Reasoned Document based on comments received on Final Draft Specification for Indigenous Wheel Impact Load Detector System (Specification No. RDSO-SPN-RE-WILD-2023 (Ver.0))

Clause No.	Description	Firm's Comments	RDSO Remarks
1.0	**Introduction**		
1.1	Railway Board vide letter No.:2017/Dev.Cell/IGRI/8, Dated: 4.01.2023 advised RDSO to float an Expression of Interest (EOI) for the development of indigenous sources of WILD equipment to expedite future proliferation. At present WILD Systems are being procured as a bundled wayside system conforming to COFMOW Specification No. COFMOW/IR/WILD/2013		
1.2	The Wheel Impact Load Detector (WILD) is a wayside detection system which is used to identify the wheels with potential tread defects such as flat spots, built-up treads, Shelled tread as well as defects in suspension (springs, shock absorbers etc.) that result in high impact loads, causing damage to the vehicle and bogie components, and to the track structure		
1.3	WILD Systems were deployed for the first time over Indian Railways following research association with IIT Kanpur using Strain gauge based technology. It is worthwhile to mention that presently various WILD systems based on different technologies like strain gauges, accelerometers and Fibre Bragg grating etched on Fibre optic cables are installed over Indian Railway network in various stages of technological maturity. Additionally other technologies using Rayleigh back scattering and load cells have shown promising results.		
1.4	The purpose of this specification is to spell out the functional and technical requirements of an indigenously developed and manufactured Wheel Impact Load Detector (WILD) system for deployment on Indian Railways using one or more competing technologies. The technical and operational aspects related with Site Selection for installing the equipment, System Operating Parameters, Detector technologies in use, Data Communication, System thresholds, existing Protocol on Indian Railways to handle rolling stock generating high impact loads, calibration and maintenance requirements etc. are also covered in this specification for guidance of the system manufacturers / suppliers.		
2.0	**Scope of supply**		
2.1	The indigenous WILD system shall be supplied on turnkey basis. The system shall include all equipment by the side of the track, camera based automatic vehicle identification module, RFID Reader capable of reading RFID tags as per CRIS specification No. 2016/CRIS/NDLS-ITPI/WS-C/POLICY/RFID/0101/PT-1 dated 05.10.2018 or latest may be referred., electric cables, access to server computer, website, client computer/laptop, audio-visual alarm display, modem, SMS delivery system, software for the track-side equipment and software for the central server and any other element necessary for optimal functioning, reporting of alarm and recording of feedback of the system. The scope shall include supply of:	**WCR:** RFID Reader should be capable to decode uniform rolling stock number. The output data of OMRS RFID of wagon stock consist of - Type of rolling stock, Railway and wagon no. in 4 digit of numeric. Data used by CRIS in FMM is 11 digit only. This will create problem in integration with the FMM system.	**WCR:** Presently RFID readers are not installed/integrated with OMRS system. The comment is vague. No change required.
2.1.1	WILD site equipment		Clause redrafted as under: *"2.1.1 WILD site equipment with concomitant accessories and services (inferred items)* *2.1.2 Spares* *2.1.3 Literature* *2.1.4 Material, as required for civil engineering work* *2.1.5 Site safety apparatus, tool kit and accessories required for maintenance and periodic calibration.* *2.1.6 Software including Information Technology equipment and for analysis and Integration with IR system.* *2.1.7 CICD (Continuous integration and continuous deployment) including software upgrade as may be required.* *2.1.8 Apart from the details mentioned in this documents, any other accessory/component/system(s) essentially required for proper functionality of the WILD equipment, will fall under the scope of supply of the tenderer."*
2.1.2	Concomitant accessories		
2.1.3	Spares		
2.1.4	Maintenance tool kit with periodic calibration accessories		
2.1.5	Literature		
2.1.6	Material, as required for civil engineering work		
2.1.7	Power cables, as suitable to the trackside equipment		
2.1.8	Modem, as suitable to the trackside equipment		
2.1.9	Site safety apparatus and tools & plants required for functioning calibration and maintenance.		
2.1.10	Apart from the details mentioned in this documents, any other accessory/component/system(s) essentially required for proper functionality of the WILD equipment, will fall under the scope of supply of the tenderer.		
2.2	Installation at site: Installation of the system would be done by and under the supervision/direction of firm's Engineers. It shall include the following		
2.2.1	Civil engineering and other allied works (if required) such as construction of hut of suitable size to house UPS, batteries, electronic and electrical equipment, power system etc.; grouting supports for steel enclosures/equipment, control box, battery box etc., necessary work e.g. trench etc. for power cables.		
2.2.2	**Electrical engineering:** AC power 230V, 50 +/-3Hz. shall be made available at main power distribution box by consignee. From this point the tenderer shall bring power supply to the site of installation by laying suitable power cable. The maximum load on the power supply system should not exceed one (1) KVA.	**Wabtec:** The clause limits Indian Railway's (IR) scope of power supply to a wayside site to 1kVA. For an adequately efficient system, 1kVA ≈ 1kW. A wayside equipment hut will house WILD system-related equipment (for data analysis and processing), power and networking equipment (switches, modem/ antenna) and UPS (including charger and batteries). Further, PVIS-related illuminators require power. In addition, the hut will be electrically fitted with an air-conditioner, general lighting, and GPOs. To power the aforementioned equipment, 1kVA load from IR is significantly inadequate. IR must provide reliable, stable, and uninterruptible power supply through an Auxiliary Transformer of at least: • 6.1 kW (approximately 27A at 230V AC, 50 ± 3Hz) for a single-track site. • 7.5 kW. (approximately 33A at 230V AC, 50 ± 3Hz) for a double-track site. **WCR:** As per Railway Board letter no. 2020/EEM/250/2/Pt. dt. 13.04.2023 ain "Provision of AT power supply for all sites of OMRS system" to be made. Similar policy may be followed for the indigenous WILD systems. And/Or 2 KVA solar power plant may be installed on the roof on WILD hut with 16 hrs battery backup.	**M/s. Wabtec:** During meeting with stakeholders, ZRs and CRIS (including WabTec) on dated 24th May 2023, it was agreed to increase the maximum load on the power supply system upto two (2) KVA. A provision for AT cannot be assured as requested by M/s WabTec. The maximum Load power is raised to 5 kVA to accomodate all prospective suppliers. Individual Systems cannot be commented upon. Firms are expected to optimise power consumption. **WCR:** OMRS system has WILD/WCM and RailBAM both. Therefore, it requires more power. Considering the power required for WILD systems installed on IR and suggestions recieved from stakeholder during meeting with industry partners, ZRs and CRIS, the maximum power requirement has been reviewed and relaxed upto 5 KVA. Wherever reliably available, state power supply may be used with AT Power as stand by. Clause modified accordingly as under: *"AC power 230V, 50 +/-3Hz. shall be made available at main power distribution box by consignee. From this point the tenderer shall bring power supply to the site of installation by laying suitable power cable. The maximum load on the power supply system should not exceed five (5) KVA"*
2.2.3	Provision of mobile connection and internet connection for transfer of data and display of reports and audio-visual alarms from site of installation to centralized location as finalized by consignee. The recurring expenditure on mobile connectivity during warranty from the date of commissioning shall be borne by the supplier during the warranty period. Subsequent expenditure shall be borne as a part of AMC by Indian Railways for which the necessary arrangements have to be done in advance by consignee.		
2.3	**Web-server:** The supplier shall launch and maintain an internet web-server at any location (in India) with following features:		
2.3.1	Multiple User password protected log-in		

2.3.2	Differential access and usage rights to multiple level of users e.g. write-only, read-only query design and administrator rights.			
2.3.3	Facility to export data in MS-Excel, CSV (Comma Separated Value) format at present but other formats may be accepted later by consignee if found suitable and on demand software based transfer of data to other railway applications. All the transfer must be over secured network and electronic transfer must be authenticated and shall be properly logged for audit and tracking. Firms shall also provide ICD (Interface control document) for system database.		**NWR:** Integration of all the WILDs on a single platform and sharing with consignee. Also sharing the data with CRIS for integration with FMM & CMM.	**NWR:** Integraion with 3rd party system so that the data can be exchanged with FMM, CMM, SLAM other Railway's applications is already included under clause 3.0 technical requirement (para 22, 23)
2.3.4	The supplier shall offer at least two designs for web-user interface for selection			
2.3.5	The web server shall have adequate capacity to handle data traffic with fast data transfer rate for all authorized users who shall access through public internet			
3.0	**Technical Requirements**			
	The system should conform to following technical/operational requirements.			
S.N	**Technical/Operational parameters**	**Requirements**		
1	Operating speed	20 - 200 Kmph		Clause modified as *" Operating speed - 30 - 160 Kmph"*
2	Train length	upto 1000 Axles		
3	Train headway	3 minutes between trains having upto 1000 axles each.		
4	Degree of protection for electronics	IP 66		
	(embedded microprocessor system)			
5	Degree of protection for trackside/rail mounted sensors housed in enclosure, Wheel detector (trigger) sensors	IP 67	**Wabtec:** Degree of protection for trackside/ rail mounted sensors housed in enclosure, Wheel detector (trigger) sensors: • Based on environmental conditions in India, IP 66 rated track-mounted sensors are operationally adequate. • Track-structures are elevated from nominal ground level to avoid flooding. Further, wayside sites are selected such that they are not prone to flooding. • We, therefore, suggest the track-mounted sensors be adequately rated to IP 66.	**Wabtec:** Higher protection is desirable. It has been observed that tracks were submerged in water at some places due to heavy rain. Therefore, track mounted sensors are required to be IP 67 protected. Also, most of the stakeholders were agreed with IP67 rating for trackside/rail mounted sensors enclousers during joint meeting on 24.5.23. Therefore, no change required.
6	Degree of protection for optics	IP 66		
7	Ambient temperature range	(-) 10^0 to 55^0 Celsius		
8	Rail temperature range	(-) 20^0 to 65^0 Celsius		RailTemperature range modified as *"(-) 20℃ to 70℃"*
9	Relative humidity	upto 100%		
10	Track Structure	Rail Section and profile: 52kg/60kg (UIC 60 or 60 E1) as per Para 203 of IRPWM, June 2020.		
		Rail Grade: 880/ R260/ R350		
		PSC Sleeper with 600mm spacing		
		Ballast Cushion Depth: 200mm to 350mm		
		Typical track structure and track geometry shall be as per IRPWM- June 2020 (amended from time to time)		
		1. Inter Sleeper Spacing: 600 mm for ballasted Deck.		
		2. Ballastless track structure: As per guidelines issued vide RDSO letter No. CT/EF/BLT-IFS dated: 04.01.2019.		
11	Operating Parameters	Type of Operation: All types of rolling stock being used in Indian Railways. Freight, Passenger (Mixed Traffic)		
		Range of Wheel Diameter: 710 mm to 1250 mm		
		Wheel Coverage - 100%	**Voestalpine:** Physical length of the sensor field in the track is longer than the circumference of the wheel. Our Sensors cover 6-8 m of track. Each sensor has a sensitivity of more than 3m, therefore full measurement range is 12+ meters of track length. Considering train wheel circumference, it would therefore be visible for ~ 3 times while passing the site. We can show raw data analysis showing that sensors have a wide measurement range and can be proven / demonstrated in the field by letting a train with a specific wheel defect run over the measurement site and showing the impact multiple times confirming a wheel coverage of 100% in the Raw data analysis software used internally by our Engineering.	**Voestalpine:** Individual Systems cannot be commented upon. 100 % wheel coverage shall be demonstrated during FAT/proving out at site. Firms may provide FAT/ Prove out Scheme to demonstrate as claimed here for scrutiny along with the offer.
12	Resolution	50 Kgf or better and should also be able to detect minimum 5 mm defect either flat or spall	**Wabtec:** The requirement for resolution should be clarified. In addition to the length of a wheel defect (spall/ flat), its depth and characteristics of its edges are critical parameters that determine magnitude of impact force (load). For example, a 5mm flat with sharp edges compared to a 5mm flat with worn/ rounded/ smooth edges travelling at the same speed could generate a relatively higher magnitude of the impact force. • Further, the impact force also depends on train speed and wheel load. As such, the specified resolution cannot be linked to the minimum defect size. • The resolution requirement should therefore be removed. **Voestalpine:** Since there is no direct relationship between dimension of a wheel flat and the actual force it produces. We will be able to measure impact forces on various sizes depending on shape and position of the wheel defect and alarm on any harmful forces. Thus we request you to kindly keep only the impact load of 50 Kgf in the resolution specs and remove the size of the defect. We should be able to prove or demonstrate the same in the Data output following any train measurement that can be displayed in a resolution less than 0.49 kN [50 Kgf] on the User Interface of the software.	**Wabtec, Voestalpine:** Considering the remarks and discussion held with stakeholders on 24.05.2023, the clause has been modified as under: *"Resolution: 0.05 ton or better "*
13	Impact load calibration	The system reported impact load should be within ± 4% of test load reported by a calibrated device.	**Voestalpine:** We can prove this by running a Test train with a defined weight over the site with a sufficient quality of track (e.g. proper tamped track) after fully calibrating the system. We can provide Site Assessment Requirements and other technical parameters with our proposal. Request you to also consider Test Train as Test Load for the purpose. We would also be happy to provide a document from other installations where we compare measurement from our system to a weighing bridge to show the customer that we fulfill this requirement.	**Voestalpine:** The purpose of the installation is not to faithfully measure the weight of the wagon but to measure impact Load under dynamic condition. Unless the firms can provide a relaible prove out method of IMPACT load, the system cannot be eccepted on heresay. Detailed calibration for Impact Load Testing may be provided for scrutiny. Clause modified as under: *"The system reported impact load should be within ± 5% of test load reported by a calibrated device."*
14	Impact Load	Upto 60 Tonne		

	measurement capability	*(To be demonstrated on non-working rail at lab level or at the time of commissioning. Necessary arrangement for demonstration shall be borne by supplier)*	**Wabtec:** Impact load measurement capability at a laboratory/ factory level is not feasible due to safety reasons besides that rail structure in the factory are not representative of an actual track. The capability can be demonstrated to the standard industry practice of up to 20 tonnes at the time of prove-out tests at a site. Please refer to our comments against Clause 9.3.2 **Voestalpine:** As you would notice from the measurement principle and calibration principle document; the principle of our calibration is based on moving vehicles on a live track. Here, our system can continuously compensate for the site specific conditions, such as: track stability, rail stiffness, temperature, etc. Therefore, our measurement system also compensates for changes in track and/or weather during the operation of the system and that makes it highly reliable. Therefore, we cannot install a system on a non-live track in a simulated or lab environment and test this with a 60 ton load. We can prove in the field that we can measure the highest wheel impact load possible in day to day operations. Request you to kindly remove this requirement of proving this in the Factory / Lab environment.	Wabtec: Considering the remarks and discussion held with stakeholders on 24.05.2023, the clause has been modified as under: *" The impact measurement capability shall be demonstrated for different impact loads upto 30 tonne at site."*
15	Detection Technology	Strain gauges / Accelerometers / Optical Fibre Sensors / Load Cells etc.		
16	System Thresholds	User Settable (Multiple Alerts- Maintenance Alert & Critical Alert)		
17	System Activation	The system should be capable of automatic detection of approaching train along-with identification of type of rolling stock (Locomotives, Wagons, ICF or LHB Coach, BV etc), automatic switching-on/off of relevant sensors, automatic measurement of Maximum impact load, Average dynamic load, Impact Load factor (ILF) etc. as specified in the specification while the train is in motion, automatic transmission of data, audio-visual alarms and reports and automatic switching off of relevant sensors to conserve electrical power.	**Wabtec:** In the absence of RFID tags equipped to the vehicles, identification of vehicle type is possible only through inter-axle spacing. Should the inter-axle spacing between different vehicle types is not unique, the required identification will not be possible. IR should provide details and drawings showing inter-axle spacing for all rolling stock. For the vehicles fitted with RFID tags, the required vehicle type identification will only be possible if the tags are programmed to contain the vehicle type information.	**Wabtec:** WILD Systems working on IR are already identifying the type of rolling stock (Locomotives, Wagons, ICF or LHB Coach, BV etc). Bogie wheel base and inter axle spacing will be provided to successfull bidder. No vehicle type identification is required. Unique vehicle ID as reported in the tag may be provided in the database.
18	Vehicle Identification	RFID Reader should be installed and integrated with the proposed indigenous WILD system. These RFID readers should be capable of reading the RFID Tags tagged on IRs rolling stocks.		
		For details of RFID tags, CRIS specification no. 2016/CRIS/NDLS-ITPI/WS-C/POLICY/RFID/0101 /PT-1 dated 05.10.2018 or latest may be referred.		
		OCR (Optical character recognition) photo tag/ camera based automatic vehicle identification module should be installed and integrated for automatic Vehicle Identification/ individual vehicle IDs. This system will be withdrawn after 100% proliferation of RFID tags in due course on IR.		
19	Calibration	The system should be calibrated as recommended by OEM. Details of calibration methodology shall be submitted along-with the offer. The system should be calibrated by the supplier every month or earlier if requested by consignee. All calibration activities should get logged in the data base or dash board.	**Wabtec:** Our system runs health checks for each sensor after train pass-by and prior to data analysis. As a result of the health assessment, data from only healthy sensors are used for reporting; thereby, preventing deviating sensors from reporting. Therefore, the requirement to calibrate the system every month or earlier is not necessary. As the calibration will require IR to provide a test train of known wagons and run at a few representative operational speeds, the requirement is onerous for both parties, with no significant gains. Monthly calibration visits to the sites will unnecessarily increase operational costs. Further, the requirement calls for the calibration as recommended by an OEM. Therefore, we, as the OEM,recommend annual calibration schedule **Voestalpine:** Per our discussion during the meeting, Please allow Auto-Calibration and Auto Logging of the last Calibration per sensor as our system is designed to Auto-Calibrate with Train passes and also compensate for site specific conditions.	**Wabtec, Voestalpine:** Based on discussion held in RDSO on 24.05.2023 with stake holders the clause has been modified as under: *"Calibration : The system should be calibrated as recommended by OEM after being agreed by IR.* *The Details of calibration methodology shall be submitted along-with the offer. The system should be calibrated by the supplier half yearly or earlier if requested by consignee.* *All calibration activities should get logged in the data base or dash board."* **Voestelpine:** Autocallibration is acceptable provided a certificate traceable to Standard Calibration device can be issued and logged to demonstrate acceptability of the results.
20	Maintenance	Minimum two times per year or earlier if requested by consignee.	**NWR :** The periodicity of maintenance should be Quarterly.	
21	Self-diagnostics	System should be equipped with Self-diagnostic feature capable of routinely checking the operating condition / heath of individual components of the WILD system and automatically detect and report sensor failures, including on-site processing and back office system failures.	**NWR :** Self-diagnostics feature should be available and access to be given to consignee.	**NWR:** Reports of heath of individual components and sensor failures, including on-site processing and back office system failures will be available on user dashboard and may be accessed through authorised users. For better clarity caluse modified as under: *"System should be equipped with Self-diagnostic feature capable of routinely checking the operating condition / heath of individual components of the WILD system and automatically detect and report sensor failures, including on-site processing and back office system failures. All activities should get logged in the data base and displayed on dash board."*
22	Integration	The system should be equipped with robust, networked, alert-management software with full suite of graphical analysis and diagnostic tools. Full TCP/IP support should be inbuilt into the system to facilitate smooth integration into all existing railway data networks. Necessary communication protocols and details required for integration (including third party interfacing) should be provided by the WILD system manufacturer to Indian Railways. Purpose of this communication protocol is to ensure that the data generated by the system can be exchanged with other Railway's applications (Existing/upcoming). System shall be capable of communicating over https protocol with external application. System must support multiple data formats such as JSON, XML, CSV, flat file etc. for information exchange. System shall be capable of handling security requirements of the communication.	**Wabtec:** As we understand that the requirement calls for forward integration of WILD data with IR applications, the description "(including third party interfacing)" is contradictory. It should therefore be removed. • The scope of integration including details of IR applications should be clearly defined. . As an example, clarifying if the integration involves exporting only the alerts-related data to the IR applications. o From the requirement at S.N. 23 Interface Control Document (ICD), we understand that the IR applications refer to maintenance platforms like CMM/ FMM/ SLAM. IR should specify details of these and unknown upcoming applications.	**M/s. Wabtec:** Agreed The clause is in line with remarks received from CRIS. Further, it is clarified that the forward intregation of WILD data necessary for railway applications like CMM/FMM/SLAM at present. Clause redrafted as under: *"The system should be equipped with robust, networked, alert-management software with full suite of graphical analysis and diagnostic tools. Full TCP/IP support should be inbuilt into the system to facilitate smooth integration into all existing railway data networks. Necessary communication protocols and details required for integration (including third party interfacing) should be provided by the WILD system manufacturer to Indian Railways. Purpose of this communication protocol is to ensure that the data generated by the system can be exchanged with other Railway's applications (Existing/upcoming). System shall be capable of communicating over https protocol with external application. System shall support JSON (JavaScript Object Notation) format for information exchange. Also it shall support multiple integration points at the same time. System shall be capable of handling security requirements of the communication including encryption. "*

23	Interface Control Documents (ICD)	The system should have capability to integrate with 3rd party system for which Interface control document (ICD) will be provided by Indian Railways. Firm will supply the ICD for the WILD System to the Indian railways and the same will be shared with suppliers.	**Wabtec:** As we understand, one part of the requirement is to integrate WILD data with another supplier of the WILD system. The scope of integration should be clearly defined. For the other part of the requirement that corresponds to forward integration of WILD data with IR applications, please refer to our comments above against S.N. 22 Integration. **WCR:** Interface must mandatorily be made with Indian Railway's maintenance platforms like CMM/FMM/SLAM/WISE for record.	**M/s. Wabtec**: No clarification is required. Clause is redrafted and self explanatory. Purpose of this communication protocol is to ensure that the data generated by the system can be exchanged with other Railway's applications (Existing/upcoming). System shall be capable of communicating over https protocol with external application. System must support JSON data format for information exchange. **WCR:** Integration with railway maintenance platforms like CMM, FMM, SLAM already defined in the clause. Clause modified as under: *"Interface Control Documents (ICD) shall be shared by CRIS at the time of integration with vendors and Indian Railway."*
		Interface must mandatorily be made with Indian Railway's maintenance platforms like CMM/FMM/SLAM for record and for cross verification of Rake Marshalling order with the PVIS/RFID data with the Brake Power Certificate.	**NWR :** As there is limitation in OMRS, OMRS is not able to communicate the exact axle and wheel side to the maintenance depots in case Rolling stock direction change en-route. In case of direction change of the rolling stock, leading Axle will become trailing axle and wheel direction will also changed (left to right). The WILD should be capable to identify the Axle and Wheel side in reference to DV as per instructions of board.	**NWR:** System communicate the wheel and axle information with respect to direction of motion. It gives information of vehicles (loco, coach/wagon, BV) and their position. For identifiaction of individual axle/ wheel new clause 6.7 added at a under: *"Scheme of identification/numbering of individual axle/ wheels to be followed as specified by Railways for different types of coaches, wagons and locomotives."* Based on discussion held in RDSO on 24.05.2023 with stake holders the clause has been modified as under: *"Data must mandatorily be shared with Indian Railway's maintenance platforms like CMM/FMM/SLAM for record and for cross verification of Rake Marshalling order with the PVIS/RFID data with the Brake Power Certificate"*
		Please note that multiple data formats shall be supported by the system. Integration is not limited to only three applications i.e. CMM, FMM and SLAM. System must have capability to integrate with multiple applications (Existing as well as upcoming) at the same time.		New clause "Norms and Regulations" added at S.No 24 of Technical Requirement.
4.0	**Functional Requirements:**			
	The WILD system is expected to run in 24x7 (available round the clock) without any human intervention. The system should be programmed for at least one self-check daily. The result of self-tests shall be displayed on central server			
	Following information is required to be captured and displayed in reports by the WILD System			
S.N	**Information Required**			
1	Date and Time of collected data / Passing Train			
2	Site Name			
3	Direction of passing train (UP/Down)			
4	Train Speed			
5	Total number of axles passed and total number of vehicles in the rake			
6	Total number of defective wheels (Maintenance & Critical)			
7	Identification of rolling stock and their position from engine			
8	Average Dynamic Wheel Load of each wheel (Left & Right)			
	(Average dynamic wheel load is the wheel weight considering components of dynamic forces associated with wheel at operational speeds of train. This is different from the synthesized wheel weight (or equivalent wheel weight) in the static condition.)			
9	Maximum/Peak Dynamic Wheel Load of each wheel (Left & Right)			
	(The peak/maximum vertical load exerted by wheel on rail in dynamic condition)			
10	Impact Load Factor (ILF) / Dynamic Ratio for each Wheel (Left & Right)			
	(The ratio between the Maximum/Peak Dynamic Wheel load and the Average Dynamic Wheel load for a given wheel)			
11	Type of Train – Freight or Passenger (LHB / ICF/ Vande Bharat) or Locomotive		**Wabtec:** The type of train will be determined by the type of vehicle in the consist. • In the absence of RFID tags equipped to the vehicles, identification of vehicle type, hence train type, is possible only through inter-axle spacing. Should the inter-axle spacing between different vehicle types is not unique, the required identification is not possible. For example, if Vande Bharat coaches have bogies similar to IR's LHB bogies, the distinction will not be possible. IR should provide details and drawings showing inter-axle spacing for all rolling stock. • For the vehicles fitted with RFID tags, the required vehicle type, hence train type, identification will only be possible if the tags are programmed to contain the vehicle type information.	**Wabtec:** WILD Systems working on IR are already identifying the type of rolling stock (Locomotives, Wagons, ICF or LHB Coach, BV etc). Bogie wheel base and inter axle spacing will be provided to successfull bidder. It is the responsibility of firm to acquaint themselves with design/drawings of various types of rolling stocks running over Indian Railway.The necessary assistance may be provided to sucessful bidder by IR.
12	Type of rolling stock : Locomotives, Coaches (LHB, ICF), Wagons, Train set/ Vande Bharat, DEMU, MEMU, Brake Vans		**Wabtec:** Please refer to our comments against Technical Requirement at S.N. 17. System Activation.	**Wabtec:** Queries already clarified at S.N. 17.
5.0	**Installation Requirements**			
5.1	The WILD system shall not infringe IRSOD and shall be installed in consultation with authorized Railway Engineer.			
5.2	The WILD systems shall be installed such a way that they do not either require or cause slowing down/ stoppage of train traffic when they are functioning/not functioning/under breakdown/under maintenance except as stipulated elsewhere in this document.			
5.3	Necessary sensor mounting arrangement that can be easily disassembled in two hours and reassembled in less than four hours shall be provided by the firm (with 24/ 48 hour advance notice for movement of trained manpower to site). The drawings of mounting arrangement of sensors may be submitted along with the offer.		**NWR :** In case of Track maintenance, as and when on intimation to the firm, the firm will dismantle and re-commission the WILD without cost.	**NWR:** The requirement of disassembling and reassembling is already defined and shall be done by firm during warranty/AMOC without any cost for preventive track maintenance as per schedule. Unnecessary or out of schedule maintenance of the site may be avoided and may be paid for through the AMC if required.
5.4	The instrumented area shall be maintained manually with proper demarcation under the guidance of engineering supervisor.			
5.5	AC power 230V, 50 +/-3Hz. shall be made available at main power distribution box by consignee. From this point the tenderer will bring power supply to the site of installation by laying power cable. The maximum load on the power supply system should not exceed one KVA.		**Wabtec:** Please refer to our comment against Clause 2.2.2.	Clause deleted.

5.6	UPS or alternate power back-up for at least 8 hours with auto switch-over functionality shall be provided by the WILD system supplier.	**NWR :** The system should work untripped in case of power supply failure so as to complete train data can be captured by WILD. **WCR:** UPS or alternate power back-up of least , 16 hours with auto switch-over functionality shall be provided by the WILD System Supplier.	**NWR:** Provision of 8 hrs. power backup with auto switch-over functionality will ensure complete data capture for passing train in case of power failure. **WCR:** Requirement of 16 hrs. power backup will incraese the system cost. 8 hrs backup is sufficient. Clause redrafted as under: *"UPS or alternate power back-up for at least 8 hours with auto switch-over functionality shall be provided by the WILD system supplier alongwith necessary surge protection."*
5.7	**Suggested site Selection criteria** – The site for WILD system should be selected in consultation with consignee (IR). The supplier may get in touch with DRM (Mechanical) in this regard.		
5.7.1	Sensor/ Instrumented Zone: upto 16 meter of clear tangent track.		
5.7.2	Straight and level track on either side of equipment of minimum 250 m length including approaches to the site and where trains do not normally require heavy braking applications. There should be no Cross level/Twist in the approach track upto 30 meters from sensorized zone measured on the basis of stations at every 3 meters.		
5.7.3	Away from track joints switches and transition zones.		
5.7.4	At least 100 meter away from any grade crossings.		
5.7.5	Track structure should be stable and well maintained with proper drainage system.		
5.7.6	Site should be preferably within 1 km from the main power distribution box.		
5.7.7	The system should be installed on main line in block section near an LC gate but not at it to avoid damage and pilferage. It should have proper road approach for transporting the material and for patrolling for safety.	**NWR :** WILD should be installed preferably near LC Gate (not mandatory).	**NWR:** The requirement of site selection is suggestive. The site for WILD system shall be selected in consultation with consignee (IR).
5.7.8	The site shall not be very close to any station or other place having any permanent speed restriction or at the approach of a signal to avoid acceleration/deceleration or braking over the sensing zone.		
5.7.9	The next train examination point after WILD should be at least 40 km away from the site so that there is adequate time for the report to reach the C&W control and organize interception and inspection of vehicle in case of alarms.	**NWR :** The next train examination point after WILD should not be more that 60 km distance to avoid running of Alert Stock without attention of C&W. **WCR:** The next train examination point after WILD should be 40-60 km away from the site so that there is adequate time for the report to reach the C&W control and organize interception and inspection of vehicle in case of alarms.	**NWR, WCR:** As per WILD JPO issued by Railway Board, the next TXR point/ examination point should be within 50 Km from site of installation. Therefore, the system may be installed at strategic loctions i.e around 40-50 Km from train examination point.
6.0	**Software Requirements**		
6.1	The supplier shall have to provide documents explaining the methodology and logic used to develop the algorithm for the WILD system to get the required output. Any information/ explanation deemed proprietary may be indicated in the technical bid for comparison with other offers. Unless indicated, it shall be presumed that the tenderer has no limitation in sharing any information on logic/ methodology used.		
6.2	The supplier shall be responsible for providing required software for collecting data, storage and graphical and tabular presentation of reports sent by the trackside equipment. The Database Management and archiving shall also be carried out by the supplier at regular intervals.		
6.3	The system should be able to record the dynamic impact load of each passing wheel measured by individual sensor and picking up the maximum dynamic load for that wheel. The average of these impact load values should be worked out for each wheel and stored as normal dynamic wheel load, accordingly the system should be able to calculate the impact load factor (ILF) i.e. ratio between maximum impact load and average wheel load.		
6.4	The WILD server must have capacity to store the history of impacts of each vehicle at least for the preceding 12 months.		
6.5	The WILD server must have software for trending of the impact history of Wheels of vehicles. The bidder should submit details what minimum functional features of trending software are being offered. Some minimum desirable examples are – the software should be capable of generating an alert if a vehicle has any parameter (as measured by the one or more detectors) repeatedly over threshold limits. Further improvements as per the direction of RDSO shall be incorporated by the contractor at no extra cost.	**Traffic-Psycho Dte:** Location of central server is not defined in the specification. Alerts generated by the WILD system should be in both audible (in the form of beep/buzzer) and in text message containing details of fault in the wheels.	**Traffic-Psycho Dte**: In clause 2.3, it is already defined that the web-server shall be located at any location in India. Provision for Audio-visual alarm display and text message for defective wheels with relevent position are already defined under clause 2.2.3 & 8.3 respectively.
6.6	System should be capable of integrating with FMM (Freight Maintenance Management)/CMM (Coaching Maintenance Management)/SLAM (Software for Loco Asset Management) for reflecting the measurements done by WILD with respective rolling stock. For this purpose, successful bidder shall be required to send processed data in JSON format using restful API with token based authentication. The details of the API shall be provided by CRIS and JSON format will be decided based on the data generated by WILD systems		
7.0	**Safety Requirements**		
7.1	The system shall be protected from external EMI/EMC/RFI interferences, electrified OHE (Over Head Equipment).		
7.2	The system shall be so designed that it shall not hamper signalling, track, communication, electrical systems, etc. in service in IR.		
7.3	The functioning of the system shall not get affected by the usual environmental and site conditions like vibrations from passing trains, track maintenance vehicles/ equipment not involved in pre-advised and scheduled maintenance activity at the site, heavy rain and water, animal trespassing and heat/sunlight.		
7.4	The system shall be designed on fail-safe principles and adequate safety margins must be incorporated in the design for systematic and random failures.		
7.5	The system should be adequately protected from waste discharge from the coaches and other ambient conditions including moisture and dirt.	**NWR:** The system should be adequately protected from fallen coal or loose commodity, petroleum from wagon.	**NWR:** In caluse 7.6, it is already mentioned that the system shall be designed and installed in such a way that it should be well protected during accident free train operation.
7.6	System shall be designed and installed in such a way that it should be well protected during accident free train operation and routine maintenance and should have reasonable anti pilferage mechanism as per good industry practices.		
7.7	The system shall be designed and installed in such a way that it should be fire resistant, non-corrosive & electrically non-conductive.		
7.8	The system functionality shall not be affected by lightning and surge. Suitable lighting arrestors/ Earthing of the system may be planned for suppression of power line surges, spikes, transients to protect electronic circuits and equipment.	**Wabtec:** Although adequate lightning and surge protection including earthing of equipment will be provided, should lightning directly hit the track-mounted sensors/ equipment, they will be damaged.	**Wabtec:** Suitable protection may be planned in system design. In case the firms are unsure about the adequacy of the Lightning protection, they can request an audit from Railway.
8.0	**Output Requirements**		
8.1	**Data Communication**		
8.1.1	All the data being generated by the WILD equipment, website, servers etc. with respect to Indian Railway operations shall be the exclusive property of Indian Railway and firm shall not use it for any other purpose.		

8.1.2	The data shall be compiled, stored in a medium, transferred and made available in a format as finally decided by Indian Railways in consultation with final supplier in suitable database. At the end of the contract, or as and when required by Indian Railways, firm shall hand over the complete data set to IR and must destroy any left-over data. Indian Railway shall be free to use data for any use during the contract as well as after the contract period. Any alternate use of such data by the firm shall only be done with the expressed permission of IR.		
8.1.3	WILD system can communicate within its on-site components and other remote parts using different technologies such as GPS-based communications, Optical fibre, Radio or Modem based systems. The protocols and communication methods should be reliable and integrated through the entire system.		
8.1.4	The report of the data captured by the system shall be relayed by the wayside device via suitable communications media to a secure web server on the internet within 5 minutes after the passage of the last axle. Standby data transfer channels may be planned if required to achieve assured and timely data transfer.	**Wabtec:** Factors listed below determine the time it takes to transfer data from a wayside site to a server: • Optical Character Recognition processing of vehicles' images from the PVIS system can take more than 5 minutes to identify/ process vehicle numbers. The vehicle numbers are an integral part of reporting. • As all the specified modes of data communication will be reliant on local third-party internet service providers, we will not have any control on the bandwidth and speed of the data transfer. We, therefore, recommend that the data communication time should be increased to 10 minutes to be consistent with the OMRS requirements. Further, we note that there is no provision of IR providing the primary mode of data communication between wayside sites and centralised server location through dedicated IR/ RailTel's optical fibre cable (OFC) network. It is requested that IR should provide its OFC network connectivity as the primary mode of data communication between the sites and server to enable controlled and smooth data transfer.	**Wabtec:** Systems working on IR are already reporting the reports of data captured within 5 minutes. The same has been agreed by stake holders during meeting at RDSO on 24.05.2023. Therefore. No change required.
8.1.5	The trackside equipment shall have the capability to record and locally store raw captured data for at least last 500 trains and the processed reports for upto 20000 trains.		Based on discussion held in RDSO on 24.05.2023 with stake holders the clause has been modified as under: *"The trackside equipment shall have the capability to record and locally store raw captured data for at least last 500 trains and the processed reports for upto 20000 trains for trains with typical length of 260 axles."*
8.1.6	The backend server systems shall be maintained and operated by the system provider. These servers shall be capable of storing data and shall be able to display parameter reports and its graphical representation (upon demand) and for up to 1 year after transferring it to appropriate Maintenance database of railways like CMM/FMM/SLAM.	**WCR:** The backend server systems shall be maintained and operated by the system provider. These servers shall be capable of storing data and shall be able to display parameter reports and its graphical representation (upon demand) and for up to 1 year after transferring it to appropriate Maintenance database of railways like CMM/FMM/SLAM/WISE.	**WCR:** The Communication with WISE can be done by the FMM/ CMM database alongwith other maintenance history of the rolling stock being transferred to WISE for preventive/ out of course maintenance.
8.1.7	The access to the report shall be provided by a standard web browser that works on various devices such as desktops/laptops/notebooks and smart phones. Users of the systems shall be provided logins / passwords for accessing the data	**NWR:** The access to the report shall also be provided also through Mobile Application.	**NWR:** Requirement to get various alerts along with relevant positions through push notifications on mobile application is already defined in clause 8.4.
8.1.8	The data shall not be divulged by the supplier to anyone other than consignee and to those authorized by consignee.		
8.2	**Report Generation**		
8.2.1	The supplier shall launch, operate and maintain an internet-based website during warranty and during comprehensive maintenance period for making available the train reports to remote users authorized by consignee. The website shall have the following features: -		
8.2.1.1	Password based access so that only authorized personnel by consignee can enter/edit/view/download data and reports.		
8.2.1.1	Differential privileges to different levels of users to access the resources of the website. Minimum 3 access/ privilege levels may have to be designed		
8.2.2	The supplier shall supply a desktop computer/ laptop at nominated place by consignee of the configuration as specified by tenderer.		
8.2.3	The system output shall consist of data reports. Data acquired by the system shall be sent to a web server and the following reports shall be available to the users on demand.		
8.2.4	**Detailed report:** This report shall be in detail showing all parameters as acquired by the remote wayside detector.		
8.2.5	**Exception report:** This report shall be an abridged version of the detailed report showing only the list of axles where the parameters have exceeded the prescribed limits. It should be possible to directly obtain prior exceptions reported for the same wheel/axle/rolling stock during last one year.		
8.2.6	Rake and Rolling Stock number type based queries for a selected period, time or parameter value (MDIL or ILF) for one or more sites		
8.3	**Alarms report through SMS:** Reports for alarms based on parameters exceeding the prescribed limits shall be sent to users through SMS. In case of delay in transmission of full reports, the system shall have the capability to send SMS directly to limited number of users. The delay shall be deemed to have occurred if the data is not dispatched within 5 minutes from the passage of last wheel of the train.		
8.4	**Alarms report through App:** The firm should develop a mobile application for the user to get various alerts along with relevant positions through push notifications. The application should be designed for Android and IOS both.		
8.5	**Diagnostic reports:** The system shall be capable of running self-diagnosis programs and report the result through the website and by SMS. It should log all system errors such as main power failure, network failure or poor network speed and events like train passing & system reboot etc.		
8.6	System should have provision of recording and analyzing the feedback of action taken by the field staff on alerts generated by WILD, including provision of entry of false negatives cases. For this purpose, standard Feedback messages may be provided in a dropdown menu besides a category for 'Other' defects feedback allowing detailed write-up of upto 50 Characters.		
8.7	In the reports, the system shall be able to highlight the wheel having the high impact in different colors as per different thresholds for easy identification.		
8.8	The system should be able to identify and count no of engines, coaches/wagons or brake vans, and also should be able to relate each axle with engine or coach/ wagon or brake van and its position from the locomotive.		
8.9	**Alarms:** Parameters exceeding the specified limits require alarms to be sent to users. These alarms should be sent in the form of SMS message after passage of the last axle of the said train. These messages will convey the following minimum data:		
8.9.1	PVIS/RFID vehicle identification (if available/ provided on the Rolling Stock or reconstructed based on CMM/ FMM data)		
8.9.2	Vehicle type Passenger(ICF,LHB,VB), Freight, Locomotive		
8.9.3	Date / time of train		
8.9.4	Direction of movement		

8.9.5	Vehicle/Wheel position from start of train		
8.9.6	Axle number where the parameters are found out of range.		
8.9.7	Short description / error code: In case of error in recording or any system failure, alarms shall be generated and transmitted similarly.		
8.1	**Basis of alarms:** It should be possible to raise user settable graded alarms, at least for the following conditions:		
8.10.1	When the maximum dynamic wheel load exceeds the specified load. This should be of multiple level thresholds.		
8.10.2	When the impact load factor exceeds the specified threshold. This should have multiple level thresholds.		
8.10.3	When both (maximum dynamic wheel load and impact load factor) exceeds the specified threshold. This should be of multiple level thresholds.		
8.10.4	In case, IR decides to include new types of alarms based on the data already being gathered in the system, then supplier shall modify the software within a reasonable time at no extra cost to Indian Railways		
8.11	The raw data generated shall be downloaded by user in MS Excel sheet for any time duration from date of commissioning of equipment, using a user –settable data filter in the dash board. User should be applying any or all of the following filters on database simultaneously or otherwise as per requirement to retrieve MDIL, Average Load & ILF values of both left & right wheels of rolling stock for further analysis:		
8.11.1	From …date to …date		
8.11.2	Freight/LHB rake/ICF rake type wise		
8.11.3	Impact History of a particular rake or individual rolling Stock type /Id for a predefined period in a single table		
8.11.4	Speed range band wise-should be user selectable		
8.11.5	Direction wise-user selectable		
8.11.6	Summary of alerts –month wise, year wise-user selectable		
8.11.7	WILD site wise alert analysis-more than one sites at a time user selectable		
8.11.8	MDIL range wise-user selectable range		
8.11.9	ILF range wise-user selectable range		
8.11.10	Average Load range wise-user selectable range		
9	**Inspection and Testing:** Inspection and testing of the equipment shall include all inspections, tests, checks, procedures etc., whether mechanical, electrical or software related as required to ensure that the supplied system meets the technical & functional requirements stipulated in the specification. The tenderer shall submit details of test plan for proposed system for each level of testing towards compliance of this specification. However any addition/deletion/modification in the test plan can be considered on mutually agreeable basis. The successful bidder shall depute team of engineers to perform all level of testing and ensure availability of testing facilities and spare parts in adequate quantity for these tests. All the instruments, apparatus, devices, sensors etc. used during all levels of inspection and testing should have valid calibration certificate issued by an independent authority/component supplier/ institute approved by NABL/IR or accredited lab.		
9.1	**Factory Acceptance Test:** All technical and design features shall be inspected and witnessed by nominated inspection agency at the firm's premises. All individually tested sub-systems should be integrated in a fully functional manner and offered for inspection. During the factory acceptance test, firm shall demonstrate the capability of the system to measure impact load mentioned in specification. Test scheme shall be finalized by inspecting/ tendering agency jointly with the firm. Necessary facilities, equipment, tools and gauges, duly calibrated shall be provided by firm at its premises for FAT.	**Voestalpine:** As mentioned above and described in the Measurement and Calibration Principle document for the system, it is not possible to measure Impact Load during FAT or in the Lab. Thus request you to kindly follow the FAT Template as attached for such a System.	**Voestalpine:** It is required to demonstrate the impact load capability traceable to international/ national standard of load measurement before supply to ensure that the supplied system is capable of segragating the defective wheels. A system needs to have demonstrable ability and canot be accepted on heresay.
9.2	**Calibration test:** The system should be calibrated before offering for proving-out test at site. Details of calibration methodology shall be submitted along-with the offer. All calibration activities should get logged on the the data base or user dashboard. The error tolerances should not exceed 2%.	**Wabtec:** Following installation at a site, our WILD system is calibrated for weighing accuracy using a test train comprising wagons of known/ reference/ stamped weights travelling through the system multiple times at several speeds to represent nominal train operating conditions. The weighing accuracy of ±4% specified at Clause 9.3.3 contradicts with the error tolerance of 2% what appears to be a typographical error. Accordingly, please correct the calibration error tolerance to ±4% of known /stamped weight (calibrated) of wagon/ coach/ loco at crawling speeds.	**Wabtec:** Please note that the calibration of system is for individual sensor level which is different form the weighing accuracy of the system. No change required.
9.3	**Proving-out tests at site:** The supplier and the consignee shall conduct the following proving out tests after installation and calibration of the system at site:		
9.3.1	Consistency with regard to data capture functionality:		
9.3.1.1	All the trains should be correctly recorded with regard to direction of motion, date and time of passing, speed, no. of axles, no of locomotives, no of vehicles other than locomotives. Minimum acceptance shall be at 100% over a period of 4 days of normal operation.	**Wabtec:** WILD systems are generally configured to wake-up/ activate through track vibrations. Track vibrations caused by track maintenance activity (e.g., manual hammering, track re-alignment) in the vicinity of the system can falsely activate the system to data acquisition mode. Should a real train arrive immediately within a minute of the false activation, that train acquisition can be affected (partially recorded or missed). Such unforeseen instances, beyond the control of the system, can impact the consistency assessment. Therefore, the minimum acceptance criterion of 100% should be revised to 98%. The revision will also align the criterion with that of generating the report as mentioned at Clause 9.3.1.2.	**Wabtec:** Suitable false wake up suppression methodology may be planned to differentiate and avoid false activation. No change is required.
9.3.1.2	The complete data report (without missing any axle) including maximum dynamic wheel load, average normal dynamic wheel load, impact load factor & speed of a wheelset of the trains passed shall be generated. The report should be successfully generated for at least 98% of the trains in a calendar day. A successful train report generation shall mean all wheels/ axles in the train within the prescribed speed range being correctly recorded.		

9.3.2	**Impact load measurement capability:** The supplier should demonstrate the impact load measurement capability of the system producing known impacts on measuring channels of the system using suitable jigs, fixtures, impact hammers or other calibration equipment duly calibrated with valid calibration certificate issued from a Govt. certified agency. The impact measurement capability shall be demonstrated for different impact loads minimum upto 35 tonne at site. For this, the impact hammer/ calibration equipment should be provided by supplier. The error tolerance [{(Measured impact – Applied impact)/ Applied impact}*100] should not exceed 4%.	**Wabtec:** Standard industry practice is to check impact load measurement of up to 20 tonnes due to operational and safety reasons besides avoiding damage to the rail head. Accordingly, impact load measurement of up to 20 tonnes can be safely demonstrated. We, therefore, recommend revising the impact load measurement of 35 tonnes to up to 20 tonnes. As multiple impacts will be generated on the rail, magnitude of the impacts will depend how well the impact hammer engages with the rail. As a result, variations are expected. We, therefore, recommend that the error tolerance should be revised to 5%, and that the error is averaged across themultiple impacts. **Voestalpine:** As mentioned above and described in the Measurement and Calibration Principle document for the system; System is calibrated on the track with live trains of known weight running over it. Thus request you to kindly remove the requirement of Jigs, Fixtures or Hammer and allow measurement capability with live trains.	**Wabtec:** Error tolerance raised to 5% as required by firm. No averaging across multiple impacts shall be permitted. Each of the multiple readings shall fall within the 5% tolerance. **Voestalpine:** Individual Systems cannot be commented upon. The documents submitted have been examined and do not demonstrate the satisfactory functioning of the system proposed as no verification of results is planned therein. Unless verifiable results can be produced with sensors traceable to national/ international calibrations, the accuracy of reported Impact load shall remain in doubt. Clause modified as under: *"The supplier should demonstrate the impact load measurement capability of the system producing known reference impacts at different locations in the measuring zones of sensors using suitable jigs, fixtures, impact hammers or other equipment duly calibrated with valid calibration certificate issued from a Govt. certified agency for metrological traceability. The impact measurement capability shall be demonstrated for different impact loads upto 30 tonne at site. For this, the necessary jigs/fixtures/hammers/calibration equipment should be provided by supplier.* *The error tolerance shall be calculated as per table 1(a) of Annexure-1 and the maximum error tolerance should not exceed ± 5%."*
9.3.3	**Weighing accuracy at crawling speed:** System should have weighing accuracy in range of ± 4% of known /stamped weight (calibrated) of wagon/coach/loco at crawling speed.		The weighing accuracy calculation methodology has been added at 1(b) of Annexure-1.
9.3.4	**Repeatability Test with regard to Average dynamic load:** The reliability of the system should be observed with the repeatability of axle load recorded. If the same rolling stock passes with the same speed, the axle load recorded by the system should be approximately same or within the range of ± 5% of the average load of minimum 5 passes at same speed.	**Wabtec:** Please clarify which vehicles — vehicles with no wheel defects (seeded or otherwise), vehicles with wheel defects, vehicles assembled in a test train or vehicles from running traffic — will be used to assess the repeatability. As the wheel–rail contact is probabilistic in nature owing to vehicle/ bogie dynamics, outliers are expected. Standard industry practice involves undertaking statistical analysis using 2σ with 95% confidence level— an approach similar to the ANOVA test with 95% confidence level as mentioned at Clause 9.3.5. The assessment methodology should therefore be accordingly modified to include 2σ or allowing a percentage of outliers. Alternatively, consider the assessment methodology as similar to the ANOVA test mentioned at Clause 9.3.5.	**Wabtec:** Repeatability Test with regard to Average dynamic load will be done during prove-out at site using test train/vehicles from running traffic with /without defects jointly finalised between consignee and successful bidder for prove-out at site. Therefore, no change required. The calculation methodology has been added at 1(c) of Annexure-1.
9.3.5	Repeatability of Impact Load measurement at different speed of the system should statistically satisfy ANOVA Test with 95% confidence level.	**Wabtec:** Please clarify which vehicles — vehicles with no wheel defects (seeded or otherwise), vehicles with wheel defects, vehicles assembled in a test train or vehicles from running traffic — will be used to assess the repeatability of impact load measurement.	**Wabtec:** Data of vehicles with no defect and fault seeded stocks both of test special/ vehicles from running stocks may be used for ANOVA Test where multiple passes can be recorded. System readings of impact load must satisfy 95% Annova criteria.
9.3.6	The reliability of the system to measure impact load in dynamic condition should be observed using fault seeded stocks / Test specials. The fault seeded stocks should be logged under alerts conditions by the system. False positive and false negative reports shall be validated with seeded defects and should be not more than 15% and 5% respectively considering all passes of test train.	**Wabtec:** Please clarify the alert conditions under which the seeded fault stock should be logged. It is well understood that a seeded fault may not always generate an alert due to several factors, such as geometry of the defect (its depth and characteristics of edges – worn/ sharp), probabilistic nature of wheel–rail contact owing to vehicle/ bogie dynamics, location of the defect on the wheel tread, train speed, wheel load, and alert thresholds. To assess the false negative rate, please clarify which seeded defect is expected to raise an alert and under what operating conditions (speed and load) or consider condemnable defects (> 60mm long, > 1 mm deep) on fully-loaded wagons (90 tonnes) at speeds > 30-40 km/h). Wabtec recommends 15% false negative rate keeping in view the dynamic and complex environment in which these WILD systems are expected to operate, where nature of wheel-rail interaction plays an important role directly affecting the wheel impact load and forces exerted on to the rail. **NWR:** Fault seeded stocks/ test special will be provided by the firm for utilization for calibration purpose	**Wabtec:** The defects shall be logged under maintenance/critical category as per WILD JPO issued by Railway Board. The nature and size of defects will be jointly finalised between consignee and successful bidder for prove-out at site considering the safety and operating conditions of IR. Based on comments recieved and experience gained from test results of Arnetha, false negative alerts conditions relaxed upto 10%. Clause modified accordingly. **NWR**: Fault seeded stocks/ test special is not in the scope of supply of the system. No change required.
9.3.7	**Speed:** The average speed calculated by the system and speedometer of loco should approximately within ± 5 Kmph.		
9.3.8	**Vehicle Identification System**: The system should be able to correctly identify the unique vehicle numbers of at least 75% stock in the train that passes the WILD site through combination of inputs from PVIS & RFID system. If required, marshaling order provided in CMM/FMM/SLAM data may also be used to ensure identification of unique vehicle numbers beyond 75 % of composition. For remaining unidentifiable Rolling Stocks, the system shall store the vehicle image files that can be viewed by the operator. The same should be demonstrated by supplier during prove-out at site	**Wabtec:** Vehicle numbers that are not legible by an average human should be excluded from the 75% success rate assessment. As we understand, the specification intends for supplementing PVIS output with train consist from IR applications until RFID tags are rolled-out to cover IR's fleet. This exercise requires joint working with IR/ CRIS for which the data sharing protocols need to be clearly specified, understood, and agreed. **NWR:** Vehicle identification should be 95% or more as the data utility of WILD at the Maintenance Depots depends on the identification of vehicle. Also in near future all the stocks will be equipped with RFID tags.	**Wabtec:** It is already clarified that the system should be able to correctly identify the unique vehicle numbers of at least 75% stock in the train that passes the WILD site through combination of inputs from PVIS & RFID system. If required, marshaling order provided in CMM/FMM/SLAM data may also be used to ensure identification of unique vehicle numbers beyond 75 % of composition. It is the responsibility of firm to aquiant themselves with the railway maintenence platform for data sharing. Necessary assistance may be provided by IR/CRIS as discussed during the meeting dated 24.5.2023 and attended by M/s WabTec. **NWR:** Vehicle identification is not feasible upto 95% at present due to the fact that some of the some of the tags may not be consistent due to manual (hand) painting, characters with non-uniform spacing, inconsistent aspect ratio, non readable, faded, obscured due to accumulation of dirt, oil, grease etc. As such excessive latitiude has been provided to the prospective Vendors
9.3.9	**RFID Reader:** RFID readers should be capable for reading RFID Tags tagged on IRs rolling stocks. The extent of vehicle identification/ tag reading should be in line with the guidelines issued by CRIS in due course.		Based on discussion held in RDSO on 24.05.2023 with stake holders the clause has been modified as under: *"RFID readers should be capable for reading all working RFID Tags tagged on IRs rolling stocks. The extent of vehicle identification/ tag reading should be in line with the guidelines issued by CRIS in due course."*
9.3.10	**Data Validation:** Wheel impact load detectors must be maintained such that each rail has at least 70% of vertical circuits active. If less than 70% of the circuits are active on a rail, then the data from that rail does not meet the validation requirements.		Clause redrafted as under: *"Wheel impact load detectors must be maintained such that each rail has at least 70% of vertical circuits active. If less than 70% of the circuits are active on a rail, then the data from that rail does not meet the validation requirements and hence, the data and reports for the rails shall not be utilized for any purpose and suitable comments shall be logged to distinguish as invalid report."*
10	Warranty: The supplier shall confirm warranty of complete system for a period of at least 24 months from date of successful commissioning.	**NWR:** Scope for AMC to cover rest of codal life of the equipment after warranty period may also be defined.	**NWR:** The scope of AMOC may be covered under tender condition as per requirements.

11	**Training:** The supplier shall provide training for minimum 10 man days per site installation at factory premises and training for minimum 30 man days per site installed at different locations in the premises of consignee or mutually agreed location/ facility in following areas:		
11.1	Operation of WILD system		
11.2	Calibration of WILD system		
11.3	Trouble shooting and Maintenance of WILD system		
11.4	Reading and interpretation of reports, alarms and SMS's etc.		
12	Submission of documents/ICD:		
12.1	**Test certificates:** Test records, test certificates, evidence for conformance to this specification & IP ratings of enclosures, sensor's data sheet, performance curves from OEM (if applicable) and it's warranty etc. Results of all inspections and tests, whether witnessed or not by IR personnel, shall be supplied as soon as practicable after performance of each inspection or tests. One set of above mentioned documents shall be supplied properly bound in books. The softcopies of the said documents should also be provided by the firm.		
12.2	Firm will supply the ICD (Interface Control Document) for the WILD System to the Indian railways.		
12.3	**Literature:** The supplier shall provide following literature in two copies to consignee along with the delivery of WILD system:		
12.3.1	Complete drawings and system architecture.		
12.3.2	Operating manual		
12.3.3	Maintenance manual		
12.3.4	Spare part catalogue		
	The tenderers shall provide a list of literature to be supplied with the system in his		