-1 symbols and using the color code mentioned below. This color code has to be applied on all piping diagram and can also be used to identify some devices on brake panel (for example: a colored sticker to identify a test point)				
A	32	DRL 2.10 : Hydraulic Scheme	This file shall include the following information / documents: - PDF Native completed of all the information necessary to understand the hydraulic concept. - Each device must be named (part number) and in the schematic must be explained his meaning/function.				
A	33	2.11 : Refrigerant Circuit Schematic	This file shall include the following information / documents: - PDF Native completed of all the information necessary to understand the refrigerant circuit. - Each device must be named (part number) and in the schematic must be explained his meaning/function.				
A	34	2.12 : Bill of Material	This file shall include the following information / documents: - Exhaustive List of all parts. - Weight estimation for each part. - Supplier reference. - Supplier revision. - Alstom reference if any. - Alstom drawing reference if any.				
B	35	2.13 : Weight Assessment	This file shall include the following information / documents: - PDF Native completed of all the information necessary to understand the weight assessment - Each device must be named (part number) and in the list				

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3.1.4 Content for Software Documentation							
A		Introduction	<p>A set of documentation is always associated with all the software installed on the train, including:</p> <ul style="list-style-type: none"> <li>• Application;</li> <li>• Firmware;</li> <li>• Maintenance SW tool, generally used for monitoring, download diagnostic data, set parameters, etc...</li> </ul> <p>Most of the requirements about software documentation are related with the chosen Software Integrity Level (SIL), in accordance with the EN 50657.</p> <p>For each project, whatever software safety level, the minimum following documentation shall be delivered. Other documentation can be required depending of project contract or project need.</p>				
B	1	DRL 3.1 : Software Quality Assurance Plan	<p>This file (item #1 Table A.1 of EN 50657) shall include the following information / documents:</p> <ul style="list-style-type: none"> <li>- Definition of the life-cycle model</li> <li>- Requirements traceability;</li> <li>- Documentation structure traceability;</li> <li>- Documentation associated with the development, verification and validation, operation and</li> <li>- Maintenance of software;</li> <li>- System integration procedures;</li> <li>- Coding standards to be used;</li> <li>- Assessment of previous validation tests;</li> </ul> <p>It is considered as the first input to deliver during a project.</p>				
B	2	DRL 3.2: Software Requirement Specification	<p>This file (item #6 Table A.1 of EN 50657) shall include the following information / documents:</p> <ul style="list-style-type: none"> <li>- Functional Bloc Diagram with sub-functions;</li> <li>- Reliability and maintainability;</li> <li>- Safety (including safety functions and their associated software safety integrity levels);</li> <li>- Efficiency;</li> <li>- Usability;</li> <li>- Webserver (if any);</li> <li>- Cybersecurity (if any);</li> <li>- Portability.</li> </ul>				
B	3	DRL 3.3 : Overall Software Test Specification	<p>An Overall Software Test Specification (item #7 Table A.1 of EN 50657) shall be developed from the Software Requirements Specification.</p> <p>This test specification shall be used for verification of all the requirements as described in the Software Requirements Specification and also as a description of the tests to be performed on the completed software.</p>				
B	4	DRL 3.3 : Overall Software Test Specification	<p>This file shall include the following information / documents:</p> <ul style="list-style-type: none"> <li>- The required input signals with their sequences and their values;</li> <li>- The anticipated output signals with their sequences and their values;</li> <li>- The acceptance criteria, including performance and quality aspects*</li> </ul>				
B	5	DRL 3.3 : Overall Software Test Specification	<p>Software validation report (item #25 Table A.1 of EN 50657) : this document must indicate tests coverage of all requirements of SwRS, software maturity delivered (for test, for commercial service,...) and commitment from validator that software is fit for its intended purpose.</p>				
B	6	DRL 3.4 : Software Validation Report	<p>For each software delivered to Alstom, even only for integration or train tests, it is mandatory to provide a Release notes (item #38 Table A.1 of EN 50657) or Software Change record (item #42 Table A.1 of EN 50657) or similar document that describe:</p> <ul style="list-style-type: none"> <li>- Software and Hardware configuration,</li> <li>- In house test coverage,</li> <li>- Open points and restriction of use,</li> <li>- Software maturity delivered for test static, dynamic, commercial service</li> <li>- Software user/maintenance manual for installation and use of the software</li> </ul>				
B	7	DRL 3.5 : Release Note or DRL 3.7 : Change Record	<p>During maintenance phase, all modifications shall be traced in software change record document that is to be delivered before implementation, after implementation Software release note must be updated at least.</p>				
B	8	Software Assessment Plan	<p>This document (item #45 Table A.1 of EN 50657) shall be provided as per definition in EN50657 for any software with SIL1 or higher.</p>				
B	9	Software Assessment Report	<p>This document (item #46 Table A.1 of EN 50657) shall be provided as per definition in EN50657 for any software with SIL1 or higher.</p>				

rev	#	Req subject	Req statement	CbC	Supplier Comments	Alstom Comments	Alstom Acceptance
3.1. Sub System Validation Activities							
Supplier Validation of a sub-system is defined by all means by which can be used to prove the performance of the subsystems and							
B	1	Validation plan	The supplier shall answer to Alstom Generic Validation plan. It shall include all the means of proof used to demonstrate compliancy with technical requirements of TPS : - Demonstration - Calculation Note - Dimensional tolerance stack-up (for interfaces mean of proof) - Functional Mock-up Interface (or FMI) - Type Test - Certificate				
A	2	FMI	The FMI is a standardized interface to be used in computer simulations to develop physical systems with : - A modelling environment describes a product sub-system by differential, algebraic and discrete equations with time, state and step-events. - such tools generate and export the component in an FMU (Functional Mock-up Unit); - an FMU can then be imported in another environment to be executed; - Several FMUs can - by this way - cooperate at runtime through a co-simulation environment, thanks to the FMI definitions of their interfaces.				
A	3	Certification of Equipment	Validity of measurements and tests shall be ensured through the use of suitable inspection, measurement, and test equipment of the range and type necessary to determine conformance of TPS. At intervals established to ensure continued validity, measuring devices shall be verified or calibrated against certified standards.				
A	4	Test Procedure	The supplier shall provide, for each test defined in the validation plan, a test procedure one (1) month before the test. Alstom can comment the test procedures sent by the supplier.				
A	5	Test Procedure Content	For each test contained in the VTA Program, the Supplier shall include the following general information: - Name of test/reference number. - Procedure, objective and scope. - Special environmental requirements, if any. - Sample size. - Equipment, facilities, and personnel required. - Step-by-step procedures for tests. - Glossary of technical terms used in procedures. - Estimated time required. - Description of set-up. - Data to be recorded (data sheet). - Pass/Fail criteria. - Documentation required. - Notification period.				
A	6	Modification during Tests	When modification, repairs, or replacement are required, there shall be a further inspection or test of the affected characteristics.				
A	7	Maintainability Demonstration Test	On-site maintainability demonstration tests shall be conducted by the Supplier to validate that they meet the LCC commitment.				
B	8	Maintainability Demonstration Test	As per contractual requirements, if any improvements / suggestion provided by End customer to be incorporated in the Software without any variations				
B	9	Maintainability Test Acceptance	The acceptance criteria for maintainability demonstration test shall satisfy the following conditions: - On-site maintainability demonstration results are met the design targets set in project technical purchase specification; - All known and identified maintenance accessibility, ergonomic and special equipment and tools issues are resolved and satisfied by the Purchaser; - The observed maintainability results to be collected in the Maintainability Analysis are met the design targets set in project technical purchase specification.				
A	10	Test Report	The Supplier shall provide clear formal reports of results of all verification activities to confirm compliance with design and performance requirements as defined herein.				
B	11	Test Report Submission	All type test reports shall be submitted within twenty-one (21) calendar days following completion of the activity in object to the SE/SSE.				
A	12	Test Report Approval	The SE/SSE will notify the Supplier in writing that the test results are acceptable, acceptable as noted, or not acceptable and the reason therefore. Any commodity found not to be in compliance with the technical specifications during a qualification test may be rejected by SE/SSE				

3.1.6 Maintenance Deliverables							
rev	#	Req subject	Req statement	CbC	Supplier Comments	Alstom Comments	Alstom Acceptance
A	1	General	Maintainability analysis covering the scope of supply shall be performed to evaluate				
A		General	- the Man.hours needed for Maintenance tasks;				
A		General	- the Man.hours needed for preparation tasks like getting access to components				
A		General	- Justification for a maintenance task				
A		General	- Justification for the proposed maintenance interval				
A	2	Manual	Maintenance manuals should include, as a minimum, the following items:				
A		Manual	- Operation of the assembly or subassembly				
A		Manual	- Troubleshooting guide				
A		Manual	- Corrective maintenance manual				
A		Manual	- Preventive maintenance manual				
A		Manual	- Illustrated Parts Catalog (IPC)				
A		Manual	- Drawings with applicable reference.				
B	3	Troubleshooting	The troubleshooting section must provide all the necessary information for the technician to be able to identify the smallest faulty LRU.				
B	4	Troubleshooting	For each fault codes it must include an explanation detailing what is detected (e.g. the failure mode of the LRU, the value of the threshold exceeded...) and how it is detected (e.g. which hardware or network information is used to detect).				
B	5	Troubleshooting	For each fault codes it must include the functional consequence(s) of the failure detailing which function(s) of the whole sub-system is affected and how.				
B	6	Troubleshooting	For each fault codes it must include the shortest list of LRUs which can potentially cause this fault.				
B	7	Troubleshooting	For each fault codes it must include Troubleshooting Instructions to identify among the shortest list above the smallest guilty LRU causing the malfunction. The instructions must detail step by step what exactly the technician must check, how he can do it and the expected result allowing to decide if the check is OK or not.				
B	8	Troubleshooting	The troubleshooting steps must mainly be based on observations, measurements using a multimeter only, self-test if any embedded in the sub-system or the maintenance software. Special tools must be avoided. When not possible, the instruction must refer to the instruction explaining how to use the special tool and perform the check.				
B	9	Troubleshooting	The troubleshooting section will be submitted to Alstom and reviewed jointly for clarification and precision.				
B	10	Troubleshooting	The source files (word, excel... are provided) and can be partially or totally reused by Alstom to build the documentation supplied to the customer and to the entity in charge of the maintenance.				
A	11	Corrective Maintenance	The corrective maintenance section of the maintenance manuals shall indicate the procedures necessary to remedy the failure at the level in question. It includes all the corrective maintenance procedures listed in the troubleshooting guide.				
B	12	Corrective Maintenance	It also includes all procedures for : - Replacing any replaceable unit in the assembly or subassembly concerned. - Configuring / updating / adjusting the newly installed replaceable unit - Testing that the newly installed replaceable unit properly works.				
A	13	Corrective Maintenance	Each procedure must identify at least the following information: - Resources required for the application of the procedure - Information required for the preparation of the procedure - Step by step procedure for securing the staff, - Step by step procedure to solve the problem at the level considered - Step-by-step test and verification procedure - Additional actions to be carried out, with reference to the corresponding procedure (eg troubleshooting a subassembly at the workshop), - Use of corrective maintenance tools, with reference to the relevant manual, if applicable.				
B	14	Corrective Maintenance	The corrective maintenance manual must include a step-by-step instruction to upload /update the software (if any): - Embedded in the controllers of the sub-system - Embedded in the special tools - Required on the computer used to connect to the special tools or the sub-system.  The maintenance manual includes a step-by-step procedure explaining how to configure, if needed, the devices above after a software installation / update or replacement.				
A	15	Storage	A section of the manual shall describe the storage recommendations for spare parts, consumables and maintenance tools (climatic conditions, stacking, limit of time, packaging...).				
B	16	Storage	A section of the manual shall describe the storage recommendations for spare parts, consumables and maintenance tools (climatic conditions, stacking, limit of time, packaging...).				
A	17	Handling	Optionally, this information can be provided in a PHST manual.				
B	18	Handling	A section of the manual shall describe the handling of spare parts, consumables and maintenance tools. Optionally, this information can be provided in a PHST manual.				
A	19	EHS	For all use, maintenance, maintenance and repair work, this implies that all hazards, warnings, risks and safety measures related to these risks must be:				
A		EHS	- briefly mentioned at each stage of this work in order to have an accurate view of the dangers associated with the step, and				
A		EHS	- listed by volume or manual for a comprehensive view of existing hazards.				
A	20	Provider/LCC	The Supplier shall supply the logistic support database of its system covering all maintenance up to level 4 in "Provider" format with :				
A		Provider/LCC	- the logistic breakdown structure allowing to quantify and identify LRUs and SRUs, repairable or non-repairable,				
A		Provider/LCC	- the list of spare parts, consumables and ingredients, for all maintenance activities (together with their serial price, validity, incoterms, lead time, conditions and duration of storage)				
A		Provider/LCC	- list of skills				
A		Provider/LCC	- the list of special and specific tools, software included (together with their price)				
A		Provider/LCC	- the preventive maintenance plan				
A		Provider/LCC	- allocation of corrective data for each LRU and SRU (failure rate, repair time, diagnostic time, restore time)				
A		Provider/LCC	- Tolerance of preventive maintenance frequencies (tolerance of minimum+10% requested) justified by one or more of the following principles: ALARP (As Low As Reasonably Practicable), GAMAB/GAME, MEM and REX (Return of Experience), as defined in EN50126.				
A		Provider/LCC	- safety tag for each task related to an exported safety constraint				
A		Provider/LCC	- reference number of maintenance manual chapter linked to each maintenance task				
A	21	Provider/LCC	Maintenance intervals shall be defined in operational units driving the failure rate or wear of a function/component.				
A	22	Provider/LCC	Alternative LCC Excel file may only be submitted when formally agreed by Alstom.				
A	23	Provider/LCC	The Supplier will limit itself to supplying the information requested in the zones identified by Alstom in the different tabs of the Provider.				
A	24	Provider/LCC	Follow-up of LCC and justification of deviations due to design changes or replacement of component (price and failure rate) until inspection of the first item:				
A		Provider/LCC	- Amendments shall be made by mutual agreement. A repair and / or overhaul strategy can be reviewed.				
A		Provider/LCC	- Maintenance costs will have to be revised accordingly.				
A	25	Provider/LCC	The Supplier shall indicate the unit frequency of each preventive task. The associated frequency unit corresponds to the parameter most impacting on the lifetime and the correct operation of the Commodity (calendar, rolling time, number of solicitation cycle, etc.)				



A	26	Provider/LCC	The Supplier shall indicate the failure rate for each failure mode. The unit associated with this rate corresponds to the parameter most impacting on the lifetime and the correct functioning of the Commodity (calendar, rolling time, number of solicitation cycle, etc.)				
A	27	Provider/LCC	The Supplier shall provide:				
A		Provider/LCC	- spare parts quantity per Commodity				
A		Provider/LCC	- preventive and corrective maintenance plan				
A		Provider/LCC	- breakdown of the spare parts grouped in a kit, with the reference of each individual spare				
A		Provider/LCC	- repair time (TAT : Turn Around Time)				
A		Provider/LCC	- lead time				
A		Provider/LCC	- transportation time				
A		Provider/LCC	- OEM spare part reference				
A		Provider/LCC	- spare part price in serial production phase				
A		Provider/LCC	- spare part price after serial production phase with a 5 years validity				
A		Provider/LCC	- overhaul cost				
A		Provider/LCC	- storage conditions (acceptable temperature, humidity, maximum storage duration, preventive maintenance during storage)				
A		Provider/LCC	- design life and maximum life time in operation				
A		Provider/LCC	- maximum number of repair before discarding				
B	28	Provider/LCC	All consumables with a replacement of the LRU should be identified and available to order as a kit on request. Consumable means parts which when worn or damaged, cannot be restored by maintenance task. This includes lubricants, filters, wear parts (brake pads), and one-shot parts (porcelain insulators).				
B	29	Provider/LCC	All the spares included in the kit of spare parts should be clearly identified on the packaging. Spare parts included in the kit can be ordered separately. This rule applies only to spare parts which are easy to lose, easy to damage during the maintenance, which are expensive, or which are to be replaced on-condition.				
A	30	Provider/LCC	Spare parts shall be delivered ready for mounting and in the applicable configuration of the train.				
B	31	Provider/LCC	Spare parts shall be delivered in a packaging compatible with their transport and storage conditions, protection and life duration preservation. If special transportation and storage conditions are expected, these shall be agreed upon on a case by case basis				
A	32	Provider/LCC	Generally speaking, packaging and unpacking of spare parts shall not necessitate any specific tools. If necessary, the Supplier must provide these tools"				
A	33	Provider/LCC	Each spare part shall be clearly identified in the Illustrated Part Catalog				
A	34	Provider/LCC	The name of each spare part shall be consistent in the PROVIDOR, SPPL, Maintenance Manual, IPC and all other purchasing, logistic and supply documents such as order form, certificates, drawings, etc. (non-exhaustive list)				
B	35	Provider/LCC	All spare parts packaging should be marked with the following requirements: - the label shall integrate the part name, its reference, the number of parts enclose, the packaging date, the expiry date (if applicable) - for reusable packaging, marking system and label should be modifiable - if the parts are tracked, identification information shall be visible without handling or unpacking. If not possible a second labelling will be applied on the packaging. - technical data sheets, drawings and other specific docs as per contract.				
A	36	List of tools	Special tools are tools not available from standard retailer or tools require a specific modification. Special tools shall be avoided as much as possible.				
A	37	List of tools	In order to limit the quantity of testing tools, they should be easy to configure for testing several functions or materials.				
A	38	List of tools	Special tools should be able to adapt to the different mechanical and software configuration of Commodity				
A	39	List of tools	The Supplier should deliver a list of standard tools necessary for maintenance of Commodity in its scope of supply, according user manual and maintenance documentation				
B	40	List of tools	Labels and information shown on displays if any must be in available in English and in the local language of the rolling stock customer if required.				
B	41	List of tools	Necessary Software shall be delivered to : - Check the current embedded software version and to update it, - View the list of the faults currently active, - View the fault history (including faults which are no longer active, and which were recorded some days ago), - Download the fault history to an excel file, erase the fault history, - Read and force variables (especially the hardware inputs and outputs or the network inputs / outputs), - Reset permanent faults and more generally perform all the corrective actions needed to restore the sub-system. - Launch / interrupt built-in tests and observe the result				
A	42	List of tools	The Supplier shall deliver license free software				
A	43	List of tools	In case of specific tools and test tools, it shall be: - delivered in their packaging - identified and marked				
A	44	List of tools	All specific tools shall be compliant with standard and safety rules applicable in the country of the Contract, and delivered with their certificate and standard mark				
B	45	List of tools	The Supplier shall deliver a specific tools documentation, including: - list of maintenance task performed with the considered tool - design documentation (drawing, calculation notes...) - technical documentation - user manual - qualification certificate - calibration certificate (if applicable) - spare parts list - wearing parts list with references and supplier name - Maintenance Manual for all special tools & Test Benches - Troubleshooting Manual for all special tools & Test Benches - Demonstration of Special tools & Test Benches to End customer.				
A	46	List of tools	A removal/installation special tool or handling device shall be proposed for each LRU with a weight higher than 15 daN (12 daN for electronic or computer LRU).				
A	47	Obsolescence	An Obsolescence Management Plan shall be delivered by the Supplier for each Alstom Project.				
A	48	Obsolescence	In this OMP, the Supplier shall detail the procedures to deal with any parts/materials/components of the Commodity that are considered at risk of becoming obsolete. The Supplier shall detail clearly how he will manage and mitigate any obsolescence risk.				
A	49	Obsolescence	The Supplier shall also provide details of the life expectancies of its Commodity				
A	50	Obsolescence	Whenever a product or part of it, is composed on electronic components, the Supplier will deliver an exhaustive list of these components (bill of material), and the manufacturer reference of a part or component during the same period, the supplier undertakes to provide, without additional compensation, a study for an alternative solution.				
A	51	Obsolescence					
A	52	Obsolescence	Impact of Part Replacements on the LCC: In the event of component replacement due to obsolescence or redesign, there shall be NO NEGATIVE impact (not justified) on the maintenance plan, both from a preventive and corrective point of view.				



DRL	Description	Due Date			Entrance System	Internal Door	Detrainment Door	Coupler	Toilet System	Gangway	HVAC	Traction Battery	Auxiliary Battery	Pantograph	Master Controller	Fire System	Air Supply Unit	Brakes System	Seat	Glazing	Floor	
		Preliminary	Final	As Built																		
3.1	Software Quality Assurance Plan (item #1 Table A.1 of EN 50657)	SDR	month before	FAI	A	Applicable with an embedded electronic with software		A	A		A	A			A	Applicable with an embedded electronic with software	A					
3.2	Software Requirements Specification (item #6 Table A.1 of EN 50657)	PDR	month before	FAI	A			A	A		A	A			A			A				
3.3	Overall Software Test Specification (item #7 Table A.1 of EN 50657)	CDR	weeks before	FAI	A			A	A		A	A			A			A				
3.4	Software Validation Report (item #25 Table A.1 of EN 50657)	FAI	month before	IQA	A			A	A		A	A			A			A				
3.5	Release Note for Final Validation (item #27 Table A.1 of EN 50657)	FAI	month before	NA	A			A	A		A	A			A			A				
3.6	Release Notes for Software Deployment (item #38 Table A.1 of EN 50657)	FEI	month before	NA	A			A	A		A	A			A			A				
3.7	Software Change Records (item #42 Table A.1 of EN 50657)	FAI	NA	NA	A			A	A		A	A			A			A				
3.8	Software Assessment Plan (item #45 Table A.1 of EN 50657)	IQA	FQA	NA	if SIL $\geq$ 1			if SIL $\geq$ 1	if SIL $\geq$ 1		if SIL $\geq$ 1	if SIL $\geq$ 1			if SIL $\geq$ 1			if SIL $\geq$ 1				
3.9	Software Assessment Report (item #46 Table A.1 of EN 50657)	IQA	FQA	NA	if SIL $\geq$ 1			if SIL $\geq$ 1	if SIL $\geq$ 1		if SIL $\geq$ 1	if SIL $\geq$ 1			if SIL $\geq$ 1			if SIL $\geq$ 1				
3.10	Software User Manual (can be part of rele	IQA	FQA	NA	A			A	A		A	A			A			A				

DRL	Description	Due Date			Entrance System	Internal Door	Detrainment Door	Coupler	Toilet System	Gangway	HVAC	Traction Battery	Auxiliary Battery	Pantograph	Master Controller	Fire System	Air Supply Unit	Brakes System	Seat	Glazing	Floor
		Preliminary	Final	As built																	
4.1	Validation plan including all means of proof	BA	CDR		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
4.2	Validation procedures	PDR	CDR		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
4.3	Validation reports	Two weeks before FAI	FAI		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
4.4	First commissioning instruction	1 month before commissioning	commissioning		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A

**5.4.2 Verification & Validation for Traction Battery & Components (new in rev B)**

DRL	Description	Due Date			Battery	Fuel Cell	BTMS
		Preliminary	Final	As built			
4.10	Calculation Notes Mechanical Resistance report	BA	CDR	FAI	A	A	A
4.11	Painting report	PDR	CDR	FAI	A	A	A
4.12	IP xx Calculation note	PDR	CDR	FAI	A	A	A
4.13	Hygrometry Control Demonstration	PDR	CDR	FAI	A	A	A
4.14	Fire calculation note	PDR	CDR	FAI	A	A	A
4.15	Thermal and hydraulic Design & Calculation	IDR	CDR	FAI	A	A	A
4.16	Performance Calculation Notes	IDR	CDR	FAI	A	A	A
4.17	Electrical Design & Calculation	PDR	CDR	FAI	A	A	A





