Clause-wise Comments of

M/s Sanrok enterprises and M/s Axtone

On

Specification No. FINAL DRAFT

SCHEDULE OF TECHNICAL REQUIREMENTS FOR HIGH CAPACITY CRASH ENERGY MANAGEMENT SYSTEM WITH ANTI CLIMBER FOR PASSENGER COACHES OF INDIAN RAILWAYS

(FOR COMPLETE RAKE OF 24 ICF SCREW COUPLING COACHES)

Clause No.	Description	Sanrok Comments	AXTONE Comments	RDSO Comments
	Clause Description	**Comments**		
0	**Foreword**			
0.1	This schedule is intended to cover the technical requirements/provisions relating to the design, development and supply of high energy capacity Side Buffer with anti climber for passenger coaches of Indian Railways.	Noted (vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013) The specification's nomenclature **"High Energy Capacity side Buffer with Crash Elements and Anti-Climber Feature for Fitment in Full Rake of ICF Type Passenger Coaches of Indian Railways"** is indicate as this is a system of for the entire and can have more than one solution for each type of coach depending upon its position is the rake, gross weight ect. the more appropriate nomenclature in our view would be **"High Energy Capacity Crash Management of ICF Passenger Coaches of Indian Railways"** (vide letter no. EOI:SBCEAC:RDSO:NS, dt.04-09-2014)	Noted (by Email, dt.11-08-2014)	The specification's nomenclature **"Schedule of Technical Requirements for High Capacity Crash Energy Management System with Anti-Climber For Passenger Coaches of Indian Railways (For Complete Rake of 24 ICF Screw Coupling Coaches)"** shall be adopted for the purpose of final specification.
0.2	This schedule draws references to some of the relevant UIC and other Indian Standard specifications. Unless otherwise stated, the latest version of the	Noted (vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)	Noted (by Email, dt.11-08-2014)	

Clause No.			Description	Sanrok Comments	AXTONE Comments	RDSO Comments
			relevant specification shall be taken as reference.			
	0.3		In this schedule due consideration has been given to the developments in the field of Energy absorption and crash management requirements of the Indian Railways and the practices followed in advanced countries in the field.	Noted (vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)	Noted (by Email, dt.11-08-2014)	
1.			**SCOPE** This section prescribes the requirements and methods of testing for high energy capacity Side Buffer for passenger coaches.	Noted (vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)	Noted (by Email, dt.11-08-2014)	
2.			**Scope of supply**			
	2.1		Scope of supply shall include the following items:-			
	2.2		Higher Energy capacity Side Buffer with separate or in- built anti climber arrangement.	Noted and Complied (vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)	Complied (by Email, dt.11-08-2014)	
	2.3		Hardware to mount the Side Buffer to the coach structure.	Noted and Complied (vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)	Complied (by Email, dt.11-08-2014)	
3			**Performance and Design Requirements**			
	3.1		The Higher Energy Capacity Side Buffers shall be fitted on passenger coaches as per the existing arrangement being	Noted. Please see our detailed technical proposal enclosed. (vide letter no. EOI:SBCEAC:RDSO:NS,	Mentioned Appendix – B doesn't exist in the document no. CGW 000 rev.3. the document contains Annexure-B (probably word	"Appendix – B" in the clause 3.1 to be replaced by "Annexure-B" and the final clause 3.1 to read as follows:- "The High Capacity

Clause No.	Description	Sanrok Comments	AXTONE Comments	RDSO Comments
	used on Indian Railway Coaches (Sketch As per Appendix –B).	dt.11-12-2013)	mistake), but the Annexure-B has only information about permissible buffer`s wear limits. (vide letter no. Nil, dt.06-12-2013) Complied (by Email, dt.11-08-2014)	Crash Energy Management System shall be fitted on passenger coaches as per the existing arrangement being used on Indian Railway Coaches (Sketch As per Annexure –B)".
3.2	The Higher Energy Capacity Side Buffers may be with or without mechanical crash element. The minimum speed at which there is no permanent damage to the Coach structure should be 25 km/h.	Noted. As per the conditions stipulated in Clause 3.13 and 3.14 , where the Limitation of the Strokes available for the buffer are give and as per the simulations carried out by us (Enclosed).,the speed at which there is no permanent damage to the Coach structure .e 25m/h can not be achieved under the existing technology available. Our Simulation results show that the speed the speed at which the buffers shall able to protect the coaches from any damage is 11 km/h for fully recoverable stroke with 2500 kJ energy absorption, whereas is 15km/h for non recoverable zone with 5000kJ energy being absorbed by moving train. For the case where the locomotive not equipped with High energy side buffers the maximum speed up to which	At this point of project can not be confirmed without simulation, proving that required buffer can absorb energy from crash impact at 25 km/h. please also refer to our comment for para 4.1. (vide letter no. Nil, dt.06-12-2013) Noted. According to our simulation we can confirm that maximal speed at which there is no permanent damage to the coach structure is 19 km/h. (by Email, dt.11-08-2014)	Clause 3.2 to be modified as follows:- "The High Capacity Crash Energy Management system with anti climber may be with or without mechanical element. The minimum speed at which there is no permanent damage to the Coach structure should be 16 km/h"

Clause No.	Description	Sanrok Comments	AXTONE Comments	RDSO Comments
		there will no damage is 8 km/h in the recoverable zone with 1600 kN as energy absorbed by the moving train. It is very much evident from the Simulations that as that having Locomotive also equipped with High energy Side buffer is essential to have the optimum safe speed for the Full Train . (vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013) The summary of the result that we achieved in our simulations we are as follows: 1. Safe impact speed for complete rake-resalable 12.2 kmph. 2. Safe impact speed for complete rake- non-resalable -16 kmph. (Vide letter no. EOI:SBCEAC:RDSO:NS, dt.04-09-2014)		
3.3	The Higher Energy Capacity Side Buffers shall be supplied with Anti-climber arrangement, which will not allow the coaches to climb over each other in case of an impact.	Noted and Complied. (vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)	Complied (by Email, dt.11-08-2014)	
3.4	The Higher Energy Capacity	Please see our Full Train	Information about locomotive	Locomotive buffers capacity for

Clause No.			Description	Sanrok Comments	AXTONE Comments	RDSO Comments
			Side Buffers shall be able to protect the coach body from any deformation or damage due to impact up to designed speed (25 km/h). The speed at which the coach body will get damaged, should be indicated and full train rake simulation results both with & without crash buffers on locomotive for the same shall be submitted with the offer. (Train formation for simulation purpose should be as per Annexure – A.	Rake simulations enclosed for both cases. (vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)	buffers capacity is not provided. Locomotive buffers capacity is required for simulation. (vide letter no. Nil, dt.06-12-2013) According to our comment to point 3.2 and simulation (by Email, dt.11-08-2014)	simulation purpose is provided in Annexure – A. Clause 3.4 to be modified to read as "The High Capacity Crash Energy Management system with anti climber shall be able to protect the coach body from any deformation or damage due to impact up to designed speed (16 km/h). The speed, at which the coach body will get damaged, should be indicated and full train rake simulation results both with & without crash buffers on locomotive for the same shall be submitted with the offer. (Train formation for simulation purpose should be as per Annexure – A."
	3.5		The Higher Energy Capacity Side Buffer have a buffer head which should give a minimum service life of 4 years and should be made of a material which has low wear rate. The buffer head should be compatible with the buffers fitted currently on Indian Railways coaches. The face plate should be replaceable in service once wear limits are exceed. (the wear limits should be as per Annexure –C).	Accepted and Complied (vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)	The point refer to Annexure-C should be Annexure-B. Presented table 9.10 in Annexure-B contains thickness of buffer tube wall and face plate. The thickness shall be calculated and established by manufacturer of buffers and wear limits also shall be presented by producer. Producer takes responsibility for further strength. This is typical practice in EU. European norms and UIC standard do not establish the thickness and wear limits. In view of this, Axtone propose that no limit of thickness of buffer tube wall and face plate is stated in	Clause 3.5 to be modified to read as "The High Capacity Crash Energy Management system with anti climber have a buffer head which gives a minimum service life of 4 years and should be made of a material which has low wear rate. The buffer head should be compatible with the sidebuffers fitted currently on Indian Railways coaches. The face plate and buffer plunger tube should be replaceable in service once wear limits specified by manufacturer are exceeded. However the design of both should be such as not to require

<table>
<tr><th>Clause No.</th><th>Description</th><th>Sanrok Comments</th><th>AXTONE Comments</th><th>RDSO Comments</th></tr>
<tr><td></td><td></td><td></td><td></td><td>Annexure-B.
(vide letter no. Nil, dt.06-12-2013)
Complied after modification acc. to previous RDSO Comments.
(by Email, dt.11-08-2014)</td><td>any replacement before 24 months under Indian Railways operating conditioned”</td></tr>
<tr><td>3.6</td><td>The working of the Higher Energy Capacity Side Buffer should be smooth without any stick slip operation so that no jerk is passed on to the coach body.</td><td>Noted and Complied
(vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)</td><td>Complied
(by Email, dt.11-08-2014)</td><td></td></tr>
<tr><td>3.7</td><td>The Environmental conditions in which high capacity Side Buffer is required to function are listed as under;-
<table><tr><td>Maximum temperature in sun</td><td>70°C</td></tr><tr><td>Maximum temperature in shade</td><td>45°C</td></tr><tr><td>Minimum Temperature</td><td>(-)5oC</td></tr><tr><td>Humidity</td><td>100% saturation during rainy season</td></tr><tr><td>Rainfall</td><td>Fairy heavy</td></tr><tr><td>Environment</td><td>Dusty during hot weather, saline and corrosive in coastal areas</td></tr></table></td><td>Noted and Complied
(vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)</td><td>Complied
(by Email, dt.11-08-2014)</td><td></td></tr>
<tr><td>3.8</td><td>The Higher Energy Capacity Side Buffers should be able to</td><td>Noted an Complied. Please see our Enclosed simulations</td><td>Complied
(by Email, dt.11-08-2014)</td><td></td></tr>
</table>

Clause No.			Description	Sanrok Comments	AXTONE Comments	RDSO Comments
			protect the coach body from any deformation or damage due to impact up to designed speed. IR coaches are designed as per UIC 566 and are load tested under static condition for a load of 2000 kN at the ends, i.e. 1000 kN at each side buffer. The Higher Capacity Side Buffer shall be so designed that the coach structure should not start collapsing before the total stroke of side buffer is reached.	(vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)		
	3.9		The triggering force for initiation of the non- recoverable part of the stroke should not be more than 1600 kN.	Noted and Complied (vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)	Trigger force value, which can be measured only during dynamic test is not required by UIC standard. During dynamic test of IP300IR in February 2007 in Lucknow, RDSO did not record this force. Based on reports on our another tests and experience, we can confirm that for this type of crash buffer the triggering force is up to 2000kn. Nevertheless we propose to remove the requirement. (vide letter no. Nil, dt.06-12-2013) Complied (by Email, dt.11-08-2014)	Clause 3.9 and 3.10 to be retained in original form. Triggering force up to 2000kN cannot be permitted since coach body strength is as per UIC – 566 and which is load tested under static condition for a load of 2000kN at the ends i.e. 1000kN at each side buffer. Keeping in mind the dynamic nature of coach during crash and manufacturing short comings peak triggering force greater than 1600kN cannot be permitted.
	3.10		The average force during the non- recoverable stroke should be less than 1600 kN and shall be constant or decrease over the complete non recoverable stroke.	Noted and Complied (vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)	Please note that value of average force and value of absorbed energy need to be considered together. In this case character of curves is not important because it is not defined neither byEN15227 nor by all UIC relevant standards.	Clause 3.9 and 3.10 to be retained in original form. Triggering force up to 2000kN cannot be permitted since coach body strength is as per UIC – 566 and which is load tested under static condition for a load of

Clause No.			Description	Sanrok Comments	AXTONE Comments	RDSO Comments
					We propose to delete this point. (Vide letter no. Nil, dt.06-12-2013) Complied (by Email, dt.11-08-2014)	2000kN at the ends i.e. 1000kN at each side buffer. Keeping in mind the dynamic nature of coach during crash and manufacturing short comings peak triggering force greater than 1600kN cannot be permitted.
	3.11		The buffer has to work at the sharpest track curve of 175 m radius and 1 in 8 ½ turn out present on IR network. The buffer drop (vertical level difference) of 75 mm in between adjacent coaches is allowed in service.	Noted and Complied (Vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)	Complied (by Email, dt.11-08-2014)	
	3.12		The base plate of the buffer shall have four mounting holes of 26mm dia. each. The pitch of the mounting holes should be 349mm laterally and 170 mm vertically. The holes are to be symmetrically located about the central axis of the buffer assembly.	Noted and Complied. Please see our Installations drawings enclosed. (Vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)	Complied (by Email, dt.11-08-2014)	
	3.13		The Free length of the Buffer projecting from the face on the head stock where they are fitted shall be $635^{+5/-0}$ mm. The TENDERER may suggest minor modifications to the head stock with a view to utilize additional space if available. The modifications shall not weaken the structure and should not render the head stock unfit for use of a standard conventional side buffer.	Noted and Compiled. Please see our Installation Drawing Enclosed (Vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)	Complied (by Email, dt.11-08-2014)	

Clause No.	Description	Sanrok Comments	AXTONE Comments	RDSO Comments
3.14	The maximum recoverable stroke for the Higher Energy Capacity Side Buffers should be 110 -5 mm. The total stroke (recoverable and Non recoverable) should not be more than 110 -5 mm for Vestibuled Passenger Coaches and not more than 270 mm for Non Vestibuled Coaches.	Noted and Complied. Please see our Installation Drawings and Simulation results enclosed. (Vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)	Complied (by Email, dt.11-08-2014)	
3.15	For the Side buffer to have higher life and not be prone to accidental triggering of the mechanical crash elements if any, the energy absorption in reversible stroke should be kept to the maximum possible.	The solution offered by us, maximum energy being absorbed in recoverable zone. Please see our simulation results enclosed. (vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)	Complied (by Email, dt.11-08-2014)	
3.16	The Higher Energy Capacity Side buffers shall be able to protect the Coaches from any kind of permanent damage of the full train up-to a speed of **15 km/h** (Minimum) in the recoverable zone and 25 **km/h** (min.) in the non recoverable zone. The above protection should be available whether or not locomotive is equipped with Crash Buffers. Product which offers protection at a higher speed with higher degree of energy absorption will be preferred. The tenderer shall provide full train simulations to substantiate the claim. The data as per 'Appendix A' shall be	Please see our comments at 3.2 (vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013) 1. Safe impact speed for complete rake-resable-12.2 kmph. 2. Safe impact speed for complete rake-resable-16 kmph. (vide letter no. EOI:SBCEAC:RDSO:NS, dt.04-09-2014)	This clause is narrowing the list of potential suppliers just to one producer, which is OLEO. In order to encourage all other manufacturers of crash buffers other than OLEO, to participate in the tender and receive competitive offers, it is important that the minimum prescribed speed is reduced from 15km/h down to 10km/h as specified in UIC 528 and EN15551 standards. The speed of 25 km/h can be considered if the simulation according to the point 3.2 will prove that requirements are realistic.	Keeping in view the UIC standard for side buffers and also with a view to making the specification generic enough to in coach both mechanical deformation based and gas hydraulics based design, the clause is modified to read as under:- "The High Capacity Crash Energy Management system with anti climber shall be able to protect the Coaches from any kind of permanent damage of the full train up-to a speed of **12 km/h** (Minimum) in the recoverable zone and 16 **km/h** (min.) in the non recoverable zone. The above

Clause No.			Description	Sanrok Comments	AXTONE Comments	RDSO Comments
			used as input for the simulations.		In general, the requirement that buffers shall be able to protect coaches from any kind of permanent damage up to 15km/h is not according to the standards, which UIC type coaches have to meet. (vide letter no. Nil, dt.06-12-2013) Noted. According to our simulation we can confirm that the maximal speed at which there is no permanent damage to the coach structure for recoverable buffers zone is 11 km/h and 19 km/h for non-recoverable buffers zone. (by Email, dt.11-08-2014)	protection should be available whether or not locomotive is equipped with Crash Buffers. The tenderer shall provide full train simulations to substantiate the claim. The data as per 'Appendix A' shall be used as input for the simulations".
	3.17		The Characteristics of the Reversible stroke of the buffer should preferably be speed dependent, which means that at low speeds of impact there shall be lower reaction force and should gradually increase as the impact speeds increase. The TENDERER shall provide a Simulation and Static test (Load Deflection Characteristics) results to verify the same.	The proposed buffers are Gas Hydraulic buffers and have a speed dependent response . Please see the technical explanation on the working and benefits of gas Hydraulic Buffers enclosed. (vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)	In order to facilities all other manufacturer of crash buffers other than OLEO to participate in the tender and offer competitive bids, it is important that that this para is deleted particularly since UIC 528 and EN15551 do not contain this requirement. (vide letter no. Nil, dt.06-12-2013) Noted (by Email, dt.11-08-2014)	Keeping in view the design of both mechanical deformation based and gas hydraulics based energy absorption system and with a view to including both under the generic specification, this para is deleted,.
	3.18		The Higher Energy Capacity Side Buffers shall be so designed that the Recoil Forces are kept to the minimum.	The Gas Hydraulic Buffers have the lower recoil; forces as compared to elastomer based buffers. Please see the technical Writeup on the features of gas hydraulic	This para also need to be deleted as UIC 528 and EN15551 do not contain this kind of requirement, which is applicable only to OLEO buffers equipped with hydraulic capsules and will disqualify all	Keeping in view the design of both mechanical deformation based and gas hydraulics based energy absorption system and with a view to including both under the generic specification,

Clause No.			Description	Sanrok Comments	AXTONE Comments	RDSO Comments
				Buffers enclosed. (vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)	other manufacturers of crash buffers. (Vide letter no. Nil, dt.06-12-2013) Noted. Acc. To RDSO previous comment. (by Email, dt.11-08-2014)	this para is deleted,.
	3.19		The Minimum Damping factor for the recoverable portion of the Higher Energy Capacity Side Buffers shall be 0.42 and 0.60 min in Dynamic Mode. (EN 15551).	Noted and Compiled (vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)	Complied (by Email, dt.11-08-2014)	
	3.20		In case of separate arrangement for anti climber, the Anti-climbers shall be either welded to the head stock or mounted by fastening. The anti climber proposed shall not interfere or infringe with any other part or system on the coach and shall not affect the functioning of Higher Energy Capacity Side Buffers or that of conventional side buffers when replaced during service.	Noted (vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)	Noted (by Email, dt.11-08-2014)	
	3.21		There should be a visual indication provided on the Buffer to indicate - being good for service after an impact. This visual indication should not be ambiguous in nature.	Noted and Complied. (vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)	Complied (by Email, dt.11-08-2014)	
4.			**Particular Requirements**			
	4.1		The Tenderer shall submit a detailed simulation of full train to	Please see our detailed	For detailed simulation of full	Simulation can be carried out with

Clause No.			Description	Sanrok Comments	AXTONE Comments	RDSO Comments
			indicate the maximum speed at which there will be no damage to the coach body. Detailed calculations should also be provided for Maximum Vertical loading permitted by the Anti Climbing feature. The input parameter to be considered for the simulation are given in Appendix-A.	Simulation results enclosed. The Calculations for the Anti climbers will be submitted in due course of time. (vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)	train, real dynamic test results of crash buffer are needed. During a crash test of IP300IR in RDSO a dynamic characteristics were not taken, therefore the simulation can be done only for theoretical characteristics. All relevant standards required a validation to be based on real dynamic characteristics. We propose to delete this para. (vide letter no. Nil, dt.06-12-2013) Noted (by Email, dt.11-08-2014)	the testing / design of the crash energy management system data available with the manufacturer after suitable modeling. Detailed calculation can also be provided for maximum vertical loading permitted by the anti-climbing feature. Hence this clause is retained in original form.
	4.2		The working design of the Higher Energy Capacity Side Buffer's Energy Absorption elements shall be proven one and approved by International Railways systems for similar coaching applications. Documentary evidence to this effect must be submitted along with the proposal.	The Oleo gas Hydraulic Damper (vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)	Axtone have RDSO`s approval and certificate for crash buffer IP300IR delivered to Indian Railways in 2008. For up-coming tender we are intent to propose the same type of crash buffer (IP300IR-M), but it is now modernized and upgraded in order to avoid all problems we had with previous delivery. At the end of para 4.2 we propose to following: 'the suppliers who has RDSO certificate delivered to Indian Railways are excluded from this obligation. (vide letter no. Nil, dt.06-12-2013) Axtone offers type of fluid elastomer buffer. (by Email, dt.11-08-2014)	Proven design is required and also proof of the design being in service over international railway system for similar coaching applications. The clause 4.2 is modified to read as under: - "The working design of the The High Capacity Crash Energy Management system Energy absorption elements shall be proven one and in service over International Railways systems for similar coaching applications. Documentary evidence to this effect must be submitted along with the proposal."
5.			**Qualifying Requirements**			

Clause No.	Description	Sanrok Comments	AXTONE Comments	RDSO Comments
5.1	The Tenderer / Collaborator should have experience in designing, manufacturing and supplying energy absorption elements for passenger rail vehicle like Side Buffers, Crash Elements (passengers safety system), Draft Gears, Bump Stops, Energy Absorption devices for Couplers and Anti Climbers and should have supplied to major Railway systems in the Developed Countries. Documentary evidence to this effect shall be provided.	Oleo provides crash energy management products and services to rail operators and train manufacturers. Over 1,000,000 Oleo hydraulic and deformation impact energy absorbers are in daily operation around the world; meeting the requirements for higher levels of protection for passenger and freight rolling stock and operating needs such as higher coupling speeds. A detailed product brocheure for Oleo's Railway Products is enclosed along with List of Customers. (vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)	Complied (by Email, dt.11-08-2014)	
5.2	The Tenderer / Collaborator shall have possibility to carry out simulation studies for the complete rakes either in-house or through internationally reputed organisations with proven experience in Railway Crash Simulations	Oleo has extensive in house capability and facilities to carry out full train simulations. Oleo has always attached great importance to achieving performance characteristics of energy absorbers that are consistently repeatable and predictable. Oleo has a long history of testing and simulating the performance of its gas	Complied (by Email, dt.11-08-2014)	

Clause No.	Description	Sanrok Comments	AXTONE Comments	RDSO Comments
		hydraulic units for rail and industrial applications. The Hydraulic characteristics are non linear and velocity dependent. Oleo has developed proprietary mathematical algorithms for the purpose of simulating buffer performance. The simulations are matched by a long history of testing full size units to ensure a high degree of correlation. This simulation software has been further developed into a suite of powerful tools for analysing train collision dynamics that have the ability to simulate various collision scenarios. These tools could be applied to all rail vehicles used in passenger and freight applications. Please see a write up on Oleo simulation capabilities enclosed for your reference. (vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)		
5.3	The Tenderer / Collaborator should have possibility to carry out the required tests including dynamic testing either in house or through internationally	Oleo has complete testing solutions in house. Please see a write-up on	Except of those crash buffer, which already have RDSO certificate; all other type tests shall be carried out only by	Clause 5.3 is modified as under:- "The Tenderer / Collaborator should have possibility to carry out the required tests including

Clause No.			Description	Sanrok Comments	AXTONE Comments	RDSO Comments
			reputed agencies with proven experience in such testings. Facilities for Static testing however must be available with the Tenderer/Collaborator.	Oleo's testing capability/expertise and facilities enclosed. (vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)	independent internationally reputed agencies (notified testing body) or agency selected bi Indian Railways. Independent internationally reputed agencies can ensure high quality of equipment using only validated and approved test bench. The biggest European railways like DB, OBB, PKP and car builders like Siemens and Bombardier required all prototype tests only in certified laboratory. In-house only internal production test can be carried out. (vide letter no. Nil, dt.06-12-2013) Noted (by Email, dt.11-08-2014)	dynamic testing either in house or through internationally reputed agencies with proven experience in such testings".
6.			**Testing**			
	6.1		The Tenderers shall submit a detailed Prototype and Production Test Protocol and acceptance criteria for approval to RDSO.	The detailed testing protocol will be submitted along with the Tender. (vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)	Compiled (by Email, dt.11-08-2014)	
	6.2		A static test shall be conducted on the buffer for its recoverable stroke at a maximum speed of 0.01-0.05mm/s as per UIC 526-1/EN 15551. The End load, Energy absorbed and the Damping factor shall be measured. This shall form part of the Production testing.	Accepted. (vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)	Test speed shall be 0.01-0.05 m/s acc. to EN15551. (vide letter no. Nil, dt.06-12-2013)	Clause 6.2 is modified as under:- "A static test shall be conducted on one Crash energy management system for its recoverable stroke at a maximum speed of 0.01-0.05m/s as per UIC 526-1/EN 15551. The End load, Energy absorbed and the Damping factor shall be

Clause No.	Description	Sanrok Comments	AXTONE Comments	RDSO Comments
				measured. This shall form part of the Prototype testing."
6.3	A Static test shall be conducted on one Buffer for its full stroke which includes Recoverable and non recoverable stroke at speed ranging from 0.01m/s-0.05m/s (UIC 526-1). The trigger force and the mean force during non-recoverable stroke shall be measured. This shall form part of the Prototype testing and Reversible and Non reversible elements of the Side buffers can be tested separately.	Accepted. (vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)	This requirement is not justified from technical point of view, static crash test doesn't provide any information about crash behavior in dynamic situation. There is no added value from static crash test European crash standard EN15227 do not required a static crash test and it is not even mentioned there. (vide letter no. Nil, dt.06-12-2013) Compiled (by Email, dt.11-08-2014)	This type of test is essential for determination of the values of the trigger force and the mean force during non-recoverable stroke. Hence clause 6.3 to be retained in original form.
6.4	A dynamic test shall be conducted on Higher Energy Capacity Side Buffers on a test bench when impacted at a speed between 15 km/h to 25 km/h. The Speed, mass and energy must be chosen in order to achieve at least 80% of the total energy capacity of the Higher Energy Capacity Side Buffer as per EN15227. This shall form part of the Prototype testing.	Accepted. (vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)	Compiled (by Email, dt.11-08-2014)	In view of M/s Sanrok and M/s AXTONE comments against clause 3.2, clause 6.4 is modified to read as under:- "A dynamic test shall be conducted on High Capacity Crash Energy Management System on a test bench when impacted at a speed between 12 km/h to 16 km/h. The Speed, mass and energy must be chosen in order to achieve at least 80% of the total energy capacity of the High Capacity Crash Energy Management System as per EN15227. This shall form part of the Prototype testing."
6.5	RDSO may witness some or all the tests during Prototype	Accepted. (vide letter no.	Complied (by Email, dt.11-08-2014)	Clause 6.5 is modified as under:- "RDSO representative shall

Clause No.			Description	Sanrok Comments	AXTONE Comments	RDSO Comments	
			testing.	EOI:SBCEAC:RDSO:NS, dt.11-12-2013)		witness all the tests during Prototype testing".	
7.			**Acceptance**				
	7.1		As the Higher Energy Capacity Side Buffers are designed to work both during normal buffing operation and High Speed impacts where Deformation may happen, the High Capacity Side buffers shall be approved based on the Test results and the Full Train Simulation provided by the Contractor**.**	Accepted (vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)	Complied (by Email, dt.11-08-2014)		
8.			**Maintenance and Service.**				
	8.1		The Buffers should me maintenance friendly and disassembly and replacement of components should be simple.	Noted and Compiled. (vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)	Complied (by Email, dt.11-08-2014)		
	8.2		The Tenderer shall provide detailed instructions for day to day maintenance.	No day to day maintenance of Oleo Buffer are required as the Oleo Buffers are largely maintenance free for a period of 5-7 years. (vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)	Complied (by Email, dt.11-08-2014)		
	8.3		The Higher Energy Capacity Side Buffers shall not require any maintenance within 3 years of Service except in case of an accident.	The Buffers shall require overhauling after 5-7 years of service. (vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)	Crash buffer shall not require any maintenance within 3 years of Service, other than periodic greasing and control of indicator. (vide letter no. Nil, dt.06-12-2013)		
	8.4		The material of buffer head and its mating face with	The reclamation procedure for the buffer will be provided	Complied (by Email, dt.11-08-2014)		

Clause No.	Description	Sanrok Comments	AXTONE Comments	RDSO Comments
	reclamation/replacement process shall be provided with the offer.	along with the supplied. (vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)		
8.4.1	Detailed work content of various inspection / maintenance practices, including procedure for assembly and fitment on coaches. The work content of each schedule shall also be intimated.	The Detailed work content for the fitment will be provided along with the supplied. There is no day to day maintenance required for Oleo Gas Hydraulic buffers and required overhauling one every 5-7 years. (vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)	Complied (by Email, dt.11-08-2014)	
8.4.2	A list of technical specification (for procurement purpose) of all special purpose tools, gauges and testing/ measuring instruments required for examination, repair and over-hauling / reconditioning of High Capacity Side Buffers . Price proposal for these tools, gauges and testing / measuring instruments shall also be submitted with the offer separately.	The Gas hydraulic side buffer are virtually maintenance free and do not require any major maintenance for 5-7 years of Service. Overhauling of the Gas hydraulic Side buffers is a specialized process and should either be done by Oleo/Their local partners themselves or under their direct supervision. A detailed proposal including Price proposal for the tools, gauges and testing/measuring instruments will be submitted along with the Tender. (vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013).	Complied (by Email, dt.11-08-2014)	

Clause No.		Description	Sanrok Comments	AXTONE Comments	RDSO Comments
	8.4.3	Copy of Maintenance Manual, which details the maintenance procedures for High Capacity Side Buffers in workshops and open lines.	These details will be provided along with the supplies. (vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)	Complied (by Email, dt.11-08-2014)	
	8.4.4	The successful Tenderer will also give at least 50 hard and 50 soft copies of the maintenance manuals of the buffer. The maintenance manuals will cover detailed process of all the maintenance activities required to be carried out by coaching depot and or the repair workshop. As per maintenance schedule of IR.	These details will be provided along with the supplies. (vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)	Complied (by Email, dt.11-08-2014)	
	8.5	The Manufacturer should provide Maintenance support for maintaining these Higher Energy Capacity Side Buffers for a period of 10 years.	Noted and Accepted (vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)	Complied (by Email, dt.11-08-2014)	
9.		**Guarantee**			
	9.1	The Buffers failing or proving unsatisfactory in service due to defective design, material or workmanship within 48 months from the date of delivery or 36 months from the date of placing in service, whichever is earlier, shall be replaced at firms own cost. This warranty shall survive, notwithstanding the fact that the High Capacity Side Buffers may have been inspected, accepted and payment thereof made by	Noted and Accepted. (vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)	In our opinion the sentence; 'This warranty shall survive, notwithstanding the fact that the High Capacity Side Buffers may have been inspected, accepted and payment thereof made by the PURCHASER' – required more accurate and detailed explanation, in order to avoid any misunderstanding in the future. (vide letter no. Nil, dt.06-12-2013)	Clause 9.1 to be retained in original form.

Clause No.			Description	Sanrok Comments	AXTONE Comments	RDSO Comments
			the PURCHASER. For the replaced Side Buffer, the period of 36 months shall commence when the replaced Side Buffer is commissioned in service. The sole judge in this case shall be the PURCHASER.		Complied (by Email, dt.11-08-2014)	
10.			**Indigenization**			
	10.1		Tenderer shall submit a detailed programme for indigenization of the Higher capacity Side Buffers, Anti Climbers and the associated components. The Indigenization program should at least include local sourcing of Non critical components, Assembly and Production Testing of High Capacity Side Buffers.	A detailed indigenization programme will be submitted in due course of time. However the level of indigenization will depend upon the volume and eventual acceptance and adoption of the Product by Indian Railways. (vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)	We see possibility for service and manufacturing of spare parts (wearing parts during operation). (by Email, dt.11-08-2014)	Clause 10.1 to retained in original form.
11.			**Operating Conditions**			
	11.1		The Higher Energy Capacity Side Buffers and Anti Climbers should be give satisfactory performance within the operating conditions as listed in Annexure –C.	Noted and Accepted (vide letter no. EOI:SBCEAC:RDSO:NS, dt.11-12-2013)	Complied (by Email, dt.11-08-2014)	
					Annexure – A – we comply (vide letter no. Nil, dt.06-12-2013)	
					Annexure – B – see point 3.5 (vide letter no. Nil, dt.06-12-2013)	
					Annexure – C – available copy has max. temp. under the sun -	

Clause No.	Description	Sanrok Comments	AXTONE Comments	RDSO Comments	
			70^{0} C and under the shade 45^{0} C should be plus. (vide letter no. Nil, dt.06-12-2013) Annexure – C we comply (by Email, dt.11-08-2014)		