

RAIL COACH FACTORY, KAPURTHALA		
Specification No.	Description	Covering Page
Mech/M&P/3600/GM/02 Rev.- NIL	Virtual Welding Simulator	

Designation	Name	Signature	Date	Level
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Issue/ Rev	Changes	Date

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## 1.0 IMPORTANT INSTRUCTIONS TO TENDERERS FOR FILLING TECHNICAL BID

- 1.1 Bidders are required to give clause wise comments on the technical specifications, confirming compliance/non-compliance with details of deviations if any along with their effect on the performance. Back references to be avoided, offers are likely to be ignored in case of non-compliance of these instructions for furnishing the information.
- 1.2 Unless otherwise stated, latest alterations/ revisions of specifications/ standards/ drawings shall be applicable. In respect of safety standards and environmental standards relevant to the machine, the machine manufacturers shall ensure compliance with international (CE/ISO/DIN/JIS)/National standards (IS) (wherever applicable).
- 1.3 Tenderers should offer and quote for all the specified concomitant accessories, as these are considered essential for commissioning and utilization of the machine. Even if bidder does not recommend the purchase any of these accessories, the price must be quoted for comparison purposes and their recommendation/suggestion indicated in the offer.
- 1.4 Tenderers should also quote for optional accessories, spares and consumable spares as asked in the specifications.
- 1.5 In case, any item is required in sets, please specify nos./pieces per set. This is essential for proper technical evaluation of the offer. Offers received without this may be considered as incomplete and liable to be rejected.
- 1.6 The bidder should quote only for the specified make of sub-assemblies and equipment wherever specified. Makes of sub-systems other than the specified ones will normally not be acceptable. In case, some other make is quoted, specific reasons for the same including its features/advantages over specified makes must be brought out in the offer.
- 1.7 In case there is a contradiction in any information provided (some parametric values given in the specification and those given in the brochure or some other document enclosed by the tenderer), unless specifically mentioned in the deviation cum confirmation statement the values as given in the specification shall be taken as confirmed by the tenderer and offer evaluated accordingly.
- 1.8 The Purchaser may accept internationally accepted alternative specifications which ensure equal or higher quality than the specifications mentioned in the Technical Specification. However, the decision of the Purchaser in this regard shall be final.
- 1.9 Purchaser reserves the right to verify the details submitted by the bidder by actual site visits.
- 1.10 Other terms & condition of the contract will be as per Indian Railway Standard conditions of contract.
- 1.11 Tenderer not submitting the requisite information may note that his offer is liable to be ignored.

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## 2.0 PURPOSE

01 no. Virtual Welding Simulator is required in Technical Training Centre of Rail Coach Factory, Kapurthala to improve upon welding skills of welders and their quality of work with the help of augmented reality- Green Learning technology with no real arc or real fumes.

## 3.0 DESCRIPTION AND SCOPE OF SUPPLY

- 3.1 The scope of supply covers design, manufacture, supply, installation and commissioning of Virtual Welding Simulator as per below specifications and major parameters given in the Schedule-I.
- 3.2 The supply shall also include all equipments and accessories which the manufacturer considers essential to make the equipment fully functional when installed and put into operation.
- 3.3 Other concomitant accessories/ equipment which the manufacturer considers essential to make the machine fully operational when installed and commissioned with requirement of utilities, etc if any, should be clearly indicated by tenderer in the offer.
- 3.4 The total value of the offer will be calculated on.
- i. The cost of the basic machine.
  - ii. Cost of the concomitant accessories according to tenderer specification.
  - iii. Cost of any other accessory treated as concomitant accessory.
  - iv. Application duties and taxes, insurance, freight and installation and Commissioning charges.
- 3.5 Technical experts of the manufacturer during commissioning of machine will fully and adequately train the operators/ maintenance staff nominated by the consignee

## 4.0 ELIGIBILITY CRITERIA

- 4.1 The tenderer shall have established quality control system and organization to ensure adequate control at all stages of the manufacturing process.
- 4.2 The tenderer shall provide a performance statement giving a list of major supplies of same/similar equipments in last 5 years to Indian Railways giving details of the order no. and date and the quantity supplied and whether the supply was made within the delivery schedule. Such period shall be reckoned from the date of opening of tender. Tenderer should also provide the prove out test certificate of his supply/supplies. All above documents shall be uploaded along with the offer.
- 4.3 Only OEM of equipment or their authorized dealers can only participate in the tender.

## 5.0 GENERAL FEATURES

- 5.1 The equipment must be able to train student and simulate SMAW, GMAW, FCAW and GTAW welding processes virtually and must not produce any real arc and real fume.
- 5.2 The equipment shall be designed to operate on single phase, 230 Volts. Current and Voltage Range parameters for SMAW, GMAW and GTAW shall be as mentioned in Schedule-I.
- 5.3 The simulator shall be sturdy enough, body made of Steel Structure.
- 5.4 The system shall feature an extensive range of options for practicing on a variety of work pieces that can be placed on the simulator in different positions as mentioned in Schedule-I.
- 5.5 The system shall be designed such that the users can be trained in almost all welding positions.

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- 5.6 The system shall be supplied with right, ergonomically designed welding torch (or electrode holder) for every process.
- 5.7 The system shall be available in both Hindi and English to practically eliminate language barriers during training.
- 5.8 The system shall have Workshop Skill Training Feature wherein there is provision to place workpiece in a Fixed stand/ Locator so that the user learns to weld where workpiece is in a fixture.
- 5.9 The system shall have Industry Skill Training Feature wherein there is provision to place workpiece anywhere on a worktable so that the user learns to weld where workpiece is not in a fixture.
- 5.10 The system shall be supplied with Augmented Reality Welding Mask which shall have two high resolution cameras and 5" screen to create an interactive and real time environment.
- 5.11 The system shall be designed such that the student can work in a real environment, with all the real elements used in workshops (welding torches, welding helmet, workpieces, etc.) and system with help of augmented reality technology, make all those elements interact, to draw computer generated graphics welding effects, offering a realistic welding training experience.
- 5.12 The system shall be designed such that it can be easily updated with latest version of the software and new processes using an external DVD or USB Drive or HDD.
- 5.13 The system shall provide feel of real environment, objects, welding simulation and welding sound to the user.
- 5.14 The supplied system shall be a complete simulation package including Welding Simulator, Router, Router Cables, Simulator Cables, Wi-Fi antennae etc.
- 5.15 **Welding Guidance through Simulator:**
1. The system shall have guidance feature for parameters like current, voltage etc. for guiding students. The student must always be able to see if the parameters are correct or wrong even after he starts welding. The simulator must have indicators to guide the student.
  2. The system shall have guidance feature for head position like head to workpiece, Up/down etc. Simulator must guide the student on the correct head position through indicators all throughout the welding practice.
  3. The system shall have guidance features for basic skills like Stick Out, Path, Arc Length, Welding Speed, Work Angle And Travel Angle. Advanced skills like Stick out (CTWD) in GMAW. In GTAW, it must Guide on The Work and Travel Angle of The Filler Rod.
  4. The system shall have analysis feature wherein it can analyze skill and defect through Graphical, Percentile and Video representation.
  5. The system shall have Welder View feature i.e. Welder shall be able to see the real workpiece from inside the helmet. At any point during the welding, he shall be able to touch / rotate / adjust the workpiece to gain comfort.
  6. The system shall be provided with HD Flat Screen Reality Helmet- Goggle less vision for the user comfort and HD Mask shall be provided for users wearing spectacles.
- 5.16 **Welding Assessment through Simulator:**
1. The system shall have skill analysis feature for Arc Length, Stick Out, Work Angle, Travel Angle & Path of the GMAW Torch and for Work Angle and Travel Angle in GTAW Filler Rod.

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2. The system shall have visual evaluation feature for holding the workpiece in hand and inspect. It shall also have provision for lifting, Rotating, Turning and seeing the welding from all possible angles.
3. The system must have dual access for both student and trainer i.e. online access for student practice and offline access for trainer to evaluate the previous performance, both activities must happen parallel.
4. The system must have trainer access i.e. offline access for the trainer for evaluation, analysis, data feeding etc. when the student is practicing
- 5.17 The system shall have feature for access from external PC for carrying out various activities as below:
  1. Adding, Editing & Deleting Student Names, Courses and Modules
  2. Uploading of PDF Documents
  3. Creating own WPS
  4. Evaluation of Student Performance.

The Supplier shall provide compatible software for offline access to the trainer to carry out the above activities through external PC.
- 5.18 The system shall comply with CE and FCC safety regulations and the bidder shall attach certificate for the same along with the offer.
- 5.19 The software supplied along with the system shall be accredited by any international welding society and designed and developed by any OEM except from China.

**6.0 CONCOMITANT ACCESSORIES**

- 6.1 The following concomitant Accessories shall be supplied along with each equipment or in addition to the quantity already part of the machine:

(i) Welding Simulator	- 01 no.
(ii) Reality Helmet	- 01 no.
(iii) SMAW Torch and Electrode	- 01 no. each
(iv) GMAW Torch with Nozzle	- 01 no.
(v) GTAW Torch with Simulated Filler Rod	- 01 no.
(vi) Lap Joint workpiece	- 01 no.
(vii) Butt Joint workpiece	- 01 no.
(viii) Fillet Joint Workpiece	- 01 no.
(ix) Pipe Butt Workpiece	- 01 no.
(x) Pipe Fillet Workpiece	- 01 no.
(xi) Work stand for 6G/6F	- 01 no.
(xii) Software for Offline access(To be provided in HDD)	- 01 no.
(xiii) Router with cables	- 01 no.
(xiv) Tool Kit	- 01 no.
- 6.2 In addition to above, the tenderer shall supply a list of concomitant accessories, which will be supplied along with the machine. The cost of each listed concomitant accessory should be quoted separately. Wherever for any reason the cost of any concomitant accessory is included in the basic price of the machine the same should be specifically mentioned.
- 6.3 Any other accessory, which in the opinion of the tenderer can contribute to higher performance, should be indicated and quoted separately.
- 6.4 A maintenance tool kit containing hand tools is required to cover all the fasteners of all sub-assemblies of the equipment.

**7.0 SPARES & CONSUMABLES**

- 7.1 The tenderer should furnish details of spares covered under warranty.

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- 7.2 List of important spare parts and accessories with their part number and costing.
- 7.3 The tenderer should be furnishing the price list of spare parts required for two years normal maintenance of the equipment. Sources of supply of spares used other than that of manufacturer should be furnished by the tenderer.
- 7.4 List of recommended spares for normal maintenance after expiry of warranty period to till useful life of the equipment and these spares should be readily available in the market with your authorised stockists.
- 7.5 List of recommended consumables for two years shall be quoted separately.
- 7.6 Useful life estimated/expected for each equipment and its sub assembly should be indicated by the tenderers.

### 8.0 OPTIONAL ACCESSORIES

Any other accessory, which is in the opinion of the tenderer can contribute to higher production rates, should be indicated and quoted separately mentioning prices of each accessory.

### 9.0 INSPECTION OF EQUIPMENT & TESTING AT MANUFACTURERS WORK

- 9.1 Manufacturers must have suitable facilities at their works for carrying out various performance tests on the equipment. The tenderer should clearly confirm that all the facilities exists and shall be made available to the inspecting authority.
- 9.2 A test report from NABL certified LAB should be submitted in respect of accuracies and other detection measurement parameters given in specification. Such a certificate will be provided before installation of the system at Site. Inspecting agency will verify all above parameters indicated in the specification before granting commissioning certificate.
- 9.3 Any precaution & extra care intended in the use of the equipment should be explicitly informed.

### 10.0 INSTALLATION, COMMISSIONING AND PROVING TESTS

- 10.1 The contractor or his agent would be required to carry out a joint check at the consignee's end, along with the consignee, before unpacking is done, to avoid subsequent complaints regarding short shipment/transit damages. It is necessary that this joint inspection be done immediately on receipt of the machine by consignee to avoid commissioning delays due to shortages/transit damages.
- 10.2 Installation of the machine would be done under the supervision / direction of firm engineers. The contractor shall arrange commissioning of machine after installation is done. Adequate number of teams of technical experts will be made available so that the commissioning delays are eliminated. Such personnel will be required to be present as soon as the machine has been received.
- 10.3 The contractor or his agent shall commission the machine within 15 days from the date of receipt of machine.
- 10.4 The machine performance shall be demonstrated to the full satisfaction of consignee at the consignee's works.
- 10.5 If an assembly/sub-assembly requires to be taken back to the manufacturer's premises for repairs/replacement either before commissioning or during warranty, the manufacturer or his agent would be required to submit a Bank Guarantee.
- 10.6 In case the entire machine has to be taken back, a Bank Guarantee would have to be submitted. The Bank Guarantee should be of adequate value so as to cover the cost of the assembly/sub-assembly/paid up cost of the machine.

### 11.0 TECHNICAL LITERATURE

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11.1 One copy of the printed illustrative catalogue showing technical features of the machine and its elements must be enclosed with each copy of the bid.

11.2 The successful tenderer will have to furnish, for each machine 4 copies of spare parts catalogue giving the part list number of each component with exploded views and assembly drawings of major assemblies, maintenance manual, safety manual, trouble shooting guide, operational manual of the machine and all electrical circuit diagrams to the consignee directly within 3 months of the placement of order. The bidders should provide a list of literature, they will supply along with the machine. The technical literature shall be provided for complete machine including imported and indigenously purchased components/sub-assemblies.

**12.0 SPECIAL FEATURES**

Special features incorporated in the equipment, if any, shall be indicated separately by the tenderer, clearly indicating advantages of the features.

**13.0 MAKE**

13.1 The supplier shall clearly mention whether the system quoted is Indian make or imported. If Indian make, the tender should be accompanied by duly sanctioned factory license & relevant documents & also produce records of installation & satisfactory after sales service performance of their equipment from at least one govt. Institution of similar or large size for duration at least 3 Years duration.

13.2 If imported item, the OEM firm should be registered for operations in India for a minimum period of last 3 years. In case this is not so, the dealer should be authorised regional supplier & service provide for the late 3 years. He should also produce installation & satisfactory after sales service record of duration at least last 3 years from at least one govt. Institution for a system of similar or larger size. Further the tender should be accompanied by authorisation certificate from OEM.

13.3 The supplier shall furnish the complete details of Model No. Make & Manufacturer's details/ address, Country and authorization details of Dealership.

**14.0 DEVIATIONS:**

The tenderer should clearly certify that the machine offered fully meets the specification various design features incorporated in the machine to fulfil different technical performance requirements should be fully explained in the offer. However, minor deviations from this specification, which do not affect or in any way interfere with the stipulated performance standards, or would result in improved safety/reliability or would reduce recurring maintenance/operating cost of the machine, can be considered for acceptance.

**15.0 SERVICING FACILITIES**

15.1 Service facility in Punjab, Address and contract details including phone and fax no. to be provided. The facility should have the necessary equipments recommended by the manufacture to carry out preventive maintenance test as per guideline provided in the service / maintenance manual. Firm should provide list of equipment available for providing calibrations and routine maintenance support as per manufacturer.

15.2 Supplier will undertake for service repairs & replacement of any needed part as & when needed.

15.3 Maintenance contract to be quoted after the expiry of maintenance period quoted above with details of scheduled visits, part covered under contract & cost of parts not covered as well.

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- 15.4 The tenderer shall clearly spell out in the offer about the facility available with him or his agent/dealer for providing adequate after sales service in Punjab during warranty period.
- 15.5 The contractor shall give a comprehensive spare part list with OEM details and price for all the sub systems.
- 15.6 The tenderer/contractor shall provide list of spares, consumables required for maintenance for 5 years after completion of warranty period as per annexure A.
- 15.7 Tenderer shall provide expected life for the components of the system and provide the maintenance schedule required for 10years for as per annexure -
- 15.8 Total up time of the system should be at least 90%. Up time shall be counted in following manner:-
- A) Total breakdown of less than 8 hours shall be ignored for the purpose of this calculation.
- B) Penalty may be imposed if the down time is more than 10% without any valid reasons. The levy of token penalty as deemed fit based on the merit of the case may also be considered.
- 15.9 Tenderer shall provide the service charges /per day/per man for deputing service engineer on the machine on requirement separately for Indian and Foreign engineer.
- 16.0 **WARRANTY**
- 16.1 As per IRS conditions or as quoted by the tenderer whichever is later.
- 16.2 Warranty period for part or machine shall be extended after completion of warranty period by the duration under which the part or machine remains under breakdown during warranty.
- 17.0 **SCHEDULE OF ANNUAL MAINTENANCE CONTRACT (AMC) FOR PERIOD OF 5 YEARS AFTER COMPLETION OF WARRANTY PERIOD**
- 17.1 Tenderer shall provide proposal for 5 year Annual Preventive Maintenance schedule to be executed after completion of warranty period in the format as per annexure-B.
- 17.2 The firm shall maintain the machine in good working condition during the contract period and shall correct the fault or failures, repair or replace the worn or defective parts/equipment during the normal working hours of shop where the equipment has been installed. Unserviceable parts/equipment need to be replaced at no extra cost with brand new parts/equivalent or superior specification.
- 17.3 The firm shall respond by deputing service personal to oral / telephonic/ or other modes of intimation for repair and maintenance of the said machines within 2 hours.
- 17.4 The firm shall ensure that the machine is in proper working condition, to the full capacity, after repair and maintenance.
- 17.5 To have a timely supply of spares during AMC, the contractor shall furnish a total list of spares which should contain list of spares that shall be arranged by the firm, both chargeable, duly mentioning the charge against each item, and spares which shall be non-chargeable, and list of spares to be held by RCF.
- 17.6 The contractor shall clearly list-out the list of consumables required for day-to-day operation of the machine. It shall be the scope of RCF to arrange the consumables once the completion certificate is issued for the retrofitted machine.
- 17.7 The tenderer/contractor shall provide suitable standby when repairs exceeds 2 hours. When any equipment is taken for repair to the tenderer/contractor's premises suitable standby equipment should be provided.
- 17.8 Besides attending the breakdown calls, the firm shall attend to the corrective and preventive maintenance of the machines once in a month.

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- 17.9 The AMC is valid for five years from the date of completion of the warranty period . No freight is admissible.
- 17.10 During the AMC period, whatever equipment is defective shall be handed over to RCF. During completion of the AMC period the machines should be handed over in full working condition to its full capacity.
- 17.11 The firm should maintain a register duly indicating the nature of defects and repair attended and got signed by RCF authority. Preventive maintenance schedule should be made. The schedule should be made in such a way that more than one machine should not be attended on the same day. A copy of the schedule should be given to RCF at the beginning of the AMC and the schedule should be strictly followed and on carrying out the preventive maintenance the same should be entered in the register and got signed by RCF authority.
- 17.12 AMC charges shall be paid quarterly as one quarter of the total AMC charges applicable for that year on submission of bills duly certified by the engineers in charge with regard to the satisfactory execution of AMC during the period for which the bill is claimed. Duties & taxes as applicable at the time of payment shall be deducted at source.

**18.0 PAYMENT TERMS**

80 % on receipt of machine and balance 20% after successful commissioning of machine and submission of Bank guarantee equivalent to 10% of P.O value valid up to the warranty period of the machine.

**19.0 DOCUMENTS TO BE UPLOADED FOR TECHNICAL EVALUATION**

Following documents must be submitted by the tenderer along with the offer:

1. Clause wise comments on technical specification
2. Documentary evidence of previous supplies to other Railways
3. Authorisation certificate of OEM in case of Authorised dealer
4. Detailed list of spares covered under warranty.
5. Details asked as per Annexure A and Annexure-B.
6. Details of deviations from specification if any as per Annexure-C

Tenderer not submitting the above information may note that his offer is liable to be ignored.

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## SCHEDULE-I

### MAJOR PARAMETERS

WELDING PARAMETERS IN THE SIMULATOR	
Make/ Model	Seabery / Soldamatic/ Fronius/ Lincoln/ EWM
Technology	Augmented Reality
Input Supply	Single Phase 230V
Current Range - SMAW	50A - 240A (2.5, 3.15 & 4mm Electrode)
Voltage & Current Range - GMAW	10V - 32V & 25A - 270A (0.8, 1.0, & 1.2 Dia Wire)
Current Range - GTAW	25A - 270A (2.0 Filler Rod)
Parameter Adjustment	Current, Voltage, Wire Feed Speed & Gas Pressure
Weight of The Simulator Unit	Less Than 20 Kg. Sturdy & Stainless Steel Body Design
System Construction	Welding simulator system should be supplied as a single unit with integrated display screen.(Easy installation and mobility is a must)
WELDING PRACTICES IN THE SIMULATOR	
Process Simulated	SMAW, GMAW, FCAW AND GTAW
Component Simulation Possibilities	Actual Component Simulation & Robotic Integration Possibility
Physical Work pieces	Butt , Fillet, Lap, Pipe To Pipe And Pipe To Plate Joints
Welding Position	1F TO 6F positions in fillet and 1G TO 6G positions in groove
Skills learned	<ul style="list-style-type: none"> <li>Stick Out, Path, Arc Length, Welding Speed, Work Angle And Travel Angle</li> <li>Stick out (CTWD) in GMAW</li> <li>Work and Travel Angle of The Filler Rod in GTAW</li> </ul>
Type of work pieces	Haptic work pieces (non-metallic)
Thickness Of Base Material	3mm, 6mm & 10mm
Welding Practice	Work piece to provide minimum 10 inch long weld bead practice.
Torch Control - GMAW & GTAW	Two step and four step controls
Torches - GMAW & GTAW	Real industrial torches for real feel and weight (any reputed make like TBI or Abicor Binzel)
WELDING SIMULATION IN THE SIMULATOR	
Simulation Technology	Augmented Reality
Simulation Methodology	Green learning with no real arc or real fumes.
Weld Bead Simulation	Real 3D simulation. No torch tracking movement on monitor with graphic imaging
Virtual & Actual Components	The work piece, torches and electrode must be real hardware and the simulation must be virtual objects visible though the reality mask
Object Simulation	100% virtual objects super imposed on real objects and can be seen through the reality helmet
Environment Simulation	100% real environment seen through the reality helmet during welding
Hardware Objects	Hardware objects are SMAW holder, SMAW electrode, GMAW torch, GTAW torch, TIG filler and all work pieces
Software Accreditation	Software must be accredited by any international welding society and designed & developed by any global OEM except from China
Welding Practice	Practice on physical workpiece - minimum 10 inch long weld bead

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SMAW Welding Practice	During SMAW welding practice, physical electrode (hardware) to be used and the same must retract simulating the consumption of electrode
Analysis modes reports	Video playback & Graphical report with option of viewing from different angles
Evaluation	Every weld bead to be evaluated by the simulator
<b>SAFETY, QUALITY, VALIDATION AND AUTHENTICITY</b>	
Safety regulations	Comply with CE and FCC regulations - certificate to be enclosed
Sturdy design	Simulator to be made of steel structure and not from non metal (wood, plastic)
ISO 9001 / 14001	ISO certificate for quality & environment - OEM certificate to be enclosed
Accreditation	Accreditation certificate from any recognized welding body (IIW, AWS, DVS, IWS etc.)
Protection Against	Over current , Under voltage , Over voltage , Short Current

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**ANNEXURE-A**

Tenderer shall provide list of spares, consumables required for maintenance for 5 years after completion of warranty period as below:

S.N.	ITEM	PART NO.	SERVICE LIFE	PRICE

**ANNEXURE –B**

Tenderer shall provide proposal for 5 year Annual Preventive Maintenance schedule to be executed after completion of warranty period in the format as below:

S.N.	YEAR	AMC CHARGES
1.	IST YEAR	
2.	IIND YEAR	
3.	IIIRD YEAR	
4.	IVTH YEAR	
5.	VTH YEAR	

**ANNEXURE –C**

DEVIATION STATEMENT ( IF ANY)

S.N.	Specification Clause No.	Deviation ( If Any)
1.		
2.		
3.		
4.		
5.		