INDIAN RAILWAYS

SPECIFICATION

FOR

INDIGINIZED WHEEL SLIDE PROTECTION DEVICE

FOR LHB TYPE MAINLINE COACHES

OF

INDIAN RAILWAYS

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Approved by: Director/Carriage
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1.0 FOREWORD

1.1 At present LHB type Mainline Coaches have been provided with Wheel Slide Protection Device in order to prevent the problem of wheel skidding which leads to frequent turning of wheel and reduction in its service life. In current situation, Wheel Slide Protection Device has been imported by the suppliers which results in higher cost of the equipment. This specification is intended to indigenise the manufacturing and standardisation of Wheel Slide Protection Device results to reduction in cost and various other merits.

1.2 Following standards and regulations (latest edition) as well as specifications are binding for the supplier:
- UIC 541-05
- UIC 564-2
- UIC 566
- EN, ISO standards as far as applicable to the WSP system of rail vehicles, especially EN 50155.
- Fire Code: EN 45545 (for electrical wires).

1.3 All the provisions contained in RDSO’s ISO procedures laid down in Document No. QQ-D-7.1-11 dated 19.07.2016 (titled “Vendor – Changes in approved status”) and subsequent versions/amendments thereof, shall be binding and applicable on the successful vendor/vendors in the contracts floated by Railways to maintain quality of products supplied to Railways.

2.0 DEFINITION AND EXPLANATION

2.1 ‘PURCHASER’ means the Indian Railways on behalf of the President of the Republic of India who are purchasing the wheel slide protection device.

2.2 ‘INSPECTING AUTHORITY’ means the organization or its representative nominated by the purchaser to inspect the wheel slide protection device on his behalf.

2.3 The Research Designs & Standards Organisation, Manak Nagar, Lucknow-226011 is hereafter referred to as ‘RDSO’.

2.4 Rail Coach Factory, Kapurthala (Punjab) is hereafter referred to as RCF.

2.5 The Indian Railways is hereafter referred to as IR.

3.0 SCOPE

This specification covers the technical requirements related to Wheel slide protection Device (WSP) used on Axle Mounted Disc Brake system for LHB type coaches and does not include other necessary provisions of the contract.

4.0 PARTICULAR REQUIREMENT

4.1 The firm seeking registration for Wheel slide protection Device shall register online on RDSO websites. All relevant documents like Vendor Approval guidelines & Application form, latest version of all specifications and drawings shall be provided on websites. The firm shall follow the latest vendor approval guidelines for registration with RDSO.

4.2 The firm should possess ISO: 9001 certificate issued by International Accreditation Forum (IAF) under Multilateral Recognition Arrangement (MLA) for his works address, covering the items for which he seeks registration with RDSO.
4.3 The firm along with their principals shall have adequate infrastructures for manufacturing, testing and quality control requirements for Wheel slide protection Device. This will be verified by RDSO at the time of registration of the firm.

5.0 GUARANTEE/WARRANTY

5.1 For Wheel Slide Protection Device supplied by the contractor, in case of any part of the Wheel Slide Protection Device failing or proving unsatisfactory in service due to defective design, material or workmanship, within 36 months from the date of delivery or 24 months from the date of placing in service whichever is later, shall be replaced by the contractor at his own expense.

5.2 Wheel Slide Protection Device shall be subjected to detailed trials as discussed in clause 16 of the specification. Any modifications found necessary as a result of these tests or further service trials shall be carried out by the contractor at his own cost in the coaches in a manner approved by the purchaser. All schematic layout and installation drawings incorporating the modifications shall be submitted to RDSO for final approval.

6.0 SPARE PARTS, RESERVE APPARATUS & WEARING PIECES

6.1 The offer shall include recommended list of spare parts required for day-to-day maintenance of the Wheel Slide Protection Device and spares in the form of kit for the various sub-assemblies for the maintenance at the time of POH. The list shall include the part number, quantity required and price of each component.

6.2 Firm shall ensure availability of all spares for a period of at least 10 years. This shall be irrespective of the fact whether the tenderer or his sub-contractor(s) have stopped manufacturing of the equipment to the design supplied to IR.

6.3 In order to ensure the highest availability and utilization of Wheel Slide Protection Device, a certain number of standby units of principal assemblies are required. In addition, the firm may stock sufficient minor components and spares to meet renewal and replacement on account of wear or occasional failure, for a period of 5 years of service. Tenderer shall therefore, submit a classified list of spares, (unit exchange, spares & stage/normal maintenance) for each type of equipment of Wheel Slide Protection Device, which he recommends for stocking.

7.0 AFTER SALES SERVICE

7.1 Firm may be required to send his technical expert during the installation and commissioning of their Wheel Slide Protection Device on coach/coaches. The charges for this service shall be quoted separately.

7.2 Firm shall also depute his technical expert on request by the Purchaser / RDSO to investigate and attend to specific problems that may come up during actual operation of Wheel Slide Protection Device.

7.3 Firm shall associate with Indian Railways during the trials with Wheel Slide Protection Device. He shall also undertake to modify the equipment supplied, if required as a result of trials.

7.4 Firm shall supply at least 10 copies (Soft & hard copy both) of the Operation & Maintenance Manuals and Servicing Instructions per 100 Sets of Wheel Slide Protection Device. These should normally include:

7.4.1 Brief Details for functioning of each equipment.

7.4.2 Details of attention to be given during IOH/POH or any other schedule examination.

7.4.3 Test procedure and standards for various Wheel Slide Protection Device on test bench as well as single coach/rake testing.

Signature
Name & Designation | Prepared by: | Checked by: | Approved by: |
--- | --- | --- | ---
SSE/Carriage | SSE/Carriage | Director/Carriage
7.4.4 Details of tools or other equipment used for maintenance of Wheel Slide Protection Device.

7.4.5 Typical defects and their remedial measures.

7.4.6 List of spares for day to day maintenance and at the time of IOH/POH in the form of periodic overhaul kit.

7.4.7 Maintenance standards including clearances and tolerances at various locations for good service performance of equipments.

7.4.8 Firm shall submit the frequency and detailed work content of various inspection / maintenance schedules necessary for maintenance of Wheel Slide Protection Device offered by him. Whether these requirements are time based or distance travelled based shall be indicated for each schedule.

8.0 TRAINING

Manufacturer will organize free of cost Seminar/Workshops on Wheel Slide Protection Device once in a year in coaching depot having coach holding less than 50 and twice in a year in coaching depot having coach holding more than 50 at coaching depot/workshop where LHB coaches are being maintained.

9.0 CHARACTERISTICS

9.1 The WSP Unit should meet the corresponding technical requirements mentioned in UIC 541-05.

9.2 FUNCTIONAL CHARACTERISTICS

9.2.1 WSP should be suitable upto speed of 200kmph.

9.2.2 The WSP shall remain fully functional even if additional brakes are used that are not dependent on wheel/rail adhesion. Even if adhesion drops suddenly during braking, the WSP shall retain its efficacy and shall prevent irremediable locking of the wheelsets at vehicle speeds above the initiation threshold for the WSP.

9.2.3 The WSP shall so vary the braking force as to make maximum use of available adhesion and improve it by providing controlled wheel slide.

9.2.3.1 Sliding of the wheel on the rail shall be restricted in order to avoid damage. This wheel slide shall not cause the axles to lock.

9.2.3.2 The speed of rotation of the wheelsets is calculated on the basis of information provided by sensors, and monitored by regulators or automatic control systems. These transmit commands to the WSP actuators to reduce or restore braking power, either totally or partially. Centrally determined train speeds may not be used to regulate the pressure in the brake cylinders as long as the safety and the reliability of that speed information is not guaranteed.

9.2.4 The WSP Unit shall retain full functionality, regardless of the braking force requested, up to a speed 20% greater than the maximum running speed of the vehicle for which it is designed.

9.2.5 The WSP Unit shall function reliably from maximum speed to a minimum speed of approx. 5 Km/h, or lower.

9.2.6 The WSP Unit shall function reliably independent of the moving direction.

9.2.7 The WSP Unit shall have provision for automatically switch on and switch off for electrical supply to WSP Unit on receiving an electrical signal from pressure switch mounted in FP line in Brake Control Panel when the coaches are not in use.
9.2.8 The WSP Unit shall have Additional output lines for attachment of speedometer, vacuum toilet system and door sub-systems.

9.2.9 The WSP shall so vary the braking force as to make maximum use of available adhesion and improve it by providing controlled wheel slide.

9.2.10 The WSP Unit is to guarantee a sufficient and safe operation. Moreover, a failure of the WSP Unit should not have any influence on the braking function of this vehicle or of the whole train set.

9.2.11 The performance of WSP unit shall conform to the latest revision of UIC Specification 541-05.

9.2.12 The WSP unit shall give satisfactory performance under dry and wet condition both.

9.2.13 The consumption of compressed air as a result of WSP actuation shall be reduced to a minimum.

9.2.14 At no time shall the actuation of the WSP lead to greater braking force being applied than initiated by the braking command.

9.2.15 If the existing adhesion level is not reduced, the WSP shall not alter the braking force from that required by the command.

9.2.16 An independent monitoring or “watchdog” device shall support the automatic control system. The device shall prevent triggering of actuator if venting continues uninterrupted for more than 10s. A similar monitoring system shall prevent an incorrect force step being sustained unduly as a result of a command fault. The watchdog device shall remain active during WSP tests, in order to restore the braking force required by the command if sustained venting of the brake cylinders occurs during the tests, or if the undesired venting continues on completion thereof. Actuation of this device other than during a test shall be indicated and recorded as a fault. If the watchdog device is activated, it shall revert automatically to its stand-by position when the WSP resumes normal functioning.

9.2.17 At low adhesion (adhesion coefficient $\mu < 0.03$) the WSP shall not allow the wheels to lock. This could occur as a result of:

- Incorrect operation of the watchdog device or
- As a result of an error in estimation of train speed.

9.3 ELECTRICAL CHARACTERISTICS

9.3.1 The power supply to the WSP shall be so designed as to guarantee that the WSP powers up. At the latest, power shall be available when the vehicle is set in motion.

9.3.2 WSP systems require an electrical power supply to function. This can be provided by the vehicles or by the WSP itself.

9.3.3 If the electronic WSP does not supply its own power, fluctuations in power within the limits of point 9.3.4 supply voltage shall not affect its functioning.

9.3.4 The WSP shall continue functioning without failure under fluctuations in nominal voltage of up to at least $\pm 30\%$. If the nominal voltage fluctuations exceed the limits where it does not work properly, the WSP shall shut down without disturbing the braking system. As soon as the supply voltage reverts to the permitted range, the WSP shall automatically return to normal functioning.

9.3.5 The WSP installation shall have its own protected circuit. Fuses or circuit breakers for the WSP shall be so separated from others on the vehicle that they cannot be confused with these or operated in the same manner. In particular, the WSP shall be so connected to the power
system that it is not switched off automatically by the vehicle to save the battery (e.g. battery voltage low).

9.3.6 In all other respects, the WSP shall meet the specifications of EN 50155, EN 50121-3-1 and EN 50121-3-2

9.4 SAFETY, RELIABILITY AND MAINTAINABILITY CHARACTERISTICS

9.4.1 General

The WSP shall conform to the provisions of EN 50126 (RAMS).

EN 50128 is to be respected for WSP software.

The WSP for coaches shall conform to the specifications of UIC leaflet 557.

9.4.1.1 The WSP shall be capable of initiating tests or checks by means of which a malfunctions or faults can be detected.

Independent of these continuous internal tests, which are inherent to the electronic or micro-processing system, availability test and the monitoring of proper functioning shall be adopted to the technology employed and defined on the basis of fault analyses specific to the architecture of each WSP and its environment.

Testing and monitoring during running shall not impair the braking functions. On no account shall testing or monitoring jeopardise the security of the train when it is stationary.

9.4.1.2 Any faults detected shall be displayed as a fault code and remain stored in the memory.

In the event of a power supply failure, the WSP shall ensure that the fault codes remain stored in the memory.

The fault codes shall be defined on the basis of a failure analysis and designed such that the smallest exchangeable unit can be identified.

9.4.1.3 Separate information on the availability status of the WSP shall be provided for Operations, in addition to the codes for “Fault” and “OK” indications required for maintenance.

9.4.1.4 If the speed information from the WSP is used for other functions, initialisation and testing shall not generate incorrect information for these functions.

9.4.2 Permanent checks when the system is functioning

The following checks shall control:

a. The availability of speed sensors and electrical actuators. In particular, open-circuit and short-circuit conditions shall be detected.

b. The reception by the appropriate actuator of every command sent by the computer.

9.4.3 Automatic Tests

When it is started up (system start), the WSP initiates a self-check aimed at controlling the availability of different sub-assemblies (electronic control units).

9.4.4 Manual tests at a standstill

i. A device accessible from inside the vehicle shall enable manual initiation of the tests.

ii. It shall be possible to read off all faults detected during the run.

iii. The manual tests include the availability check of the different sub-assemblies.

iv. The tests shall allow a search for faults that subsist when stationary. This sequence also comprises:
9.4.5 Functioning safety

i. Safety

The WSP approvals documentation shall contain a safety analysis for the following undesirable events:

ER 1: Unintended venting or constant pressure on one control channel for duration in excess of that specified in point 8.2.15.

ER 2: Loss of any safety critical speed output (speed-dependent brake force application, magnetic brakes).

ER 3: Loss of the function indicating a locked wheelset for equipment approved for \( v > 200 \) km/h.

NB: ER = undesirable event

The hourly probability of these anticipated events occurring shall be:

- \( ER \ 1 \leq 10^{-6}/h \)
- \( ER \ 2 < 10^{-5}/h \) for \( v < 200 \) km/h
- \( ER \ 2 < 10^{-6}/h \) for \( v > 200 \) km/h
- \( ER \ 3 \leq 10^{-6}/h \)

These events shall be quantified using the databases for expected reliability or operating reliability valid at the time of approval.

ii. Maintainability

The WSP shall be built to a modular design:

- Modules with the same function shall be interchangeable;
- The physical construction of the modules shall be such that those which are not functionally interchangeable are not plug-compatible.

9.5 Precision of reference speed

9.5.1 During brake applications to a standstill in conditions of reduced adhesion, the maximum permissible reference speed deviation shall be as follows:

- If the reference speed is greater than the real speed: 5 km/h
- If the reference speed is less than the real speed
  - 10 km/h where the real speed is less than 200 km/h.
  - 15 km/h where the real speed is more than 200 km/h.

10.0 EQUIPMENT DESIGN

10.1 The WSP unit shall consist of the following components:

10.1.1 DUMP VALVE

A dump valve is provided for each axle of the vehicle. These dump valves are a type of solenoid valves, connected with the air pressure line of brake cylinder. Dump valve/antiskid valve should be fitted close to the brake cylinders. These dump valves allow to deplete the air...
available in brake cylinder line during brake application based on the signals from WSP microprocessor. The dump valve must have following characteristics:

**Designed according to EN 15595**  
**Minimum Port:** 3/2 port valve (3 ports & 2 positions)  
**Dump Valve Material:** Aluminium  
**Interface arrangement with the coach to be of standard design.**  
**Pipe Connection:** 15mm (O.D.)  
**Maximal operating pressure:** 6 bar (max.)  
**Shock and vibration according to EN 61373 Cat. 1 Class B**  
**Operating temperature:** -10 °C to +75 °C  
**Supply voltage:** 24 V according to EN 50155  
**Nominal power:** 5 W  
**Protection IP67 according EN 60529 (connector)**  
**Surface treatments pneumatic plates: anodizing**  
**Air quality:** Should be as per IR standard

### 10.1.2 SPEED SENSOR

The speed sensors are fixed on one end of the axle box cover with the help of two bolts. During fitment the gap between sensor probe & phonic wheel plays vital role. The gap can be adjusted with the help of shims & measured through the peephole in axle box cover. The other end of the speed sensor i.e. cable is connected to junction box in car. The sensor system provided on coaches is based on non-contact type of counting of RPM. This is ensured with the help of phonic wheel & sensor probe fitment with some air gap. The main function of speed sensor is to pick up the signals with the rotation of phonic wheel mounted on axle end & convey to microprocessor. The speed sensor must have following characteristics:

**Nominal Voltage:** 15V ± 5%  
**Current level of the signal:** I<=20mA  
**Frequency:** 0 Hz - 25 KHz  
**Operating temperature:** -10 °C to +75 °C  
**Shock, vibrations and bump tests according to IEC 61373:2010 cat. 3**  
**EMC according to EN 50121-3-2:2006**  
**Protection IP66/IP68 according to CEI EN 60529:1991**  
**Protection against mechanical damage**  
**Resistance to corrosion**  
**Durable and maintenance free**  
**Protection against HF interference**  
**Temperature range from -10 deg. C to + 75 deg. C**  
**Protection on all input and output against reverse polarity, and short circuit connection**  
**Constant output signal, when stationary for functional diagnosis**  
**Permissible insulation test voltage of 500 VAC and 50 Hz for one minute**  
**Blank flange with cover**

### 10.1.3 PHONIC WHEEL

A phonic wheel is installed on one end of each axle. The phonic wheel is a toothed wheel (gear type). The purpose of this toothed wheel is to alter the internal inductance of the adjacent sensor. The change in internal inductance is evaluated as axle speed of various axles on a coach. Phonic Wheels (4 pcs) with M8 bolts to IS:1364 Pt.III clause 10.9 and washers to IS:3063 type-B. The phonic wheel must have following characteristics:

**Teeth number:** 80
Pressure angle: 20°
Module: 2
Profile: DIN 867
Material: Ferro Magnet
Mechanical Strength: As per UIC 566

10.1.4 Microprocessor-based control unit (1 pc) consisting of the following:
I. Power Supply
II. Control Unit

- Control unit should be mounted in the standardized 19 inch rack and height is 3u.
- Control unit shall be capable to provide output for CDTS (30kmph), Automatic Doors (>5kmph, <5kmph & <45kmph) apart from output required for WSP system. The speed output signal of WSP to CDTS should be remain closed contact for speed less than 30 kmph.
- The display of control unit is LED/Backlit LCD (minimum 4 digits).
- Complete electronic unit shall be EMI-EMC compliance.
- Safety integration shall be of SIL-2 compliance (EN50128 standard).

III. Micro processor

IV. Input/ Output:- Supply/Input voltage to microprocessor rack shall be 110V ± 30% DC nominal. Output voltage should be 24V as per manufacturer’s requirement.

10.1.5 Speed sensors (with cable of 2000mm length) with integrated amplifier (4 Pcs) and mounting bracket & Cable for complete wiring of anti-skid system 150 Mtr.

10.1.6 Connectors (1 Set) comprises of:
- Power Connection (input connector).
- Connectors for Speed Sensors & dump valves.
- Connector for external interface upto WAGO terminals.
- Shielded cable to be used for Speed Sensor.

10.1.7 Anti-Skid Valve (4 Pcs) & Housing (4 pcs).

10.1.8 Junction boxes for speed sensor (4 pcs) & Junction boxes for Dump valve (2 pcs).

10.1.9 Pressure switch (1 pc) 1.3/1.8 Kg/cm² in FP line (if necessary to switch on/off the WSP depending on the pressure).

10.2 The WSP Unit should have sturdy design, long maintenance intervals and easy to repair.

10.3 The WSP Unit has to work axle-selective, that means it has to be a four-axle/four channel configuration.

10.4 It is to be ensured, that manual correction for wheel diameter is not required by WSP.

10.5 The microprocessor wheel slide protection shall have additional module for kilometre performance. So that total kilometre earned by the coach (WSP unit) can be recorded and it can be correlated with the Error Code.

10.6 Supplier shall indicate maximum temperature and humidity for safe working of his equipment. The unit is proposed to be mounted in non-air-conditioned area of the coaches.

10.7 WSP software should have suitable user friendly interface and should store at least the following data w.r.t. time and date for minimum period of three months. WSP software to be provided free of cost against purchase order to the user Railway.
a) Error code.

<table>
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<tr>
<th>Failure Description</th>
<th>Failure Code</th>
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<tr>
<td>Speed Sensor Failure (Open/Short Circuit) Axle 1, Axle 2, Axle 3 &amp; Axle 4</td>
<td>0011, 0021, 0031 &amp; 0041</td>
</tr>
<tr>
<td>Speed Sensor Failure (Gap/Frequency) Axle 1, Axle 2, Axle 3 &amp; Axle 4</td>
<td>0012, 0022, 0032 &amp; 0042</td>
</tr>
<tr>
<td>Dump Valve Failure (Short Circuit) Axle 1, Axle 2, Axle 3 &amp; Axle 4</td>
<td>0013, 0023, 0033 &amp; 0043</td>
</tr>
<tr>
<td>Dump Valve Failure (Open Circuit) Axle 1, Axle 2, Axle 3 &amp; Axle 4</td>
<td>0014, 0024, 0034 &amp; 0044</td>
</tr>
<tr>
<td>Transient Error</td>
<td>0001</td>
</tr>
<tr>
<td>O.K.</td>
<td>0099</td>
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b) Dump valve activation date & time; Axle number and reference speed/speed of all four axles.

10.8 The supply of the microprocessor shall switch-off automatically after a certain period of time when the vehicle is not in use.

10.9 Wheel slide protection system shall employ pole wheel of 80 teeth fitted on to Security disc to FIAT-SIG Drg. No. 1902094 Ver-4 on the one end of each axle as shown in FIAT-SIG drawing No. 1268823 Ver-02. For the purpose of standardization and enabling physical interfacing with the bearings, it is desirable that the pole wheel should be as per Parizzi Drawing No. V12014.

10.10 Axle box mounted speed sensor (one for each axle) shall be employed as a transmitter and shall fulfil the requirements of this specification. In order to achieve physical interfacing of speed sensor with front cover of axle box and pole wheel, the sensor shall be fitted in the front cover as per FIAT-SIG Drawing no. 1902713 Ver.06 and 1902714 Ver.07. The tenderer shall ensure it that proper gap between pole wheel and speed sensor is maintained for proper functioning of the wheel slide protection system.

11.0 ENVIRONMENTAL AND AMBIENT CONDITIONS

11.1 Environmental and Ambient Conditions for the WSP Unit

11.1.1 Climatic Conditions

When designing the WSP system, the climatic and environmental conditions as specified below, are to be taken into consideration. All materials selected must withstand these external influences during their lifetime without any restrictions on their function and safety.

- Maximum Temperature in Sun: 70 deg. C
- Maximum Temperature in Shade: 45 deg. C
- Ambient Temperature inside NAC Coach: 0-50 deg. C
- Altitude: Sea level – 652 m
- Humidity: 100% saturation
- Rainfall: Fairly Heavy
- Atmosphere during hot weather: Dusty
- Environment: Coaches shall be working in coastal area with salt laden and corrosive atmosphere

In minimum all equipment of WSP system must withstand a humidity of 95% and it is presupposed that the water does not condense.
11.1.2 Protection against Corrosion

11.1.2.1 Due to the climatic conditions defined above, protection against corrosion as well as an anticorrosive design and material selection are of special importance for the parts and components of the WSP Unit and must be realized accordingly. All WSP components to be arranged in the vehicle’s underframe are to be painted completely where corrosion protection is needed.

11.1.2.2 Before painting, the inspection addresses with the company labels are to be covered. Bolts, slide surfaces, threaded spindles, valves, etc. are not to be painted. If necessary, the inner walls of the WSP Unit components are to be molatened with corrosion protection oil.

11.1.3 Energy Supply for Electrical/Electronic Components of the WSP Equipment

For the energy supply of electrical and electronic components of the WSP Unit a 110 V direct current voltage is available in the vehicles.

11.1.4 Mechanical Strength Requirements

All components of the WSP Unit are to be designed according to the mechanical strength requirements stipulated in UIC 566. If required corresponding proofs are to be submitted.

11.1.5 Service Life

The coaches manufactured by Indian Railways are designated for a service life of 35 years. The WSP Unit is to be developed and designed accordingly. The supplier should specify the recommended maintenance schedules/practices clearly to achieve the desired life. However, minimum life of WSP system should not be less than 10 years.

11.1.6 Reliability

The reliability of the WSP Unit or the parts and components included in the supplier’s scope of delivery is to guarantee a mileage of 200,000 km without any failures. The conditions for proving a trouble free mileage are to be coordinated with LHB. The design of all parts has to guarantee that under normal operating conditions a mileage of 1,000,000 km will be reached without any replacements. The supplier should specify the recommended maintenance schedules/practices clearly to achieve the desired life. The approvals documentation for the WSP shall also contain a reliability study. Quantification shall be carried out using the databases of expected or operating reliability valid at the time of approval.

11.1.7 Design Suitable for Easy Maintenance

The design of the WSP Unit is to allow an easy maintenance.

11.1.8 Environmental and Ambient Conditions caused by the WSP Unit

11.1.8.1 Environmental Acceptability

When selecting the materials, the general aspects of environmental acceptability, the degradability of the materials used without residues, if possible, or the later recycling are to be taken into consideration.

11.1.8.2 Electromagnetic Compatibility

The legal rules concerning the protection requirements for the EMC of electrical parts and components within the scope of supply of the WSP Unit supplier are to be considered and corresponding proofs are to be submitted.
12.0 DESIGN DOCUMENTS

12.1 The following documentations for the development and design of the WSP equipment are to be prepared by the supplier:

- A set of drawings consisting of broad dimensions and parts lists, including block diagrams, pneumatic flow charts and wiring schemes, list of operating subassemblies etc. (for documentation of electrical and pneumatic components).
- A description of the WSP Unit including the description of diagnostics.
- An operation and maintenance manual.
- A list of spare parts.

13.0 SUBMISSION OF TECHNICAL DOCUMENTS

13.1 Firm shall submit the following technical documents/details for WSP Unit at the time of registration to RDSO:-

13.1.1 Schematic diagram for the WSP Unit.
13.1.2 Descriptive literature explaining the systems.
13.1.3 Descriptive literature explaining the individual equipment used in the system.
13.1.4 Layout dispositions of all the components/equipments on bogie, underframe and body.
13.1.5 QAP for manufacture and supply of WSP Unit. The 'Quality Assurance Plan' shall be prepared in accordance with the guidelines given in brochure No. CG-G-7.1-2.
13.1.6 Operation and maintenance manual and instructions, maintenance schedule of all individual items.
13.1.7 The complete set of drawings in A1/A2 size for each item of WSP Unit which shall contain details regarding material specification, dimensions, estimated weight, testing parameters, reference to manufacturing / original collaborator’s drawing etc.
13.1.8 Electrical wiring diagram.
13.1.9 Electrical power requirement i.e. voltage, current (AC/DC) for WSP.

14.0 APPROVAL OF DRAWING

14.1 The design/drawing of the WSP Unit shall be developed based on the technical and performance requirements given in this specification and sound engineering practice. The entire drawing shall be submitted by the firm with technical data and calculations to RDSO for approval.

14.2 The drawing shall be developed in SI units.

14.3 Material grade/ specifications for each component shall be indicated on the relevant drawings of the firm and the firm shall supply copies of translation in English of such specifications/drawings other than Indian Standard Specifications to purchaser/RDSO.

14.4 Approval of the design means the approval of the general design features. Notwithstanding the approval, the contractor will be wholly responsible for the performance of the WSP Unit as well as individual components offered.

14.5 Further changes/modifications in the WSP Unit may be called for with a view to achieve standardization and interchangeability. Firm shall be obliged to incorporate necessary changes in the design of his equipment for this purpose.

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15.0 MANUFACTURE

15.1 WSP Unit shall be strictly manufactured as per drawing and specification submitted by the manufacturer.

15.2 WSP Unit to be supplied shall be free from injurious defects that may impair their strength. Contractor shall also ensure that all items are adequately treated and painted (excluding flange faces) to prevent corrosion.

15.3 All parts of WSP Unit shall be given suitable anti-corrosive treatment and painted with two coats of paints with colors as specified by IR before supply (if required). The surface of light alloy castings shall be anodized.

16.0 INSPECTION

16.1 The complete WSP Unit to be supplied by the firm shall be inspected and accepted by the inspecting authority nominated by the purchaser in the supplier’s plant. The cost shall be borne by supplier.

16.2 During Prototype development the firm shall offers at least one sets of complete WSP Unit to carry out the following test/check:

16.2.1 Checking of dimensions & tolerances, interchange ability of components and general workmanship.

16.2.2 Performance testing of WSP Unit.

16.3 Contractor shall be responsible for the proper functioning of the WSP Unit, as per procedure laid down to be mutually agreed to between the contractor and Purchaser.

16.4 Inspection authority shall have access to all detailed manufacturing/original collaborator’s drawings for all items of equipment. Contractor shall be obliged to table these drawings as and when called for.

16.5 The inspection authority may deviate from the agreed procedure if and when found necessary to reassure that the material is being furnished in accordance with these specifications. In this regard the contractor shall not be entitled to object on any ground whatsoever on the nature and procedure of testing that may be followed by the inspecting authority.

16.6 During the fabrication, subsequent inspection visit, the brake supplier shall allow IR inspection officer.

17.0 EXAMS, PROOFS

17.1 Qualification tests, commissioning test routine

The supplier is to carry out a type test of the WSP system. This can be combined with the first article inspection.

Within the framework of this type test, the supplier is to prove that

- The WSP system fulfills the requirement specified in this specification,
- The interfaces with other components and systems as well as with other vehicles of Indian Railways guarantee a perfect operation.

The supplier of the WSP system is punctually to submit the check plan for the type test, which specifies which tests are to be carried out at what time, to the customer for approval.

The supplier has to draw up a commissioning test plan which specifies all necessary activities for first commissioning of the WSP system.
17.2 Proofs
At latest within the framework of the type test, the supplier of the WSP system is to deliver the following proofs:
- According to UIC 566, the corresponding strength proofs and calculations respectively are to be delivered.
- All weights of the parts being included in the scope of supply of the WSP system.

18.0 FIELD TRIAL
18.1 The WSP Unit of all suppliers (even UIC approved) shall be subjected to field trial on minimum 2 nos. Coaches for examining the functional/performance testing as per RDSO trial scheme no.RDSO/2015/CG/TS-21.

18.2 Further WSP Unit (Non UIC approved) of the supplier shall be subjected to extended field trial on minimum 08 nos. Coaches (preferably in a rake) for a period of minimum 12 months. The performance during this period shall be monitored as per RDSO trial scheme.

18.3 Any modifications found necessary as a result of these tests/trial or further service trials shall be carried out by the manufacturer at their own cost in the coaches in a manner approved by the purchaser/RDSO. All key and manufacturing drawings incorporating the modifications shall be submitted to RDSO for final approval.

18.4 After the satisfactory performance of the field trials, the firm may be considered for approval.

19.0 MARKING
Identification codes (manufacturer’s name / trade mark), month / week & year of manufacture and serial number is to be applied to main equipment and subcomponents in a minute, clearly recognizable way; (Plate, label, or stamped, laser marking) to avoid mixing and for settling down warranty claim.

20.0 PACKING
20.1 Supplier shall ensure that all outer parts and exposed threaded portions of the various items of WSP Unit are suitably covered with protection caps to prevent ingress of foreign matter / damage to threads during handling and storage.

20.2 Supplier shall also ensure that all items of WSP Unit in an assembled condition are adequately packed before dispatch to prevent damage in transporting, handling and storage. The safe transportation shall be the responsibility of manufacturer.