

Reasoned Document

S. No.	Clause No.	Clause	Comments From Firms/Railways & PUs	Comments	RDSO's Remarks
1.	1.1.3	Train shall have a minimum of 16 (sixteen) passenger carrying Cars. Minimum length of the train shall be 384 (three hundred eighty-four) meters, buffer to buffer. The maximum train length shall not exceed that of the longest passenger train operating on the Route of the Railway Network. For the avoidance of doubt, a Car having Driving Cab and also carrying the passengers shall be considered as a passenger carrying Car	M/s Patentes Talgo SLU	Could you inform us about the longest passenger trains that are operating in every route?	Presently, maximum 24 coaches having 24-meter length each, hauled by locomotive are permitted in IR for passenger services.
			M/s BT	<p>BT Clarification: Requirement of train flexibility missing.</p> <p>BT Proposal: We understand that the requirements in the specification are linked to the described 16 car configuration. Therefore, we would like to understand the performance requirements for longer configurations up to the maximum expected train length. We understand the maximum train length has to be equal to 24 coach configuration similar to existing trains, please confirm our understanding of maximum train length. Furthermore we would like to understand the requirements related to the adaptation of the train configuration</p>	Performance requirement will be for train having length of equal to or more than 384 meters. Clause has been modified for clarity.
2.	1.3.3	(ii) Safety risk assessment shall utilize more than one methodology to assess risks; and	M/s BT	<p>BT Clarification: Safety risk assessment shall utilize more than one methodology to assess risks</p>	No change in the specification is envisaged.

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				<p>BT Proposal:</p> <p>The referred standards do not require 2 independent assessments. This requirement will make the safety assessment quite cumbersome exercise. Kindly delete this requirement.</p>																			
3.	1.4	<p>Power supply system</p> <table border="1"> <tr> <td>Nominal supply voltage</td> <td>25 kV (RMS), 50 Hz, single phase, AC</td> </tr> <tr> <td>Normal variation in supply voltage</td> <td>19 kV to 27.5 kV (RMS)</td> </tr> <tr> <td>Voltage range for Train to operate in full compliance with these Specifications and Standards</td> <td>22.5 kV to 27.5 kV</td> </tr> <tr> <td>Occasional maximum voltage</td> <td>31 kV (RMS)</td> </tr> <tr> <td>Occasional minimum voltage</td> <td>16.5 kV (RMS)</td> </tr> <tr> <td>Normal variation in frequency</td> <td>± 3% (48.5 to 51.5 Hz)</td> </tr> <tr> <td>Stagger of the contact wire</td> <td>± 200mm on straight track Up to +300mm on curves</td> </tr> <tr> <td>Normal contact wire height in mid span</td> <td>5.5 m from Rail Level</td> </tr> <tr> <td>Max. contact wire height</td> <td>5.8 m from Rail Level</td> </tr> </table>	Nominal supply voltage	25 kV (RMS), 50 Hz, single phase, AC	Normal variation in supply voltage	19 kV to 27.5 kV (RMS)	Voltage range for Train to operate in full compliance with these Specifications and Standards	22.5 kV to 27.5 kV	Occasional maximum voltage	31 kV (RMS)	Occasional minimum voltage	16.5 kV (RMS)	Normal variation in frequency	± 3% (48.5 to 51.5 Hz)	Stagger of the contact wire	± 200mm on straight track Up to +300mm on curves	Normal contact wire height in mid span	5.5 m from Rail Level	Max. contact wire height	5.8 m from Rail Level	<p>M/s Patentes Talgo SLU</p>	<p>Nominal Voltage is 25 kV. According to standard EN 50388, to 22.5 kV shall be reached a 90% of power obtained with 25 kV. Could we provide 90% of the power to 22.5 kV according to EN 50388?</p> <p>Maximum occasional voltage is higher than maximum non-permanent voltage value established by standard EN 50163. On the other hand, minimum occasional voltage is lower than minimum non-permanent voltage value established by standard EN 50163. Could be possible to design for the occasional voltage range established by EN 50163?</p>	<p>Accepted. Necessary changes have been made in the para.</p>
Nominal supply voltage	25 kV (RMS), 50 Hz, single phase, AC																						
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			M/s BT	<p>BT Clarification:</p> <p>(i) If, the train is envisaged to be operated under high rise OHE, parameters of High rise OHE may also be included to design the system accordingly.</p> <p>(ii) It is to be noted that 'Minimum contact wire height of 4.54m from rail level' in para 1.4 is applicable to rolling stocks not higher than 4.27m</p> <p>BT Proposal:</p> <p>(i) RDSO shall define whether the train route will use mixed tracks with Standard and High Rise catenary. It would be most desirable that IR recommends pantographs suited</p>	<p>Parameters of High rise OHE are already part of specification.</p> <p>High reach pantograph as per RDSO specification no. RDSO/2007/EL/SPEC/0054, Rev.3 can work from 4.54m to 7.57m upto speed of 200kmph (tested upto 110kmph under catenary at height of 7.57m). Successful tenderer may offer pantograph with improved designs to meet the stipulated requirements in specification.</p>																		

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		<table border="1"> <tr> <td>Min. contact wire height</td> <td>4.54 m from Rail Level</td> </tr> <tr> <td>Neutral sections</td> <td> After around every 25 to 50kms <ul style="list-style-type: none"> ○ A neutral section of 41 m in length having insulated overlap on both ends and a neutral wire in between which is not earthed; and ○ A short neutral section of approximately 4.61 m and 9.6 m length having an insulated portion (of PTFE) on both sides and middle portion of neutral section which may or may not be solidly earthed. </td> </tr> <tr> <td>Feeding zone for traction substation</td> <td>There may be 3 - 4 block sections on each side fed by the traction substation.</td> </tr> <tr> <td>Max. continuous OHE current rating</td> <td>600 Amps.</td> </tr> </table> <p>High rise OHE is also being installed on IR. If, the train is envisaged to be operated under high rise OHE, parameters of High rise OHE may also be included to design the system accordingly. High rise OHE Parameters:</p>	Min. contact wire height	4.54 m from Rail Level	Neutral sections	After around every 25 to 50kms <ul style="list-style-type: none"> ○ A neutral section of 41 m in length having insulated overlap on both ends and a neutral wire in between which is not earthed; and ○ A short neutral section of approximately 4.61 m and 9.6 m length having an insulated portion (of PTFE) on both sides and middle portion of neutral section which may or may not be solidly earthed. 	Feeding zone for traction substation	There may be 3 - 4 block sections on each side fed by the traction substation.	Max. continuous OHE current rating	600 Amps.		<p>and homologated for operation under catenary extending from 4.54 to 7.57 m height up to speeds of 160 km/h.</p> <p>(ii) Is our understanding correct that for any rolling stock offered higher than 4.27 m, IR will make sure that it will be routed under adequate catenary? Or does the sentence mean, that rolling stock up to 4.27 m only is acceptable? Further we would like to point out that in earlier rolling stock specs the min. height has been 4.58 m.</p>	<p>Annexure II to this specification & IRSOD(BG)-2004 with correction slips/addendums/corrigendum may be referred for more clarity.</p> <p>Necessary changes in this para & para 2c of Annex 1 have been made.</p>
Min. contact wire height	4.54 m from Rail Level												
Neutral sections	After around every 25 to 50kms <ul style="list-style-type: none"> ○ A neutral section of 41 m in length having insulated overlap on both ends and a neutral wire in between which is not earthed; and ○ A short neutral section of approximately 4.61 m and 9.6 m length having an insulated portion (of PTFE) on both sides and middle portion of neutral section which may or may not be solidly earthed. 												
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		<ul style="list-style-type: none"> • Normal contact wire height in mid span: 7.52m from RL • Max. contact wire height: 7.57m from RL • Min. contact wire height: 7.166m Pantograph bounce time- upto 45ms (limit of zero pressure contact) may also be included. It is to be noted that 'Minimum contact wire height of 4.54m from rail level' in para 1.4 is applicable to rolling stocks not higher than 4.27m.			
4.	1.5	Maximum cant deficiency: 100 mm	M/s Patentes Talgo SLU	Cant deficiency could be higher than this limit if the proposed train does not exceed the values indicated in EN14363 standard	Accepted. Already permitted in note to this para.
5.	1.6	Climatic and Environmental Conditions The climatic and environmental conditions prevailing in India are the following: (See Draft Specification)	M/s ALSTOM	We Suggest for Locomotive the Flood level height should be 102mm in line with WAG12B.	M/s Alstom has referred to the feature of existing WAG12B loco. The suggestions given by M/s Alstom can not be considered.
			M/s BT	BT Clarification: Altitude: 1776 m above sea level BT Proposal: Is it really true that the trains under consideration will travel up to 1776 m above sea level? This requirement will impact design of equipment like VCB, surge arrester, pneumatic components etc. Kindly modify this requirement to 1000 m as followed in case of RDSO specification for trainset tender.	The existing equipments of electric locomotives are being designed considering the mean sea level height as 1776m. The suggestions given by M/s BT can not be considered.

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6.	1.7.4	Locotrol/EOTT etc. - 452-458 MHz Future system Real Time Train Information System (a) Radio Frequency - 2.4 GHz (b) GSM/CDMA Frequency - 850/900/1800/ 1900/2100 MHz Future system	M/s Patentes Talgo SLU	Do we need to leave room for these future systems?	Para has been modified for this.
7.	1.7.9	Train Protection and Warning System The Trains shall be fitted with Automatic Train Protection systems (ATP) necessary to operate on the Railway Network which shall include the following: (i) ATP shall generally conform to latest approved functional requirement specification & system requirement specification for TPWS (Train Protection Warning System)/ TCAS (Train Collision Avoidance System- Indian ATP system- RDSO/SPN/196/2012 ver3.2 or latest)/ETCS level-2, as applicable at site.	M/s BT	BT Clarification: ATP shall generally conform ... as applicable at site BT Proposal: Please clarify whether all trains shall be equipped with all systems or only on select clusters / routes.	Clause has been modified for more clarity.
8.	1.9.1		M/s Patentes Talgo SLU	(iii) As Mumbai Suburban platform are a minimum percentage within the entire IR network. Should the trains which are dedicated to other corridors to be compatible with 900 mm height platforms?	Trains dedicated to other corridors will not be required to be compatible with Mumbai or Pune suburban platform heights.

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		<p>Indian Railways has platforms of various heights indicated below:</p> <p>(i) High level platforms having platform height in the range of 840mm – 760mm above Rail Level.</p> <p>(ii) Low level platforms having platform height below 455mm up to Rail Level.</p> <p>(iii) The height for Mumbai suburban passenger platform and Pune suburban passenger platform may be in the range of 840mm-900mm.</p> <p>The Cars shall have suitable safe and comfortable arrangement to allow Users to board and alight from the Train at station having platform height mentioned above.</p>	M/s BT	<p>BT Clarification:</p> <p>(ii) Low level platforms having platform height below 455mm up to Rail Level.</p> <p>BT Proposal:</p> <p>Is our understanding correct, that lowest platforms may be at rail level or any intermediate height between 0 and 455 mm.</p>	Ok, changes have been made in the specification.
9.	2.1	<p>Maximum Axle load:</p> <ul style="list-style-type: none"> • Should not exceed 17t for cars with bogie design • Should not exceed 19.5t for power head <p>Note 1</p> <p>As bogie less design is also permitted, if rolling stock wheels are without axle, maximum vertical wheel force assessed as per EN14363:2016 in Oscillation trials would be limited to 15 ton.</p>	M/s Patentes Talgo SLU	<p>Limit of 19.5 t shall be also applicable for articulated passenger cars with bogie-less design</p> <p>This sentence should be corrected as it does not state the exemption of the above mentioned requirement (maximum axle load 17 ton) if you fulfill this requirement (maximum vertical wheel force 15 ton). It should be something like "As bogies less design is also permitted not being limited to 17 tonne, if rolling stock wheels are without axle, ..."</p> <p>The limit value should be according to EN 14363.</p> <p>Talgo's comment :</p> <p>i. EN 14363 & UIC 518 Take on this</p> <p>ii. 46 Kg EU Rails vs 52 /60 Kg IR Rails</p>	<p>It is already clear. Axle load limit will not be applicable on bogie less design as bogie less design doesn't have axles.</p> <p>Necessary change has been made in the specification.</p> <p>(i) The limit of maximum vertical wheel force in the specification has been prescribed on the basis of</p>

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				<p>iii. Effect of Fatigue Loading and Cyclic Loading on Talgo Trains iv. Technical benefit Compensation without any risk for Axle Load Limit v. Global Data of Talgo Trains on the Issue vi. Oscillation trial results of High-Speed wheelsets and bogies.</p> <p>M/s PATENTES TALGO S.L.U would like to justify that EN 14363 Maximum Wheel Force (dynamic value) is applicable for Indian case not been necessary to create new limitation. Even more, no new limit value following EN 14363 statistical and methodological concept.</p>	<p>calculation of rail stress on the prevalent track structure of Indian Railways. These stresses depend on the type of rails being used, internal stresses in rail, formation characteristics, fastening and ballast, track modulus, operating conditions etc. These conditions/values may vary on different rail networks. The methodology adopted by Indian Railway for calculation of rail stress is well established in line of International practices and UIC D-71.</p> <p>(ii) Table– 2 of EN-14363: 2016 specifies ‘Larger quasi-static guiding forces, vertical wheel forces and accelerations, dynamic content generally decreases’ for test Zone–III & IV. Also, as per trial data provided by M/s Talgo, the maximum vertical wheel force measured in test Zone – III & IV is higher in comparison to Zone-I & Zone-II.</p> <p>(iii) It is also observed that the number of curves</p>

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					<p>corresponding to Zone-III (R – 600 m to 400 m) & Zone – IV (R less than 400 m to 250 m) on Indian Railways are limited. Therefore, in case of exceedance of maximum vertical wheel force above 160 kN in Zone-III & Zone-IV, if suitable lower speed is permitted on these curves then its effect on the overall travel time of the train between origin to destination would also be limited.</p> <p>Further, maximum dynamic wheel force limit has been increased. Para has been modified.</p>
10.	2.1.1	No part of the Train, except the wheels, shall be within 91 mm of Rail Level when the wheels are at their minimum permissible diameter and the Cars are loaded. No part of equipment attached to the under frame of the Vehicle shall be within 215 mm of Rail Level when the wheels are at their minimum permissible diameter and the Train is not loaded.	M/s ALSTOM	Minimum Clearance from the top of rail for the underframe equipment for Locomotive shall binding with respect to gauge (MMD), Hence Minimum clearance of 91 mm when wheel diameter is at minimum level is critical & to be respected for Locomotive. However the minimum clearance of 215 mm should not be applicable for Locomotive.	Firm comments appear to be in order & has been considered. Necessary change has been made in specification.

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11.	2.5.3	Train shall be capable of accelerating to a speed of 160 kmph from 0 kmph in a maximum of 140 seconds on level track.	M/s ALSTOM	<p>This requirement corresponds to an average acceleration of 0.32 m/s² from 0 to 160 kmph: $(160/3.6) [m/s] / 140 [s] = 0.32 [m/s^2]$.</p> <p>As a reference, the European Technical Specification of Interoperability (TSI) specifies accelerations as follows: "For High speed train" •From 0 to 40 km/h: 0.40 m/s² •From 0 to 120 km/h: 0.32 m/s² •From 0 to 160 km/h: 0.17 m/s²"</p> <p>The acceleration value of 0.32 m/s² is considered here for 0 to 120 kmph.</p>	Para has been modified based on simulations carried out by RDSO on Power Head hauled train & Trainset.
			M/s Patentes Talgo SLU	We request to change this clause into the following "Train shall be capable of accelerating to a speed of 160 km/hour in a maximum of 210 seconds." Justification Attached	
12.	2.11.2	The noise level inside the Car shall not exceed 65 dB(A) when stationary and shall not exceed 70 dB(A) at maximum service speed with all auxiliary equipment operating at its greatest noise output. The measurement shall be done as per ISO 3381.	M/s ALSTOM	<p>We understand Interior Noise limit of 65 dBA & 70 dBA is for Passenger car.</p> <p>For Locomotive Driving cab</p> <ol style="list-style-type: none"> 1. WAG12 B Locomotive requirement is 68 dBA & 75dBA respectively at stationary & Running at Max Service Speed (120 kmph) Condition. 2. As per TSI NOISE 2014 (Technical Specification of Inter-Operability - Global European standard) the Noise limit in 	As clause does not pertain to locomotive/power head, no change in specification envisaged.

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				<p>driving cab for Electric Locomotive at Max operating Condition (< 250 kmph) is 78dBA.</p> <p>3. We suggest for Passenger Locomotive Cab Noise limit at stationary & dynamic condition should be 68dBA & 78dBA respectively.</p>	
			M/s Patentes Talgo SLU	<p>In order to clarify where must be demonstrated the fulfillment of the requirement. We suggest to redact the requirement as follows:</p> <p>The noise level at the passenger areas shall not exceed 65 dB(A) when stationary and shall not exceed 70 dB(A) at maximum service speed with all auxiliary equipment operating at its greatest noise output. The measurement shall be done as per ISO 3381.</p>	<p>As per RDSO specification no. RDSO/E/SPEC/EMU /0196-2019 for three phase propulsion equipment and control system for electric train set, the inside noise level of Car shall not exceed 65 dB(A) when stationary and shall not exceed 70 dB(A) at maximum service speed with all auxiliary equipment operating at its greatest noise output.</p> <p>Hence, no need to change the requirement of existing clause.</p>
13.	2.11.3	<p>Limits of Stationary Noise</p> <p>The limiting value for noise emission of the Cars shall be 68 dB (A) at a distance of 7.5 m from the centerline of the track, 1.2m and 3.5m above the upper surface of the rails. The measurement shall be done in accordance with the standard EN ISO3095</p>	M/s Patentes Talgo SLU	<p>In order to clarify where must be demonstrated the fulfillment of the requirement. We suggest to redact the requirement as follows:</p> <p>The limiting value for noise emission of the train shall be LAeq,20s < = 68 dBA at a distance of 7.5 m from the centerline of the track, 1.2m and 3.5m above the upper surface of the rails. The measurement shall be done in accordance with the standard EN ISO3095.</p>	<p>As per clause 5.7 of ISO3095:2013 “The measurement time interval T shall be at least 20 s. If, however, as an exception it is not possible to maintain the source of noise at its nominal load for 20 s, the measurement time interval T may be reduced to a minimum of 5 s. This</p>

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					reduction shall be specified and justified in the test report". Hence, limiting time "T" as 20s is not desirable. The clause is retained as existing.
14.	2.11.4	<p>Limits of Starting Noise</p> <p>The limiting value for noise emission of the Cars shall be 82dB(A) at a distance of 7.5m from the center line of the track, 1.2m and 3.5m above the upper surface of the rails. The measurement shall be done in accordance with the standard EN ISO 3095.</p>	M/s Patentes Talgo SLU	<p>In order to clarify where must be demonstrated the fulfillment of the requirement. We suggest to redact the requirement as follows:</p> <p>The limiting value for noise emission of the train shall be $L_{pAFmax} < = 82$ dBA at a distance of 7.5 m from the centerline of the track, 1.2m and 3.5m above the upper surface of the rails. The measurement shall be done in accordance with the standard EN ISO3095.</p>	<p>As per clause 4.4 of EN ISO3095: 2005, The measurement quantity for accelerating or braking tests shall be the maximum AF-weighted sound pressure L_{pAFmax}.</p> <p>Hence, the suggestion of M/s Patentes Talgo SLU is accepted and clause is revised accordingly.</p>
15.	2.11.5	<p>Limits of Passing - by Noise</p> <p>The limiting value for noise emission of the Cars shall be 81 dB(A) at a distance of 7.5 m from the center line of the track, 1.2 m and 3.5 m above the upper surface of the rails. The passing – by noise shall be measured at 80 kmph and at maximum service speed. The value to be compared with the above limits is greater of the measured value at 80 kmph and the measured value at</p>	M/s Patentes Talgo SLU	<p>In order to clarify where must be demonstrated the fulfillment of the requirement. We suggest to redact the requirement as follows:</p> <p>The limiting value for noise emission of the train shall be $L_{Aeq,TP} < = 81$ dBA at a distance of 7.5 m from the centerline of the track, 1.2m and 3.5m above the upper surface of the rails. The measurement shall be done in accordance with the standard EN ISO3095.</p>	<p>The basic measured quantities are L_{pAeqTp} for passing by noise.</p> <p>Hence, the suggestion of M/s Patentes Talgo SLU is accepted and clause is revised accordingly.</p>

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		<p>maximum service speed but referred to 80 kmph by following equation:</p> $L_{pAeqTp}(80\text{km/h}) = L_{pAeqTp}(v) - 30 \cdot \log(v/80)$ <p>Where</p> $L_{pAeqTp}(v) = \text{Measured value at maximum service speed } v = \text{maximum service speed}$ <p>The measurement shall be carried out in accordance with the standard EN ISO 3095.</p>			
16.	3.1.2	The Train shall be air-conditioned and protected against dust and water in accordance with IP 65.	M/s ALSTOM	We suggest That the requirement "The Train shall be air-conditioned and protected against dust and water in accordance with IP 65." is too generic & request to specify IP level Component wise.	No change in the specification is required.
17.	3.2 & 3.3	Electric Propulsion System (See Draft Specification)	M/s BT	<p>BT Clarification:</p> <p>Integration principle of propulsion equipment including auxiliary power supply</p> <p>BT Proposal:</p> <p>With regards to the maintainability and maximization of passenger capacity we would propose to install all propulsion equipment in the underframe and/or on the roof of the cars and prohibit machine rooms within passenger compartments for the installation of propulsion equipment.</p>	No change in the specification is envisaged.

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18.	3.2.1	The Trains shall work on not more than two Pantographs. Minimum distance between two pantographs should be as per EN 5036	M/s BT	BT Clarification: The Trains shall work on not more than two Pantographs. Minimum distance between two pantographs should be as per EN 50367 BT Proposal: Kindly clarify if neutral sections on IR's network are compliant with underlying assumptions in EN 50367.	Details of neutral section has been provided in Clause no. 1.4, which has been modified.
19.	3.2.2	The profile of the pantograph shall be in accordance with the drawing no. SKEL-3871 enclosed as Annexure - III. Metallized carbon strip in accordance with RDSO's specification no. RDSO/2009/EL/SPEC/0097, Rev.1 or latest shall be used on the pantograph. It shall be possible for each of these pantographs to be electrically disconnected from the roof equipment and earthed in case of damage.	M/s BT	BT Clarification: It shall be possible for each of these pantographs to be electrically disconnected from the roof equipment and earthed in case of damage. BT Proposal: It is not always the best solution to earth a pantograph in case of damage. Depending of kind of damage parts of the pantograph may be close to the catenary and lead to electric arcs and consequential damages. It might be more beneficial not to earth it. Kindly delete this requirement.	In case of damage of pantograph, it is normally needed to be secured first and then earthed. No change in the specification is envisaged.
20.	3.5	Master cum Brake Controller (See Draft Specification)	M/s BT	BT Clarification: Master cum brake controller BT Proposal: Is our understanding correct that the "brake controller" addresses electric brake control only.	Clause to be read with clause no. 3.42.2

21.	3.12.1.4	<p>Electrical Fire safety:</p> <p>The design of equipment shall incorporate all measures to prevent fire and will be such that should any fire take place the effects shall be minimized and no spread of fire should take place. Materials that are not fire retardant shall not be used. Fire survival cables according to EN 50200 shall be used at least for, PA/PIS, ETB circuit, Passenger Alarm, supply and other essential circuits of Fire detection system and Door system for their continued functioning to the extent possible in the event of fire.</p> <p>All electrical circuits including 110 V DC shall be fully insulated from the super structure on both the positive and negative sides and the super-structure shall not be used as a part of any earth return circuit.</p> <p>Relevant provisions stipulated in Central Electricity Authority (Measures related to Safety and Electric Supply) Regulations, 2010, shall be followed in the interest of safety of passenger/staff as well as for equipment / instruments provided in the Cars.</p> <p>A manually operated two-position earthing switch shall be provided. Operation of the switch shall enable earthing of the power circuit of the Train and allow attention to the high voltage equipment by releasing interlocked keys from a box fitted to the earthing switch.</p> <p>A discharging and an isolation switch shall be provided by the contractor to facilitate the maintenance personnel with a simple means of isolating the traction equipment, discharging all high voltage capacitors to a safe voltage of 50 volt and earthing all high voltage equipment.</p> <p>System shall provide foolproof safety against unauthorized person driving the train</p>	M/s Patentes Talgo SLU	It is mentioned that train shall comply with EN 45545, but it is necessary to specify the Operation Category (from 1 to 4) and the Train Type to be able to define its Hazard Level according to EN45545. (The Operation Category is the relationship between service, infrastructure and evacuation conditions for passengers and staff.)	<p>The query pertains to clause no. 2.13</p> <p>Due to pattern of train services in India, rather than limiting the selection of materials to Operation category of train, it is required that all the coach furnishing materials used should be EN 45545 HL2 compliant for Chair car type Day trains and EN 45545 HL3 compliant for all coaches of other type of trains.</p> <p>No change in specification is envisaged.</p>
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22.	3.13.1	The Car body shall be lightweight and corrosion resistant and rugged to withstand the tractive and braking effort as well as impact and accidental damage. The mechanical strength of car body shall conform to EN 12663 (Category P1) and the design of coach body shall be compatible in respect of crashworthiness with EN 15227 (Category C1) standard.	M/s Patentes Talgo SLU	We request to change the requirement for the mechanical strength of car body acc. to EN 12663 from Category P1 to Category P2. Category P2 is suitable for fixed units and coaches, whereas category P1 is more appropriate for loco hauled coaches.	Comments are related to 3.33.1 The mechanical strength of car body shall be according to Category P1 of the specification EN 12663 as IR main line coaches running over IR are designed under P1 category. No change in specification is envisaged.
23.	3.17.1	All Trains shall be equipped with a stand-by battery power source to supply emergency load for at least 180 minutes in case of failure of normal power supply fed from overhead traction system.	M/s Patentes Talgo SLU	This requirement could unnecessarily increase the capacity of the batteries. Instead of this, and taking into account TSI Standard in Europe, our experience and the best practice into this matter, we recommend changing the emergency ventilation time to 30 minutes.	No change in the specification is envisaged

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24.	3.17.2	Emergency loads shall include, but not limited to: (i) Emergency lighting; (ii) All exterior lights; (iii) Ventilation fans but not air conditioners; (iv) Communication systems including public address, emergency alarm, (v) surveillance system and Train radio; (vi) Propulsion and brake controls; (vii) Door controls; (viii) Electric horn; (ix) Cab console indicators, lighting and interlocking and functioning of Toilets	M/s Patentes Talgo SLU	We consider that some loads on the list are not emergency loads, and therefore suggests removing the consumption relating to toilets from the list or reduce the time that it have activated. In the same way, please, reconsider to remove the consumption of room ventilations fans from the list or reduce the time to be on, condition to provide that CO2 conditions are kept below the limits specified in the TSI. This requirement could unnecessarily increase the capacity of the batteries.	No change in the specification is envisaged
25.	3.18	Heating, Ventilation and Air Conditioning (HVAC)	M/s Patentes Talgo SLU	In the event of the failure of air conditioning unit in a Car, an emergency ventilation shall operate automatically to admit fresh air directly into Car to maintain the required oxygen level in fully loaded Car, in accordance with ASHRAE. This requirement has been removed in the new revision of technical specification: What requirements have to be fulfilled in case of failure of air conditioning in a car ?	Clause No. 3.18.4 has been added for clarity.
26.	3.18.3	The minimum fresh air quantities shall not be less than 0.325 m3 / minute / person for all types of Cars.The air flow parameters shall be as per ASHRAE/EN 14750.	M/s Patentes Talgo SLU	In the same way as for airflow parameters EN 14750 has to be fulfilled, Is EN 14750 the applicable standard for all rest of comfort requirements (regulation, temperatures, air speed inside the car...)? EN 14750? Category A or Category B?	Clause 3.18.3 has been revised. It refers to air flow parameters only.

S. No.	Clause No.	Clause	Comments From Firms/Railways & PUs	Comments	RDSO's Remarks
27.	3.21.3	Additionally, at least one camera shall be placed in Driving Cab for gathering frontend view, track and OHE conditions etc. Cameras shall be placed on outer side of the Train for gathering rear view of the platform. One/two camera shall be installed on the roof of driving Car/power head towards pantograph to monitor the roof equipments.	M/s BT	<p>BT Clarification:</p> <p>One/two camera shall be installed on the roof of driving Car/power head towards pantograph to monitor the roof equipments.</p> <p>BT Proposal:</p> <p>The benefit of such camera is minimum and maintenance effort will be substantially high due to dirt/abrasion particles depositing on the camera lens. Further, it will not provide images during the night (except from sparks), unless special illumination of the pantograph is provided with additional cost and maintenance. Kindly delete this requirement.</p>	Not agreed to. No change in the specification is required.
28.	3.24.6	Design validation of wheels and axles shall be required to be carried out to validate the design. Latest versions of EN standards as mentioned in clause 3.23 should be used.	M/s ALSTOM	The clause referred (3.23) seems to be not applicable, Please Review & in case it is a typographical error Please update.	Corrected, Para modified.

S. No.	Clause No.	Clause	Comments From Firms/Railways & PUs	Comments	RDSO's Remarks
29.	3.27.1 /3.33.1	<p>Draw and Buffing Gear</p> <p>3.27.1 The Power Heads and driving end of Driving Cars shall be provided with AAR "H" type tight lock center buffer coupler with transition screw coupling. It shall conform to AAR specification No. M-211 with M-201 grade E steel. All couplers shall have crashworthiness features.</p> <p>3.33.1 The Car body shall be lightweight and corrosion resistant and rugged to withstand the tractive and braking effort as well as impact and accidental damage. The mechanical strength of car body shall conform to EN 12663 (Category P1) and the design of coach body shall be compatible in respect of crashworthiness with EN 15227 (Category C1) standard</p>	M/s BT	<p>BT Clarification:</p> <p>The Power Heads and driving end of Driving Cars shall be provided with AAR "H" type tight lock center buffer coupler with transition screw coupling. It shall conform to AAR specification No. M-211 with M-201 grade E steel. All couplers shall have crashworthiness features.</p> <p>The Car body shall be lightweight and corrosion resistant and rugged to withstand the tractive and braking effort as well as impact and accidental damage. The mechanical strength of car body shall conform to EN 12663 (Category P1) and the design of coach body shall be compatible in respect of crashworthiness with EN 15227 (Category C1) standard.</p> <p>BT Proposal:</p> <p>Usually the AAR couplers are fitted to carbodies with higher compression (and tension) resistance than defined by EN 12663. We request RDSO to kindly elaborate on this and provide clear guidance on how to apply EN standard in the present case such that the same is acceptable by RDSO.</p>	<p>At present carbody of IR mainline passenger coaches are designed for a compressive load of 2000KN and tensile force of 1500 KN , which is in line with the requirements laid down in specifications EN12663 & UIC 566. IR is providing AAR couplers in these coaches.</p> <p>At present AAR-H couplers with transition screw couplings with compressive strength of 2000 KN and tensile strength of 1000 KN are being used in IR mainline coaches with the maximum end force of 1600KN. AAR-H couplers have been envisaged on the power heads and driving cars only, for clearing the section in case of failure, as all other power heads on the Indian railways are compatible with the AAR-H couplers. Other cars may be provided with suitable design by concessionaire. AAR specification No. M-211 with M-201 pertain to coupler head. No change in specification is envisaged.</p>

S. No.	Clause No.	Clause	Comments From Firms/Railways & PUs	Comments	RDSO's Remarks
30.	3.32.1	The front windscreen shall be laminated and shall comply with EN15152.	M/s ALSTOM	Inline with WAG12B Design, We have grid in front of wind screen & we assure Compliance as per IS 2553 (Which is relevant standard for wind screen with grid), We suggest to add IS2553 as an alternative.	M/s Alstom has referred to the feature of existing WAG12B loco. The suggestions given by M/s Alstom can not be considered.
31.	3.33.1	The Car body shall be lightweight and corrosion resistant and rugged to withstand the tractive and braking effort as well as impact and accidental damage. The mechanical strength of car body shall conform to EN 12663 (Category P1) and the design of coach body shall be compatible in respect of crashworthiness with EN 15227 (Category C1) standard.	M/s ALSTOM	As per EN 12663 Category P-1 is for passenger coaches & Category "L" is for Locomotive & power Unit. Hence we suggest the Locomotive carbody mechanical strength criteria to be added.	This clause pertains to cars not power heads.
32.	3.33.2	The Car body shall be of an integral design, where under frame, sidewalls, end walls and roof shall be integrated so that the body structure contributes to strength of under frame and the unit as a whole behaves as a rigid tube in its ability to withstand loads. The body ends of the Car shall incorporate an anti-telescopic feature.	M/s ALSTOM	3.33.2 & 3.34.2 We Suggest Anti Telescopic feature should be applicable only for Passenger car not for Locomotive (Ref WAG12B).	This clause pertains to cars not power heads.
			M/s Patentes Talgo SLU	The body ends of the Car shall incorporate an anti-telescopic feature. How should this requirement be evaluated? Should it be understood that designing according to EN12663 the requirement is fulfilled?	The car body strength shall be as per EN12663. Any specific requirement regarding telescopic feature is not given in the specification EN12663. However, provision of crashworthy feature in car body as per EN15227 will take care the requirement of anti-telescopic feature. The requirement of the crashworthy features can be evaluated through crash simulations.

S. No.	Clause No.	Clause	Comments From Firms/Railways & PUs	Comments	RDSO's Remarks
					For clarity necessary changes have been made in chapter 4 & 5 of the schedule.
33.	3.33.3	The Car body may be of austenitic stainless steel or aluminum. Where dissimilar materials are used, measures shall be provided to mitigate corrosion in the body due to electrolytic action.	M/s ALSTOM	For Locomotive, We propose Carbon steel for the Carbody, in line with WAG 12B Locomotive.	M/s Alstom has referred to the feature of existing WAG12B loco. The suggestions given by M/s Alstom can not be considered.
			M/s Jindal Stainless Ltd.	Our recommendation is that this clause should be read as "car body shall be made of stainless steel.....". Currently all LHB coaches of Indian Railways are made of ferritic stainless steel (X2CrNi12 as per CK 201 specs). Only the metro coaches are made out of austenitic stainless steel. Hence, we feel that it should be left to the manufacturers to decide on the right grade of stainless steel to be used for the private trains.	Accepted. Clause modified accordingly.
34.	3.27.1 3.34.2	Draw and Buffing Gear The Power Heads and driving end of Driving Cars shall be provided with AAR "H" type tight lock center buffer coupler with transition screw coupling. It shall conform to AAR specification No. M-211 with M-201 grade E steel. All couplers shall have crashworthiness features The Car structure and its supplemental energy absorption devices shall be designed to minimize accelerations transmitted to Users, by absorbing collision energy, whilst not permitting one vehicle to over-ride another, nor to telescope one into another. A suitable proven energy absorption feature with associated collapse and	M/s ALSTOM	1. We Suggest the Compression Load Requirement for the design of Locomotive Coupler should be as per category "L" EN12663. 2. AAR "H" type tight lock center buffer coupler (head, shank & yoke) as per specification No. AAR Specification No.M-211 and M201 Grade "E" steel, cannot be Provided with the Collapsible feature, since geometry & design shall be governed by AAR specification. However collapsible feature can be provided with an Alternate Proposed design, where only the head profile will be as per AAR specification. The rigid center tube section	Crashworthy features are to be provided in the draft gear which will work only when a force much more than the working force of draft gear comes across. A collapsible feature with an alternate design can also be accepted. AAR specification No. M-211 with M-201 pertain to coupler head.

S. No.	Clause No.	Clause	Comments From Firms/Railways & PUs	Comments	RDSO's Remarks
		anti- climbing features shall be incorporated into the coupler.		shank & integrated draft gear with collapsible feature will not respect AAR standard.	
			M/s Patentes Talgo SLU	The Car structure and its supplemental energy absorption devices shall be designed to minimize accelerations transmitted to Users, by absorbing collision energy, whilst not permitting one vehicle to over-ride another, nor to telescope one into another. A suitable proven energy absorption feature with associated collapse and anti- climbing features shall be incorporated into the coupler. Shouldn't the anticlimber features be incorporated in the lateral buffers instead of the coupler? The lateral stops usually have anti-climbers, but not the coupler	Couplers can also be designed to provide anti-climbing features. However, lateral buffers with anti-climbing features can also be accepted. Change has been made in the schedule accordingly.
35.	3.37.1	A location shall be provided on the roof of the Car where emergency services may cut through to gain access to the interior of a Car that has rolled on to its side. This space shall be clearly labeled to enable emergency services to immediately identify the appropriate space and cut lines. The location shall be adequate to enable a stretcher born patient to be removed from the Car. The region to be cut shall be devoid of any cables/ pipes or miscellaneous equipment that may impede access.	M/s Patentes Talgo SLU	We suggest to modify as follows: "A location shall be provided on the roof of the Car where emergency services may cut through to gain access to the interior of a Car that has rolled on to its side. This space shall be clearly labelled to enable emergency services to immediately identify the appropriate space and cut lines. The location shall be adequate to enable a stretcher born patient to be removed from the Car. The region to be cut shall be devoid of any cables/ pipes or miscellaneous equipment that may impede access -shall be easy to cut"	Accepted. Clause has been modified.
36.	3.39.1	Seats/Berths shall meet the requirements of UIC 566 or equivalent standard. Seats shall be ergonomically designed to accommodate range Users from 5th percentile of Indian female and 95th percentile of Indian adult male. The seating arrangement inside the Car shall be planned ensuring the following:	M/s Patentes Talgo SLU	Interior distribution of daily and night composition shall fulfil UIC 565-1, UIC 565-3 and UIC 567? i) Shall be fulfil the parameter K according UIC 567? Or from where have to be measured the space for legs?	This clause has been modified.

S. No.	Clause No.	Clause	Comments From Firms/Railways & PUs	Comments	RDSO's Remarks
		<p>i) In executive chair car, the leg space and aisle are at least 450 mm and 640 mm respectively.</p> <p>ii) In chair car, the leg space and aisle are at least 327 mm and 556 mm respectively.</p> <p>iii) The Middle and Upper berths of sleeper cars shall have arrangement which shall provide resistance to passenger movement longitudinally along the vehicle during acceleration and braking etc.</p> <p>iv) The head room between the berths in sleeper cars shall be adequate for Users.</p>		<p>ii) Shall be fullfil the parameter K according UIC 567? Or from where have to be measured the space for legs?</p>	
37.	3.41.2	Each Car shall have minimum 04 (four) electrically/pneumatically powered, plug type doors, 02 (two) on each side. The free passing through height of open door shall be 1900 mm minimum and the minimum door width shall be 1400 mm. Minimum door opening shall be 800 mm	M/s Patentes Talgo SLU	<p>This requirement shall not be applicable if the length of the car is lower than the maximum value defined in the technical specification. In fact, we suggest to define this parameter depending on the door/passenger ratio. 2 doors per each 55 passengers shall be applicable</p> <p>There are defined two widths for the door, Which must be the minimum width of the door?</p>	Accepted. Para has been modified.
38.	3.42.5	Air brake system comprising MR & BP shall run from end to end of the Train with two isolating cocks at either end terminating outside. There shall also be a provision of additional isolating cock on both pipes at either-r end, located below each buffer beam of the Train. Locomotives on Indian Railways have pressure settings of 5±0.1Kg/cm ² for BP 8.5±0.1Kg/cm ² to 10±0.1Kg/cm ² for MR. In case of loco hauled trains, air brake system may also comprise of BP & FP running through out all the coaches. On IR, Feed Pipe (FP) Pressure = 6.0 ±0.1Kg/cm ²	M/s BT	<p>BT Clarification:</p> <p>In case of loco hauled trains, air brake system may also comprise of BP & FP running through out all the coaches. On IR, Feed Pipe (FP) Pressure = 6.0 ±0.1Kg/cm²</p> <p>BT Proposal:</p> <p>Please elaborate on this. What means "may comprise"? Is FP needed or not? Which is the specific purpose of FP resp. MR? Is MR pipe required from locomotive or not if FP is installed?</p>	Para has been modified.

S. No.	Clause No.	Clause	Comments From Firms/Railways & PUs	Comments	RDSO's Remarks
39.	3.42.7.4	In the event of a failure of the regenerative brake, the friction brake shall be capable of carrying out three consecutive emergency brake applications from maximum speed to standstill of a rake in loaded condition. The rake shall be deemed to then accelerate at its maximum rate up to maximum speed after each stop.	M/s Patentes Talgo SLU	We suggest to change the clause as follows: In the event of a failure of the dynamic brake, the friction brake shall be capable of carrying out three two consecutive emergency brake applications from maximum speed to standstill of a rake in loaded condition. The rake shall be deemed to then accelerate at its maximum rate up to maximum speed after each stop.	Accepted & change made in the clause accordingly.
40.	3.42.7.5	The Cars shall be provided with disc brakes in accordance with EN 14535-1 & EN 14535-2 respectively	M/s Patentes Talgo SLU	We request to allow wheel mounted discs in trailer cars	Already EN 14535-2 (Brake Disc mounted on to the wheel, dimension and quality requirements) has been indicated in the clause. For clarity Para 3.42.7.5 is to be modified.
41.	3.42.8.4	Electric regenerative brake fadeout shall not occur above 5 kmph. After the speed is reduced to a very low level, holding brakes shall be applied to prevent the Train from rolling backwards at station stops and gradient.	M/s ALSTOM	Referring WAG12 Locomotive (power head type) with conventional brakes no automatic HB application at train stop. After a certain low speed (10-7 kmph) when ED brakes are not able to provide any braking effort, the driver has to apply friction brakes manually to stop the loco, Hence We suggest to exempt "Holding brake" requirement for loco hauled Train (power head type).	M/s Alstom has referred to the feature which is present in the existing loco WAG12. Hence, the suggestion given by M/s Alstom can not be considered.
42.	3.42.11	Brake Operating Timing 3.42.11.1 The following maximum brake operating timing shall be achieved on all Cars of a Train. The maximum time for a brake application from full application to 90% of full Brake Cylinder Pressure (BCP) and for brake release from full Brake Cylinder pressure to 10% shall not exceed the following: (i) Service Brake Application: 2.0 seconds (ii) Emergency Brake Application: 1.5 seconds (max.) (iii) Service and Emergency Brake Release: 2.5 seconds	M/s ALSTOM	The Brake Timings provided in clause 3.42.11.1, are more applicable with EP Brake system. Reference to clause 3.42.5, For Loco hauled Train with conventional brakes system (BP control) We Suggest to add alternate timing in line with UIC 547 as per Passenger mode "BC filling timing between 3 to 6 secs and BC Release timing between 15 to 20 secs".	Accepted, Para 3.42.11.1 has been modified as below:

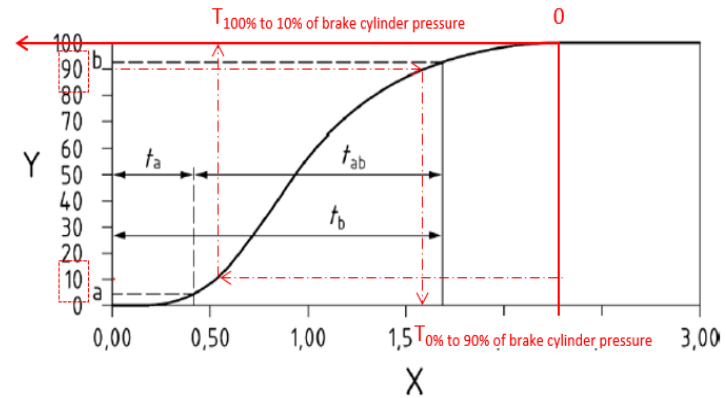
S. No.	Clause No.	Clause	Comments From Firms/Railways & PUs	Comments	RDSO's Remarks
		3.42.11.2 A malfunction of the EP friction brake affecting the braking rate or safety shall result in an emergency brake application. In case of single point failure, brake compensation shall take place to account			

for failure of brake on one bogie. This shall be achieved with minimal intervention of the Train operator.

M/s Patentes Talgo SLU

(i) It must be clarified if the requirement 3.42.11.1 related to brake Operating Timing is well written, since it seems to refer to the times defined in the standard EN 14531-1 as system response times. Please confirm . the Graph to help the understanding of the brake requirement is presented in next cell for RDSO's reference .

Response



(ii) The Timing for a brake application indicated in this requirement does not correspond to the current response times of an UIC-Type pneumatic brake.

The defined Timing requirement is more focused for commuter type trains, that is means, trains designed to run urban and suburban routes.; That kind of trains accelerates and braking continuously, the time between stops is very low.

For the long distance Trains that are being required for the PTO in which there are less number of stops and greater distances between stations, the adequate type of brake should be based on UIC brake Types, according to UIC 14198 y UIC 544-1.

Then we propose the following change in order to align the requirement with the UIC brake achievable performance:

As per scope of EN 14198 page 5

“ This standard defines the basic requirements for the braking of trains pulled by locomotive, including the requirements of their vehicles, running on European networks and their infrastructure systems”

Thus the comments of M/s Talgo to refer EN14198 is not acceptable.

				<p>"The following maximum brake operating timing shall be achieved on all Cars of a Train. The maximum time for a brake application from 0% of Brake Cylinder Pressure to 95% of full Brake Cylinder Pressure (BCP), called built up time, and the time for reducing the full BCP, starting from the beginning of the pressure drop down to 0,4 bar, called as release time, shall be according to the values defined passenger cars in Table A.1 of Annex A of EN 14198".</p>	
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S. No.	Clause No.	Clause	Comments From Firms/Railways & PUs	Comments	RDSO's Remarks
43.	3.45	<p>Energy Metering System</p> <p>The Train shall have an Energy Metering System which shall record energy separately for traction and regeneration. The Energy Metering System shall comply with EN 50463-1:2017 Railway applications- Energy measurement on board trains.</p>	M/s BT	<p>BT Clarification:</p> <p>The Energy Metering System shall comply with EN 50463</p> <p>BT Proposal:</p> <p>Will metering system be needed for energy billing, or only for information? In the second case we recommend cost effective consumption calculation by vehicle control without any additional hardware. Kindly clarify.</p>	<p>The concerned clause is related to the energy metering at train level. However, energy billing is to be governed as per the commercial conditions.</p> <p>Hence, no change is in the specification is envisaged.</p>
44.	4.3.1.5	<p>Bogie including brake rigging and suspension: The Design shall include (a) traction motor mounting arrangement if any; (b) unsprung mass; (c) primary and secondary suspension; (d) bolster arrangement; (e) axle floating arrangement; (f) strength of bogie frame and major bogie components under static and dynamic loading conditions; (g) Vogel's layout for 10° curve and 1 in 8½ turnout for negotiability of bogie; (h) throw over at head stock coupler; (i) movement of bogie parts with clearances; (j) estimation of flange forces on curves and turn outs; (k) kinematic profile of coaches (l) design validation of components of bogie as per specification & applicable standard</p>	M/s Patentes Talgo SLU	<p>Regarding (c) apart from the requirement 4.3.1.5, although this requirement is included in the section 4 related to documentation to be supply. Please clarify.</p> <p>Talgo would like to clarify that the "Talgo Rodal"/WheelSets is not provided of Primary Suspension and therefore Talgo requests for a more general text for this requirement . Please confirm.</p> <p>Regarding point (g) apart related to Vogel's layout. Talgo requests to send us information about Vogel's Diagram that is followed in this case. Requests you to send an example to understand how it must be carried out . Please provide</p>	<p>It is understood that concessionaire will submit only applicable design/drawing of it's cars/power head .</p> <p>Curve negotiability is to be established.</p> <p>This para has been modified for more clarity.</p>
45.	4.3.1.9	<p>Vehicle Dynamics Simulation</p> <p>Concessionaire shall conduct vehicle dynamic simulations on the bogies and the results thereof shall conform to the performance requirements stipulated in the Specifications and Standards.</p> <p>(i) All the parameters and values used in simulations shall be provided to enable Vehicle</p>	M/s ALSTOM	<ul style="list-style-type: none"> As per contract, the reference for railway dynamic validation is EN 14363. Criteria will be followed as per this standard. The track quality of the reference line section to be considered for oscillation trial need to be clarified. 	<p>Para 4.3.1.9 & Para 5.2 of Annexure I have been modified & Annexure VI has been added for more clarity.</p>

S. No.	Clause No.	Clause	Comments From Firms/Railways & PUs	Comments	RDSO's Remarks
		<p>Modelling on NUCARS / ADAMS RAIL or SIMPACK including CG of coach & bogie frame, mass moment of inertia(x,y,z), balancing of mass of the coach and coefficient of damping both lateral and vertical directions etc.</p> <p>(ii) Parameters as per adopted EN 14363 for first stage & dynamic performance assessment by simplified as well as normal method & other tests shall be evaluated including Mean Ride Comfort by Standard Method as per EN 12299, Bogie rotational resistance, wheel offloading on twisted track, safety & performance on twisted track, Wheel wear index, Bogie rotation, Curving capability and any tendency to hunt, Natural frequency of the suspension etc.</p>			
46. Annexure-I					
47.	5.2	Oscillation trials & Ride comfort (See Draft Specification)	M/s ALSTOM	1. All the Validation & qualification shall be performed for Locomotive standalone and Coaches standalone separately? 2. We understand the Mean ride comfort criteria means Nmv criteria <3.5 as per EN12299 for Locomotive. Please Confirm.	For powerhead/loco hauled trains, understanding seems correct. Understanding seems correct.
		Type tests - Oscillation trials (See Draft Specification)		As Locomotive doesn't have Air Suspension, so no fault mode shall be considered for type test- Oscillation Trial for Locomotive.	Ok. It shall depend on suspension.
48.	5.3.13.4	Bogie Suspension Elements (Air spring)	M/s ALSTOM	For Locomotive Bogie Suspension component coil spring to be added.	Coil springs already covered in 5.3.1 of Annexure I. Para has been modified for clarity.

S. No.	Clause No.	Clause	Comments From Firms/Railways & PUs	Comments	RDSO's Remarks
49.	-----	-----	M/s BHEL	As desired we have gone through the draft specification clause by clause and would like to submit that we envisaged no alteration in specification except one suggestion that documentation/ correspondence should be in the form of soft media to avoid use of papers. Therefore one clause/point may please be added in specification to use electronic media for documentation	It shall be considered during receiving designs & drawings as per feasibility.

Note: Some other paras of the schedule have also been modified as a result of internal review of paras of the schedule by RDSO.