Section-I

IMPORTANT INSTRUCTIONS TO TENDERERS FOR FILLING TECHNICAL BID

1.0 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.

1.1 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).

1.2 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.

1.3 Tenderers should also quote for optional accessories, spares and consumable spares as asked in the specifications.

1.4 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.

1.5 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.

1.6 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.

1.7 In order to assess the manufacturing capability of OEM and to be assured regarding OEM's manufacturing facility/ facilities in India and hence the ability of its Authorized Distributor to supply the said machine, a self certified Capability Assessment report of the OEM as per Annexure-F must be submitted by the bidder along with their offer. In addition to above, if felt necessary by the Purchaser, an inspection by actual visit to his works/ office can be carried out by representative of Purchaser/ Third party agency as nominated by the purchaser (TPI cost to be borne by the bidder) to verify the details furnished vide Annexure-F The bidder is bound to comply with the same, without fail.

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.

1.12 **Tenderer shall design the arrangement as per RCF requirement.**

1.13 The CAMC (Comprehensive Annual Maintenance Contract) shall be kept for a period of 05 years after the completion of the warranty period, irrespective of the type of machine/equipment. **The tendered item shall be treated as Critical from CAMC point of view.**

Bidder shall quote year-wise CAMC cost for a period of 5 years in the following format:

Year	**AMC Charges (in Rupees) Without Taxes**	**Remarks**
Ist Year		
IInd Year		
IIIrd year		
IVth year		
Vth year		

In case, any bidder has not quoted year-wise cost of CAMC and only single value has been offered for 05 years CAMC, linear cost division method shall be followed for calculating yearly CAMC cost. It will imply that CAMC cost of each of the 05 years will be *total quoted CAMC cost divided by tenure in years of CAMC*.

1.15 For CAMC, a Bank Guarantee (BG) equivalent to 10% of the PO value of the machine/ equipment shall be deposited by the contractor to the concerned division/section of Executive department as authorized by PHOD/ CHOD of the department, 90 days before the expiry of warranty. BG shall have validity of 5 years and 6 months. The period of CAMC can also be decided to be less than 5 years, if need be at this stage, with the approval of PHOD/CHOD, in which case the validity of BG will be decided accordingly. In addition to the above, Railway reserves the right to cancel the CAMC at any stage of Contract.

1.16 As indicated above, CAMC cost shall be made part of Evaluation Criteria of the Tender. However, this cost will not be part of the Contract Value (PO value).

1.17 The CAMC payment will be made quarterly on submission of the satisfactory performance certificate issued by consignee/user.

2.0 **DESCRIPTION:**

The Robotic Welding System Equipped with Laser Eye for Fabrication & Welding of Bogie Frame & Bolster as per specification no MECH/M&P/3900/2 is required as per main features and description of tender requirements as covered in Section I & Technical Specification in Section-II for carrying out welding of FIAT bogie side-frames & bogie bolsters and Longitudinal beam of TC/NDTC & motor coach Vande Bharat as per Annexure-A. The welding shall be done with the help of robotic welding system and Robot shall complete the weld layer bead in the single sense having the features of automatic seam sensing and seam tracking arrangement Refer clause 1.2.2 and clause 1.2.2.1.1 of Section-II.

2.1 The machine shall have following configuration:

2.1.1 The machine shall consist of controller, teach pendant, robot (moving gantry/ Pedestal/ Linear Track or as per clause 1.2.2.4 of Section-II), single/ multiple axis work positioner, welding power source, work holding fixtures, on line laser sensor, wire feeder with connecting cables and welding torch with inter-connecting cables etc.

2.2	**LEADING PARAMETERS:**	
	MAJOR PARAMETERS:	
	Description	**Parameter**
2.2.1	*Robot Type*	*Gantry or Fixed type to cover the required working envelope on a linear track.*
2.2.2	*Robot Wrist Joint Axis*	*Articulated arm construction*
2.2.3	*No. of Rotational Axis*	*6(Six)*
2.2.4	*No. of Robot*	*01No*
2.2.5	*Repeatability*	*Less than +/- 0.03mm*
2.2.6	*Payload*	*Min.20-25 kg using Twin wire technology*
2.2.7	*Acoustic Noise level*	*70 dB or less (ISO 11201)*
2.2.8	*IP Rating*	*Wrist (*)+J3 arm should be IP67 and other part should be IP54 of robot*
	Power source	
2.2.9	Number of Power Sources	1 nos.
2.2.10	Capacity at 100%duty cycle at 50^{o} C ambient	360 A
2.2.11	Welding Voltage	15 – 40V(range)
2.2.12	Operating Frequency	Not less than 50KHz
2.2.13	Max Pulse Current	500A(min.)
2.2.14	Efficiency	90%
2.2.15	Power Factor	Must be greater than 0.95
	Positioner	
2.2.16	Number of Positioner	2 nos. per Robotic Welding System
2.2.17	Payload	1000Kg.(min.)
2.2.18	Distance between Plates	4500mm(min.)
2.2.19	Rotary Diameter	1500mm(min.)
2.2.20	Torque	1300Nm(min.)
2.2.21	Bending Moment	3200Nm(min)
2.2.22	Rotation Speed	0.1 – 7.5 (range)
	3D Laser Sensor	
2.2.23	Vision Range	30 – 65mm(range)

2.2.24	3DVision Depth	120 mm (min.)
2.2.25	Cooling	Water/Air
2.2.26	Speed	2000 mm/min.(min.)
	OTHER PARAMETERS:	
2.2.27	Synchronized axes	Min.12 fully synchronized axes
2.2.28	*IP Rating*	*54*
2.2.29	Water tank volume (for cooling unit of torch)	5 ltrs.to10ltrs.for each cooling unit.
2.2.30	AC Servo Drive longitudinal slide	Power to be mentioned
2.2.31	Work place protection	To be provided
2.2.32	Humidity	Up to 98%
2.2.33	Temperature	Ambient 0-55deg.C

Note: No deviation shall be permitted in major parameters.

2.3 PERFORMANCE STANDARDS & CAPABILITY:

2.3.1 Each robot shall be capable of heavy weld up to 18 mm mild steel and shall be capable to withstand intensive use of three shift working. Each robot shall be able to provide consistent quality with zero defect welding output along with the desired productivities considering 10 mm (min) deviation in components/assembly.

2.3.2 Six axis welding robot (Robots) with articulated arm type construction having online 3D Laser sensor (with volumetric compensation for variation in groove geometry) are required for complete welding of different types of sub-assemblies and assemblies as per Annexure-A of Section III to the required productivity as mentioned in clause no. 2.4 using *Twin wire* technology for sub-assemblies and assemblies as per clause no 1.2.9.3.2 of Section II with the help of suitable work piece positioners. If required, robots can have the floor mounted slide in horizontal direction in case the components are going out of the work envelope of the robot.

2.3.3 The six axis robot should have simultaneous six-axis movement control having the *repeatability of less than +/- 0.03 mm with payload capacities of minimum 20-25 Kg while welding with twin wire technology.* The effective working range for robot shall cover all the components given in Annexure-A of section III. The control system shall have one digital drive system per freely programmable axis drive actuation. The control system shall be based on industrial PC system/ CNC system with IP 54 Class of protection and suitable for *380-415V, +10%, 50/60 Hz*, 3 phase AC input supply 3 wire system with neutral solid earth. The complete fabrication of sub-assemblies/ assemblies/ Components as per Annexure-A. Work piece positioned shall be located in such a way near the robot so that when welding activities are going on at one positioner, other positioner should be accessible for the operator simultaneously, individually, complementarily for loading and unloading activities of the job. Manual welding required to be done after robotic welding shall be minimum possible and indicated clearly in the offer along with the welding length and time required.

2.3.4 The open machine interface control for monitoring the output data shall be provided.

2.3.5 Each robot shall have AC digital Servo drives with brakes. The Robot Servo and external Axis Servo are to be installed inside the controller unit to protect against dust and temperature. Each robot shall be provided with position recovery system and shall automatically restart the system.

2.3.6 The robots and other equipments shall be capable of working in non-air conditioned arduous tropical workshop conditions and dusty atmosphere with ambient temperature ranging from 0 to 50 degree Celsius and relative humidity up to 98%.

2.4 PRODUCTIVITY:

The integrated Robotic Welding System should be designed to produce components as per Annexure-A of Section-III

Detailed activity wise breakup of time taken for fabrication of each Components/assembly/subassembly as per Annexure-A should also be given. Offers without above information will be treated as incomplete. The welding includes Robotic welding inside and/or outside.

2.4.1.2 The tack welded sub assembly/assembly's may be grinded for fitment purpose.

2.4.5 The uptime of the machine shall be minimum 85% measured every week during the entire proving out period (from the date of commissioning) of machine and 85% measured every month till the warranty period expires. The supplier may continuously monitor and guide the operations during entire proving out period. The full Robotic Welding System breakdown will be considered only on pass-over of 48 hrs breakdown time.

2.4.6 All welding shall be done in down hand welding mode.

2.4.7 The rate of weld deposition, for a range of 0.8-1.6 mm dia. wire, in kg/hr, shall be furnished by the bidder. The design of the torch reach shall be for maximum weld deposition.

2.4.8 The maximum welding length timings taken for welding by Robot for each components mentioned in the Annexure-A shall be given by the bidder with conditions of working, if any.

2.4.9 The bidder must explain the working of machine with concept drawings showing dimensions of overall machine, sequence of working of robots with material handling system for achieving stated productivity.

2.4.10 The bidder must ensure that the above productivities or better are achievable with their offered machine and prove the same at consignee premises during installation and commissioning of the system.

2.5 PROVE OUT AT FIRM'S PREMISES:

2.5.1 The complete system inclusive of material handling system, and robotic working station with manipulator shall be proved out for establishing the claimed productivity mentioned in clause 2.4, at the inspection stage itself at supplier's premises for all the components mentioned in Annexure-A of Section III. The number of sets of components needed for proving out (not more than three sets) shall be indicated by the bidder. The system shall be proved out for establishing the claimed productivity as per Annexure-A of section-III

The bidder shall indicate the number of components needed for proving out.

2.5.2 Consignee will provide the samples/components to be proved out to the supplier on submission of requisite Bank Guarantee. Transportation charges whatsoever shall be borne by supplier of the machine/ system.

2.5.3 Inspection will be carried out by RITES.

2.6 PROVE OUT AT CONSIGNEE'S WORKS

2.6.1 Commissioning at consignee's premises:-commissioning of the machine at consignee's premises shall include the following:

1. Productivity demonstration as per Annexure-A of Section-III
2. *Fabricated side frame ,Bolster & Longitudinal beam of TC/NDTC & motor coach Vande Bharat as per Annexure-A of Section-III should meet with quality criteria [Dimensional (fabricated) and welding quality] as per drawing.*
3. Machine availability should not be less than 90% during commissioning (for 4 days) considering single-shift working.
4. Commissioning certificate would be issued after successful demonstration of the above commissioning-related clauses. Prove out period will start after issuance of successful and complete commissioning certificate.

2.6.2 The prove out period shall start from the date of successful and complete commissioning of the system at consignee's works for 01 month for reliability of lines. *The up-time of the machine will be monitored and will not be less than 90%.*

2.6.3 Proving test certificate shall be issued by the consignee after watching performance of machine for one month after all the components had been proved out. The consignee shall arrange the components for prove out at their end within 30 days of the dry run of the machine and prove out completed within 30 days thereafter failing which the components will be deemed to have been prove out.

2.7 **QUALITY CRITERIA**:

2.7.1 The Scope of Robotic welding of components/assembly/subassembly is mentioned in Annexure-A of Section III. In this regard, the bidder shall provide details.

2.7.2 The MIG wire of size 1.2 mm as per IS specification No. 6419 1996 Grade S3X503 (AWS equivalent A.5.18/93 grade ER70S-6) will be used with the robotic welding system. The weld quality should be achieved with Argon 82%-, CO2 18% gas shield. The gas will be supplied from manifold system/Cylinder.

2.7.3 Welding will be subjected to non-destructive and destructive testing as per Welding Process Qualification of RCF and the weld should qualify those tests. Side frame, Bolster & Longitudinal beam as per annexure-A will be subjected to 100% radiographic tests.

2.7.4 In case it is not possible to test as per above clause (2.7.3), sample test pieces of different thickness combinations as per components mentioned in the drawing of sub assembly/assembly

will be provided. The weld should be free from welding defects. After the welding, there should be no machining and heat treatment involved. The general requirements for interpretation & evaluation of radiographs shall be:

a) Optical Density is 2 to3 as per specification IS:2595/78.

b) Sensitivity less than 2% as per specification IS:3657/78.

2.8 ***SPACE AND UTILITIES AVAILABLE WITH RCF***

2.8.1 SPACE:

2.8.1.1 The offered integrated Robotic welding system is to be set up in the Bogie shop of RCF. The *total covered area of Bogie shop is? ~~60mx420m~~. However, the area available for installation of complete robotic welding system is as shown in the sketch general arrangement plan bogie shop. This sketch is for guidance purpose only.*

[User shop should comment on the area available for installation as per the general arrangement plan and provide any additio nal requirements or constraints.]

2.8.2 Water supply

a) The water supply availability with the consignee is indicated below. The successful bidder shall make arrangement for taking necessary connection from the available point and connect to the system wherever required.

b) Water supply will be available in the plant at about 1.5 kg/sq.cm and temperature range of 4 deg. C to 45 deg. C depending on the seasonal conditions and through GI pipe connection.

c) All piping necessary for connection from the supply main and to the return main and from the various consumption points respectively together with valves, fittings, pressure reducers, gauges and controls shall be included in the supplies. All valves and fittings shall be located in easily accessible positions for operation and maintenance.

d) Water treatment plant, if required, shall form part of the Scope of supply. The water shall be recycled and used.

e) The rate of consumption of water shall be furnished in the offer, if required.

2.8.3. Compressed air supply (If required)

2.8.3.1 *Compressed air at 6 bar pressure is available at RCF*. If more pressure or other quality of compressed air is required, the system shall be supplied by the successful tenderer with a self-sufficient air compressor of adequate capacity fitted with air drier capable for supplying air at requisite pressure and quality of the system.

2.8.4 Electrical/Electronics

a) Electrical / electronic system for the equipment should be suitable for 415 + 10%V, 50 Hz+/- 3% 3 phase AC input supply 3 wire with neutral earth.

b) The necessary incoming supply will be made available by RCF at a single point in a distribution board located near the equipment by using suitable cables.

c) All the internal requisite power & control wiring shall be under the scope of successful tenderer. All other details of electrical / electronic shall be as per clause 2 of Section-II.

d) Necessary separate earthing pits and earthing strips as per relevant IS specification for safe working of electrical and electronic equipments shall be included by the tenderer which will be in the scope of work.

e) The total cabling work from distribution board to the machine will be carried out by the successful tenderer.

2.8.5 Shielding Gas (Argon and Co2 mix):- Shielding gas is available on the points mounted on column in Bogie Shop. Internal pipe line of shielding gas is in the scope of successful bidder. In case of failure of pipe line gas, it will be also provided in cylinders.

2.8.6 Soil Condition

The floor of the shed, where the machines will be installed, will have industrial flooring. The floor leveling for flatness requirement for machine installation shall be taken care of by the supplier while doing the foundation work. Bidders may visit the actual site located at RCF, if required.

3.0 QUANTITY & CONSIGNEE:

S.No.	CONSIGNEE	QUANTITY REQUIRED	Specification No.
1.	Dy. CPE-I	one	MECH/M&P/3900/2

4.0 EVALUATION CRITERIA

4.1 The total value of the offer will be calculated based on:

i) The cost of basic Machine.
ii) The cost of the concomitant accessories according to tender Specification as per clause 5.2 including cost of any other accessory offered as concomitant accessory.
iii) Applicable duties and taxes and charges for insurance, freight, installation and commissioning, training etc.
iv) Cost of Turnkey Charges viz. foundation, installation & commissioning etc.
v) Cost of Preventive Maintenance during 1st & 2nd year of Warranty Period.
vi) Cost of Comprehensive AMC for five years after the warranty as per the General conditions of CAMC.

Note: Cost of CAMC for 5 years to be a part of commercial evaluation. However this will not form a part of contract value.

5.0 SCOPE OF SUPPLY:

5.1 The scope of supply includes:

5.1.1 Design, manufacture, supply, installation including foundation and commissioning on turnkey basis of welding robots having six axis control with independent AC digital servo drives and controllers including *Twin wire technology*, online 3D Laser sensor (with volumetric compensation for variation in groove geometry), teach pendent and controllers along with 2 numbers of spare welding torch with each robot and its cable assembly.

i) Two numbers of suitable work piece positioners along with the fixture /pallet having the capability of positioning the components as per Annexure-A for the robot as per clause 5.2.1.5 of section I.

ii) Linear track Unit if required having longitudinal travel length as per requirement of each workstation. Details to be provided in the bid.

5.1.2 Online 3D Laser sensing system (with volume compensation for variation in groove geometry) shall be supplied for seam tracking.

5.1.3 Wire feeder and interconnecting cables with torch setting jig.

5.1.4 Synergic pulse MIG welding power source of 500 Amps capacity with IGBT control (one for each robot) depending upon ~~single~~ *twin wire* welding.

5.1.5 10 nos. of jumbo coils weighing 100 Kgs. for each robot. (No's required/work station to be supplied per set as per productivity requirements).

5.2 CONCOMITANT ACCESSORIES:

5.2.1 The machine should be accompanied with the following concomitant accessories:

Item No.	Description	Quantity
5.2.1.1	*USB SSD Hard disc (1TB) along with job programs, all software, all passwords, license keys, all troubling shooting, maintenance, fault diagnostic & spares manuals, backup, ghost backup, PLC ladder diagram, all CNC, PLC, and welding parameters and other parameters with backups shall be supplied as a maintenance spare*	2 sets
5.2.1.2	MIG welding wire of size 1.2 mm as per IS specification No. 6419-1996 Grade S-3X503 of 100Kgs	2 spools
5.2.1.3	A closed humid-free air-conditioned cabin for main controller of Robot and welding machine is to be installed	1 nos.
5.2.1.4	Suitable safety guard/box for protection from Laser is to be provided with each Robotic Welding System	1 set
5.2.1.5	Fixtures & Positioners for holding/aligning of the components for carrying out welding on items described at Annexure-A of section-III	2 sets for each item
5.2.1.6	Welding torches for each robot	2 nos.
5.2.1.7	Maintenance tool kits including special tools if any, for mechanical maintenance, electrical maintenance, and for operator shall be supplied	3 sets
5.2.1.8	Touch sensing system (nozzle/wire)	1 set

4.2.1.9	Anti-collision arrangement with welding torch directly mounted on the anti-collision device	1 set
5.2.1.10	Manual operated universal Welding fixtures to carry out the welding on the manipulators	2 sets
5.2.1.11	Servo type voltage stabilizer and Isolation transformer (~~combo unit~~) *each with minimum capacity of 1.5 times higher than the maximum load on machine* with Spike & surge arrestors of proper rating from reputed Indian manufacturers for robot controller, *etc. such as Servomax, NeelKanth, Powerware*,	1 no
5.2.1.12	Consumable spares are to be provided as per clause-6.2 of Section-V	1 set
5.2.1.13	200 Glasses for laser sensor	1 set
5.2.1.14	*Maintenance tool for electronics maintenance only which includes: - Fluke 376 True RMS AC/DC Clamp Meter with i Flex & carry case, Fluke 62 Max Infrared Thermometer, STANLEY 68-0002C Cushion Grip Screwdriver*	*Set-16 pcs,*
5.2.1.15	*Torx T10-T25 Screwdriver 60-042 (4 pc)*	*01 set*
5.2.1.16	*STANLEY Insulated VDE Screwdriver Set STMT60175*	*Pack of 7*
5.2.1.17	Safety light barrier	One set

Note: Any other accessory/ equipment, which the manufacturer considers essential to make the machine fully operational, when installed and commissioned connected to power source and give the specified output/productivity.

6.0 DELIVERY SCHEDULE

6.1 The Robotic Welding Manipulator (Specification No. MECH/M&P/3900/2) must adhere to the Delivery schedule as per Annexure-G of section-III.

Section-II

1. BASIC DESIGN FEATURES:

1.1. SAFETY FEATURES:

Safety provisions should be as per the latest EN 775 Standard. Safety equipment such as Safety Light Barrier, Start Pre-selection panel, and workplace protection inside the Robot arm are to be provided as standard features.

1.2 SPECIFIC CHARACTERISTICS:

1.2.1 GENERAL:

The general characteristics of the machine shall be as per clause 3.0 of Section-II.

1.2.2 ROBOT:

Welding Robot with online 3D Laser Seam Tracking (with volumetric compensation for variation in groove geometry) arrangement is required for fabrication of components as per Annexure-A *of Section-III*. The online 3D Laser seam tracker (with volumetric compensation for variation in groove geometry) shall be capable of accommodating deviation in dimensions outside the tolerance mentioned in the drawing up to ±10 mm (minimum).

1.2.2.1 Robot having six rotational axes (min) in overhead position with a *payload of a minimum of 20-25 Kg using twin wire technology* for sub-assemblies, as per clause no. 2.3.3 and 2.3.4 of *Section-I*, shall be provided. Each axis shall be controlled by an independent AC digital *servo motor and drive with less than +/- 0.03mm repeatability*. *The robot shall include penetration stabilizer, arc length stabilizer, and pulsed arc control technologies. This will ensure consistent penetration, stable arc length, and optimized pulsed arc welding*. The robot shall have the working envelope to suit various types of job requirements (*Ref. Annexure-A of Section -III).* The robot should be provided with an additional Axis for moving the laser up and down. The number of robot linear axes shall be determined based on the actual layout requirements.

1.2.2.1.1 The purpose is to set up a system for robotic welding for production, and the **Robotic Welding System** should be capable of *welding side frame, Bogie Bolster for FIAT and Longitudinal beam of TC/NDTC& Motor coach Vande Bharat (Annexure-A of section-III).* The setup is to be installed and proved out for productivity and quality requirements mentioned in the specification at RCF Kapurthala.

1.2.2.2 The Robot shall have AC digital Servo drives with brakes. The Robot Servos and External Axis servos are to be installed inside the Controller unit to protect against dust and temperature. The robot shall be provided with a Position Recovery System and shall automatically restart the system.

1.2.2.3 Robot should be capable for accommodating variation in geometry deviation or volume per Unit length.The robots shall tolerate dimensional/geometrical deviations to the extent of ± 10 mm minimum. The Robot shall be equipped with an online laser sensor for 3D shifting and auto weaving to cover the gap of joints. External axis-controlled vertical and horizontal slides shall also be provided for the robots. Technical details of the sensing arrangement should be furnished in the bid.

1.2.2.4 The robot should be mounted on a moving gantry/pedestal/linear track or on an overhead linear travel track with two carriages or cantilever-type, suiting the best possible arrangement as per the productivity requirements of clause 2.4. The length of the travel track should be sufficient to cover the range of products mentioned in Annexure-F of Section -III.

1.2.2.5 The Robot shall have the following additional features:

a) Arc retry function for automatic re-ignition before moving when the arc is not initiated.
b) Multi-pass facility to offset the torch position and orientation after the second layer.
c) Simple menu-based programming.
d) Automatically initiate crater control operation at the end of each welding to prevent the arc crater.

The adjustment of voltage, current, wire feed speed, and weld length control shall be possible through the teach pendant of the controller during welding.

1.2.2.6 Dual Check Safety

1.2.2.6.1 System should have a function for capable of collecting & analyze robot data for maintenance received over a network.

1.2.2.7 Torch Mate function
1.2.2.7.1 System should have a function for correct shift of tool centre point of welding torch automatically in a short time.
1.2.2.8 Torch Guard Function
1.2.2.8.1System should have a function for immediately stops the robot with alarm when collision is detected
1.2.2.9 TAST (Through Arc seam tracking0
1.2.2.9.1 System should have a function for keeping constant current value between wire & work.
1.2.2.10 On The Fly
1.2.2.10.1System should have a function for capable of adjust command values of weld schedule in real time during executing program.
1.2.2.11 Process logger
1.2.2.11.1 System should have a function for recording welding status information automatically.
1.2.2.12 Multi equipment control function
1.2.2.12.1One controller should be capable controlling more than 02 equipment
1.2.2.13 Arc Abnormal monitor function
1.2.2.13.1 System should have a function for monitoring actual current & voltage parameter during ARC welding & inform through signal or alarm if parameter exceeds the thresholds.
1.2.2.14 Touch sensing

1.2.2.14.1 System should have a function to change a path automatically to compensate for object displacement.

1.2.2.15 Intelligent Grease change reminder

1.2.2.15.1 System should have a function to remind user for periodic appropriate grease change timing.

1.2.2.16 Intelligent cable change reminder

1.2.2.16.1 System should have a function to remind user for periodic appropriate cable change timing.

1.2.2.17 Co-ordinate motion

1.2.2.17.1 System should have a function to control path of follower robot relative to leader positioner/robot.

	Robot		
1.2.2.18	*Make*		ABB/KUKA/FANUC/YASKAWA /IGM/CLOQ
1.2.2.19	*Arm Type*		*Articulated*
1.2.2.20	*Arm length*		*1831mm*
1.2.2.21	*Axes number*		*6*
1.2.2.22	*Axes Range*	*J1*	*370°*
		J2	*260°*
		J3	*458°*
		J4	*400°*
		J5	*360°*
		J6	*900°*
1.2.2.23	*Axes Max. Speed*	*J1*	*210°/s*
		J2	*210°/s*
		J3	*265°/s*
		J4	*420°/s*
		J5	*420°/s*
		J6	*720°/s*
1.2.2.24	*Wrist Payload Capacity*		*25kg*
1.2.2.25	*Wrist Moment*	*J4*	*52Nm*
		J5	*52Nm*
		J6	*32Nm*
1.2.2.26	*Wrist inertia*	*J4*	*2.4*
		J5	*2.4*
		J6	*1.2*
1.2.2.27	*Repeatability*		*±0.02mm*
1.2.2.28	*Motor*		*FANUC/IGM/KUKA AC Servo Motor*
1.2.2.29	*Position Detection*		*Absolute encoder*
1.2.2.30	*Wrist Hollow Diameter*		*57mm*

1.2.2.31	*Weight*		*250kg*
1.2.2.32	*J5 Offset*		*90mm*
1.2.2.33	*Protection*	*(a) Wrist and J3Arm*	*IP67*
1.2.2.34		*(b) Body*	*IP54*
1.2.2.35	*Acoustic Noise level*		*70dB or less (ISO11201)*
1.2.2.36	*Installation Environment*	*(a)Ambient Temperature*	*0 to 55°C*
		(b)Ambient Humidity	*Normally 75% RH or Less*
			Short time 98% RH or Less (within 1 month)
		(c)Permissible Altitude	*Above the sea 1000m or less*
		(d)Vibration Acceleration	*4.9m/s² (0.5G) or less*

1.2.2.37 A water-cooled torch hose unit package shall be provided, designed to connect the wire drive and the welding torch. The package must include quick-change connectors at both ends for ease of maintenance and replacement. The length should be adequate to cover the robot's entire working envelope. The cooling system must have sufficient capacity to maintain the torch temperature below 50°C during operation.

1.2.3 CONTROLLER:

1.2.3.1 Each robot system should have its own separate controller. The controller unit shall have drive actuation of one digital drive system per freely programmable axis. The control system shall be based on an industrial PC system/CNC system with *IP 54 Class of protection* and suitable for 380-415V, ±10%, 50/60 Hz, 3-phase AC input supply, 3-wire with neutral earth. The protection classification of the in-line wrist shall be *IP 67*. The external axes servos shall be installed within the control cabinet to ensure compact and efficient integration. Details to be furnished. Battery backup shall be *provided for complete shutdown of the PC and controller*. The tenderer must ensure that the CNC system offered should not be obsolete within the next 10 years, and the bidder shall give a commitment for the same and ensure supply, *spare and service support.*

1.2.3.2 The controller shall be synchronized in such a way that it controls the movements of the robot, workpiece positioners, external axes, MIG/MAG welding system, Nozzle cleaning system (from outside and inside), and the safety devices such as light barriers, etc.

1.2.3.3 The Robot controller shall have a *SSD hard disk* of minimum 10 GB capacity, RS 232, USB 3.0, and an Ethernet port. It shall have a minimum 5 GB user memory for part programs & user data. The memory capacity in terms of part programs, steps & points shall be clearly specified.

1.2.3.4 The Robot controller should be enclosed in a humid-free, air-conditioned room of size *(4m x 5m approx).?*

1.2.3.5 *The Robot controller should have a function for/to:*

i. Checking speed & position data of motors & shut down motor power if any error occurs.
ii. Capable of collecting & analyze robot data for maintenance received over a network.
iii. Correct shift of tool centre point of welding torch automatically in a short time.
iv. Immediately stops the robot with alarm when collision is detected.
v. Keeping constant current value between wire & work.
vi. Capable of adjust command values of weld schedule in real time during executing program.
vii. Recording welding status information automatically.
viii. Monitoring actual current & voltage parameter during ARC welding & inform through signal or alarm if parameter exceeds the thresholds
ix. Change a path automatically to compensate for object displacement.
x. Remind user for periodic appropriate grease change timing.
xi. Remind user for periodic appropriate cable change timing.
xii. Inbuilt feature for IOT enable with facility to capture data of all accessories.

	Controller		
1.2.3.6	*Number of Parallel Task*		*9*
1.2.3.7	*Control Unit*		*Digital*
1.2.3.8	*Number of Controlled axes*		*6*
1.2.3.9	*Memory Type*		*CMOS RAM with backup battery*
1.2.3.10	*Memory Capacity*		*1GB*
1.2.3.11	*External Storage*		*USB, PCMCIA*
1.2.3.12	*I/O Signal*		*IN 40 (80/96/136/192 optional) OUT 40 (80/96/136/192 optional)*
1.2.3.13	*Motion Control Type*		*Joint,Cartesian and Tool*
1.2.3.14	*Interpolation*		*Joint,Linear,Circular,Arc*
1.2.3.15	*Teach pendant*		*7 inch and LED display, XGA(1024x768),High Speed CPU and USB3.0 Support*
1.2.3.16	*Programming Method*		*Block Teaching and Menu driven instructions*
1.2.3.17	*Serial Port*		*RS422/RS232C*
1.2.3.18	*Ethernet Port*		*2*
1.2.3.19	*Connection cables*		*Std 7mtr (max. 30 mtr)*
1.2.3.20	*Dimensions*		*740X550X1100 mm*
1.2.3.21	*Weight*		*180Kg*
1.2.3.22	*Ambient conditions*		*0-55 deg*
1.2.3.23	*Humidity*		*98% RH*
1.2.3.24	*Input Power source*		*380-415 VAC, 50/60Hz 3 Phase*
1.2.3.25	*Protection*		*IP54*
1.2.3.26	*Field bus*		*FL-net, Devicenet, Profibus,*
			Profinet, CC-link, Cclink IE,Ethernet/IP, Ethercat

1.2.3.27	*Overvoltage category/ Pollution category*		*Overvoltage category III, Pollution Degree 3, IEC60664-1 and IEC/EN/UL61010-1*

1.2.4 TEACH PENDANT:

1.2.4.1 The controller shall be operated *through light weight* & an ergonomically designed Teach Pendant with no less than a *7-inch LED full-color display* and touch-sensitive surface. The backup shall be ~~CD/~~Flash Memory/*USB 3.0 Port* through the robot controller for mass storage. The display shall be via a color *XGA monitor (XGA Resolution 1024 x 768,) High speed CPU,* weighing not more than 3 Kg for easy portability. The keyboard shall be membrane type. For better accuracy, an Electronic Mastering-type Robot calibration *gauge or auto calibration with preinstalled calibration program is to be provided*. The system shall be suitable for industrial applications. The teach pendants shall be easy to handle, featuring a safety switch for stopping the robot as and when desired. *It must have USB connection support for memory stick or mouse.*

1.2.4.2 Each and every action by the system and user must be logged. The necessary Technology Package for Programming, Digital/Analog, and weaving for various welding patterns must be provided.

1.2.4.3 Programming shall also be done by Teach Pendant. The interpolation type shall be *Joint, Linear, Circular, Partly Circular*, and welding parameters, which can be controlled through the Teach Pendant. The coordination systems shall be 4 (base, hand axis, workpiece, & Robot). Software for pass points, multi-layer, end crater, program shifting, workstation shifting, external start, and ignition repetition shall be provided.

1.2.4.4 Essential features like digital data interface with *RS422/RS232C* ~~RS-485~~ and a minimum of 255 sets of job memory, open machine interface control for monitoring output data, welding data monitoring, and personal access key to prevent unauthorized usage are to be provided to improve the output productivity of the welding power source with the robots.

1.2.5 GANTRY WITH CARRIAGE:

In order to carry out the fabrication of all components in Annexure-A of Section-III

1.2.5.1 The system shall have a moving mechanism to move the robot on a linear track with horizontal carriages. The movement of the robots on the gantry shall be sufficient to travel & cover both workpiece positioners. A floor/overhead gantry is one suggested arrangement. Other arrangements are acceptable if space or productivity constraints are met. It may be ensured that under no circumstances shall the robot hit the undercarriage, column, or any other part of the system.

1.2.6 WORK POSITIONER:

1.2.6.1 In order to carry out all welding in the down-hand position and achieve the desired productivity, including the quality, a single/multiple axis freely programmable & fully synchronized workpiece positioner suitable for the corresponding components as mentioned *in* Annexure-A of

Section-III shall be offered as part of the system. The center height of the swiveling axis and swiveling range, torque, and swiveling speed must be such that the work positioners are able to handle the components as per the list *in* Annexure-A of Section-III.The drive motors shall use AC servo motors synchronized through the Controller.

1.2.6.2 For the complete bogie Side Frame and Robotic Welding System, the two-axis positioner must be used to access all the welding positions in down-hand. The motion of both axes of rotation must be synchronous, and the same can be used if required.

1.2.7 WELDING POWER SOURCE:

1.2.7.1 For carrying out MIG/MAG Welding by each Robot, Microprocessor-controlled, Synergic Pulse, MIG/MAG, preferably IGBT-based welding power sources depending upon a *Twin* ~~single~~ wire system having serial interface programming by the controllers of the robots shall be supplied for each robot. The power source shall have multi-process capabilities, including Low Spatter Ignition function, Burn-back Pulsing, automatic fan & built-in cooling unit cut-off facilities. The digital display for welding speed, current, voltage, arc length, wire feed speed, sheet thickness, job number, hold function, over-temperature, and intermediate arc sensor shall be available with each power source. Details to be furnished in the offer.

1.2.7.2 A personal access key to prevent unauthorized usage is to be provided to improve the output productivity of the welding power source with the robots.

1.2.7.3 If a discrete PLC is used, a programming unit for the PLC may be supplied along with the machine to enable the verification of the status of the input, output flags, timer & counters, and other elements of the system in real-time to troubleshoot during a breakdown of the system.

1.2.8 WIRE FEEDING ARRANGEMENT:

1.2.8.1 For *Twin* ~~single~~ wire robotic welding, the wire feeding system should support a wire feed speed of 0-25 m/min (with feed tolerance less than 1%). The push-push system must have one wire feeding motor just behind the torch and another motor on the ground inside the cabinet, pulling the wire from the Marathon pack and pushing it through the conduit toward the motor behind the torch.The tenderer may also offer an alternative wire feeding system with equal or superior performance, and details of the same must be explained in the offer.

1.2.8.2 For tandem wire robotic welding, each robot should have one set of four powered feed roll drive systems suitable for tandem/*twin* ~~single~~ wire welding technology. The wire feed speed should be 0-30 m/min. The wire feeder should support wire sizes between 0.8 to 1.6 mm, and the weight should not exceed 20 kg.

1.2.9 WORKHOLDING FIXTURES:

1.2.9.1 Manually operated Pneumatic/Hydraulic/Mechanical clamped universal welding fixtures and pneumatic universal assembly as described in clause 1.2.9.3.2 & 1.2.11 of Section-II for components as per Annexure-A of Section-III, which are part of concomitant accessories vide

clause 5.2.1.5 of Section-I, shall be supplied along with G.A. drawing by the successful tenderer. The universal welding fixtures shall be easily loaded and unloaded on the manipulators and shall be able to accommodate all the variants of the particular product as per Annexure-A of Section-III. The firm is to supply the drawings of hydraulic/mechanical clamped universal welding fixtures and universal assembly to the consignee along with GA drawings.

1.2.9.2 MATERIAL HANDLING & CONVEYOR SYSTEM:

1.2.9.2.1 The material handling system for the entire fabrication line should be suitably mechanized as per the productivity requirement. The material handling tackles at the manipulator stages should assist in the loading/unloading operation in such a way as to maintain an uninterrupted flow of material at each stage with the least amount of travel.

1.2.9.2.2 The offered material handling system should be able to load the material on individual manipulators from the storage bin of the Robotic Welding System and further unload at the specified place of the Robotic Welding System, efficiently considering ergonomics and safety requirements.

1.2.9.2.3 The material handling system in the entire fabrication line should be semi-automatic with KBK or equivalent guide rails.

1.2.9.2.4 The bidder should provide complete details, including a flowchart of material movement of the offered material handling system along with the offer.

1.2.9.2.5 The bidder is free to decide the material movement process/stages for welding.

1.2.9.3 TECHNICAL REQUIREMENTS:

1.2.9.3.1 The broad technical specifications/parameters for a representative robotic workstation are as per clause 1.2.2 of Section-II, or better may be provided by the bidder. The specifications indicated therein are mainly guidelines; they provide broad parameters, including likely accessories required for the processes to assist the bidder in understanding the requirements of the facility to be set up. It shall be clearly understood that the choice of equipment, the arrangement of the robot and positioners, the material handling system, the interfacing of equipment, and all other connected and relevant details shall be the sole responsibility of the bidder. The governing considerations shall be the conformity of cycle time, norms of output, dimensional tolerances, and finish requirements as per drawings and specifications, ease of maintenance of the equipment, confirmation to relevant international environmental norms, and availability of consumables in India to suit the robotic workstations.

1.2.9.3.2 *Following is the generalized description of the stations. The number of stations for each subassembly/assembly shall be decided by the supplier based on the productivity requirement of Para 2.4 of Section-I and as per Annexure-A of section-III for this purpose. However, the supplier may offer superior alternatives wherever feasible.*

1.2.9.3.2.1 SIDE FRAME LINE:

a) **Robotic Welding System for Side-frame:**
b) The robotic welding system for the side-frame shall be with *Twin* ~~single~~-wire robotic welding.
c) The Robot should be mounted on a fixed pedestal/gantry on a linear track with two single-axis servo welding positioners.
d) The robot & welding package should be broadly as per the attached specifications in the tender.
e) The leftover welding will be accomplished manually.

1.2.9.3.2.2 BOLSTER LINE:

a) **Robotic Welding System for Bolster:**
b) The robotic welding system for the bolster should be preferably with *Twin* ~~single~~-wire robotic welding.
c) The Robot should be mounted on a fixed pedestal/gantry on a linear track with two single-axis servo welding positioners.
d) The robot & welding package should be as per the attached specifications in the tender.

1.2.9.3.2.3 MATERIAL HANDLING DEVICES:

a) The supplier must provide a KBK or equivalent guide rail system for handling the Assembly/Subassembly in Side-frame & bolster lines.
b) The guide rail system movements will be motorized/mechanical. The supplier shall also provide hoist systems of suitable capacity along with the guide rail systems. All necessary support structures for the proposed material handling system will be within the scope of supply.
c) *The side frame & bolster, after tacking* ~~*Stage 2 at each station*~~, will be provided by forklifts in sets. The forklifts are NOT within the supplier's scope.
d) Loading on the robotic welding systems fixtures and robotic Petitioners shall be done from the storage area using this material handling system.
e) Intermediate transfer of assemblies in a line between different Robotic Welding Systems shall be done by this system.
f) An overhead crane will NOT be used/provided at the side-frame line, bolster line.
g) The supplier must provide suitable tackles for the side-frame and bolster. The number of tackles supplied for each line should be indicated with justification in the bid and *The Robotic welding system shall be supported by an efficient mechanized material handling system to transfer the input Subassembly/Assembly to fixtures/manipulators and so on up to work positioners for robotic fabrication stations as per Annexure-A of Section-III.*

1.2.9.5 Loading and unloading on universal fixtures of robotic positioners.

1.2.9.6 Movement of subassemblies from one station to another as per requirement.

1.2.10 ONLINE LASER SENSOR:

3D Laser Sensor shall be provided with:
a) Joint Position and its characteristics, like volume per unit length variation, so that the throat of the weld joint as specified in the side frame and bolster can be achieved.
b) Conversion of camera coordinates to robot coordinates.
c) Real-time trajectory rectification.
d) Real-time 3D weld joint check with auto data interpolation as per original joint specification (volumetric compensation).

1.2.11 SPECIFIC CHARACTERISTICS:

1.2.11.1 The motors and drives provided with the robots, overhead Liner track and cross track including work piece positioner shall be AC digital drive through AC Servo Motors and shall be controlled by a centralized controller unit.

1.2.11.2 The length of Overhead Linear Track and horizontal cross slides shall have sufficient distance for the robot in order to keep a safe distance from the jobs while welding.

1.2.11.3 The synchronization of both internal and external axis shall be in such a manner that all the welding shall only be done in the down hand or gravity position for achieving highest productivity for manufacturing of bogie side frames and Bolster. This is applicable for both the Robots.

1.2.11.4 The adjustment of voltage & current, wire feed speed, and weld length control shall be possible through the Teach pendent of each controller during welding.

1.2.11.5 Online 3D Laser sensor system for seam tracking shall be supplied for each robot for keeping the torch in the desired position without shifting in 3D (with volumetric compensation for variation in groove geometry).

1.2.11.6 The robots shall have Automatic/Real-time Oscillation/weaving facility with precise travel speed to provide different weaving patterns during welding, even in the overhang position.

1.2.11.7 The robots should have sufficient memory storage capacity to store different programs. The memory list shall have the capacity to store at least 999 welding parameters.

1.2.11.8 For re-initiation of the Arc, automatic advancing in the program direction shall be possible by the controller.

1.2.11.9 The robots shall automatically initiate crater control operation at the end of each welding to prevent the Arc crater.

1.2.11.10 Overlap function shall be available in case of temporary stop of welding due to sudden power failure. The torch shall automatically move backward for restarting the welding, permitting a smooth overlap of the welding bead.

1.2.11.11 The power backup facility shall be provided so that the program can be memorized in case of power failure. While restoring the power supply, the operation of the robot shall start from the last point of operation.

1.2.11.12 The system shall have the feature to enable the welding robots to recall the exact position where the power supply was interrupted. Upon recovery, the option shall be available to resume the operation exactly from where power was interrupted and shall not start as a new program.

1.2.11.13 The welding robots shall have AC Servo Motors with advanced motion control to reduce cycle time and increase production.

1.2.11.14 The robots shall have an arc retry function for automatic re-ignition before moving when the arc is not initiated.

1.2.11.15 The robots shall have a multi-pass facility to offset the torch position and orientation after the 2nd layer.

1.2.11.16 A torch swiveling arrangement is to be provided.

1.2.11.17 The robot shall have simple menu-based programming in English language.

1.2.11.18 The robot shall have high precision processors enabling high-speed processing.

1.2.11.19 The system shall have a standard *RS422/RS232C* ~~RS-485~~ port for Digital data interface communication.

1.2.11.20 Provision to control at least twelve external axes in synchronization with the robot's axis, extendable up to 16, shall be provided.

1.2.11.21 Weld condition monitoring facilities to reduce the risk of weld defects is to be provided optionally.

1.2.11.22 A personal access key to prevent unauthorized usage of the power source is to be provided.

1.2.11.23 A nozzle cleaning arrangement with rigid holding of the torch during cleaning shall be provided.

1.2.11.24 The welding wire stick-out cutting facility should be located to reduce the time required for this operation.

1.2.11.25 An open machine interface control for monitoring the output data is to be provided.

1.2.11.26 Welding data monitoring is to be made available.

1.2.11.27 It should be able to sense the path of welding Even rusted/not cleaned/coated surface.

1.2.11.28 Provision shall be made for the future installation of an additional robotic unit, ensuring seamless integration with the existing system.

1.2.11.29 Welding torch with interconnecting cable for robotic welding system:

a) One air/water-cooled ~~single/~~twin wire welding torch for each robot assembly of 500 Amps capacity at 100% duty cycle at *0-55°C* ambient with mixed gas shall be connected by means of a coupling unit, with a double wall direct cooling nozzle for higher service life with optimum repeatability.

b) The torch cable should not have any influence on the offset speed and motion of the robot. The system shall also be provided with a proven automatic in-built torch cleaning unit which shall not necessitate more than two manual cleanings per shift. The system shall preferably be provided with a pressure intensifier.

c) Compressed air cleaning of the torch interior and rotating steel blade to remove the weld splatter including injectors for separating oil with wire cutting device. Firm to provide details in the offer.

d) One torch cable assembly of adequate length with each robot with a solid flexible hose for external protection and coupling on both sides for quick connection shall be supplied. The torch cable should not have any influence on the offset speed and motion of the Robot.

e) An integrated collision sensor with the robot for protection of the torch from damage due to collision shall be provided.

f) One TCP alignment checking and correction mechanism to check the torch geometry shall be supplied.

g) A set of suitable welding control cables, welding cables, work return cables with earth clamp, gas regulators, and welding helmets shall be supplied.

1.2.12 CNC SYSTEM:

1.2.12.1 The machine shall be provided with a microprocessor-based computer numeric control (CNC) system with simultaneous control over 3 axes, i.e., X, Y, & Z. The CNC control system should be of reputed makes like the latest generation Siemens/Fanuc/*Kuka* make/series. However, bidders can also offer other makes/models of the latest generation having comparable technical performance and features. The PLC may be of Siemens, Fanuc, or Allen Bradley*, if there is additional requirement other than I/Os of the controller*. In the case of a customer-built microprocessor, the data sheet of the microprocessor shall be furnished along with the machine. It shall have at least the following features:

1.2.12.2 The CNC control shall be with high processing speeds. It shall be based on the latest multi-processing/multi-tasking technology for robotic welding operations.

1.2.12.3 It shall be totally enclosed in a metal box to ensure a high degree of electromagnetic compatibility.

1.2.12.4 The CNC control shall ensure easy man-machine interface/communication. It shall have an

integrated compatible PC terminal unit for integration to PC-based data networks. The control software should be compatible with the WINDOWS operating system.

1.2.12.5 The CNC system shall have at least the following features:

1. Work piece movement and control of all machine functions.
2. Storage capability for the program with quick access to main and sub-programs.
3. Fixed cycle and sub-program facility.
4. Manual data input with edit facility.
5. Interactive graphics with program simulation and dry run capability.
6. Complete self-diagnostic capability for easy maintenance.
7. Capability to reduce or enlarge, turn around programmed shapes for optimization.
8. Manual override feature.
9. "On the Machine" input of programs, without interrupting the welding operation.
10. *Minimum CNC user memory for program and data should be 16 MB. Memory extension up to 512 MB should be offered as optional.*
11. The input program-interaction ISO/EIA/ASCII codes or DIN-ESSI codes.
12. RS232C V24 interface for DNC link.
13. Absolute/incremental programming with input resolution (least input increment) of 0.001 mm.
14. Inch and metric programming.
15. 32-bit microprocessor.
16. Teach-in operations mode.
17. *Real time monitoring of current, voltage, temperature, torque etc. for each individual axis.*

1.2.12.6 The entire electronics of the control system shall be housed in a dustproof and air-conditioned cabinet. The control panel air conditioner should be of adequate capacity, keeping in view the ambient conditions specified in Clause 2.3.1.1 of Section I. The panel AC should be either side-mounted or standalone type.

1.2.12.7 Part Programming Software on P.C. Systems This software shall have the following capabilities:

a) Graphically supported creation of part program, including welding sequence and welding direction.
b) Graphic display of single parts and/or cutting plans.
c) Part programming nesting in the welding plan (Make and catalog of nesting software to be submitted).
d) Construction elements: point, line, circle, circular arc, polygon.
e) Constructional aids: snap functions for cursor, tangent function, rounding, copying, rotation, and mirror imaging functions.
f) Built-in calculator.
g) Zoom functions.
h) DXF interface for taking over geometry for CAD pockets, e.g., AutoCAD, Uni-graphics.
i) Teach-in by using teach pendant including offline program modification on separate PC.
j) Interpolation types: linear, circular, partly circular, welding parameters.
k) Pass points, multi-layer welding, end crater program shifting, workstation shift, external starts & ignition repetition.
l) A minimum of 99 welding parameter lists shall be available.
The bidder shall indicate various facilities available for programming on the software.

1.2.12.8 The offline programming equipment with interface should be IBM-compatible laptop computer

with *Intel Core2 Duo processor, 1.83 GHz or more, 2GB RAM, DVDRW drive, 120 GB HDD (upgradeable),* and 15.4 inch TFT display/colors, along with NiMH/3.25 hrs battery for operation and battery eliminator for working on 230V, & laser jet printer 1200x1200 DPI, size A4, speed 21 PPM. The latest available Intel processor should be offered. The make of the laptop should be IBM, Compaq, Toshiba, DELL, or Acer. The bidder shall specify the make of the laptop along with its configuration of processor and hard disk drive, and Inkjet printer.

1.2.12.9 Battery backup for remembering the position of the torch during power failure, so that the torch starts cutting without needing to reset on resumption of power supply. Bidders shall specify the time period of battery backup.

1.2.12.10 Uninterrupted power supply (UPS) unit, if required.

1.2.12.11 Complete self as well as remote diagnostics system for rapid fault detection at consignee's end and manufacturer's end respectively shall be provided as required. The following functions are expected:

i. Fault, its status, indication, and logging.
ii. Analysis of fault condition, providing information on its nature and reasons thereof.
iii. Continuous monitoring of machine operation, detection of abnormal conditions, initiation of corrective action, and recording the condition of the machine at the time of fault through transducers suitably placed at various locations on the machine with 'fail-safe' devices that, under abnormal conditions, are required to prevent damage to the machine.
iv. Provision of adequate and correct information to enable appropriate action regarding repair and operation of the machine to be taken in time.

1.2.12.12 The CNC system that is being provided shall have service support in India through the OEM or its Indian agent and can be supported throughout the codal life of the machine.

1.2.12.13 The machine builder or supplier shall provide one standby copy of the software that has been provided in the controls and peripherals, along with the procedure for reinstallation. Training shall be imparted in this area also. If any passwords are required for loading software, they shall be given to the maintenance wing, which will look after the machine.

1.2.12.14 For online condition monitoring of machine, issue of automated warning and must be there in the control system for interaction and connectivity messages, software's like SAP etc are likely to be used. Necessary compatibility with such software's.

2.0 GENERAL ELECTRIC SPECIFICATION:

2.1 The provision of this General Specification shall apply wherever relevant.

2.2 All equipment and materials shall comply with appropriate Indian Standards (latest), International Standards, or National Standards of the country of origin, provided the latter are equivalent to or better than the former. The tenderer shall indicate the Standards applicable. The following standards are applicable in particular. (Corresponding International Standards like ASA, NEMA, BIS/BSS, DIN, etc. may also be quoted).

a) **IS: 325-1979 (Latest)** - Three-phase induction motors (corresponding to IEC Pub-34-1) (Latest).

b) **IS: 1248 (Latest)** - Direct acting indicating analogue electrical measuring instruments and their accessories (corresponding to IEC Pub-51) (Latest).
c) **IS: 1231-1974 (Latest)** - Dimensions of three-phase induction motors (corresponding to IEC Pub-72-1) (Latest).
d) **IS: 1271-1985 (Latest)** - Classification of insulation material for electrical machinery & apparatus in relation to their thermal stability in service (corresponding to IEC Pub-85) (Latest).
e) **IS: 6875 (Latest)** - Push Buttons and related control switches corresponding to IEC Pub-73 (Latest).
f) **IS: 375-1963 (Latest)** - Marking and arrangement of switchgear, bus bars, main connection & auxiliary wiring.
g) **IS: 996-1979 (Latest)** - Single-phase small AC and universal electrical motors.
h) **IS: 1356 (Latest)** - Electrical equipment of machine tools.
i) **IS: 2516 (Latest)** - Circuit breakers (corresponding to IEC Pub-56) (Latest).
j) **IS: 7752-1975 Pt.I** – Guide for the improvement of power factor consumer's Installation.

2.3 Unless specified in the main specification, the AC motors and starters shall be of the following type. The tenderer is, however, free to give an alternative proposal along with justification if, in his view, the alternative proposal is warranted by site conditions.

	Type of motor	**Type of starter**
2.3.1	Any type of AC motor, starting current of which does not exceed 75 amps.	Direct on line.
2.3.2	AC squirrel cage induction motors, starting current of which is above 75 amps, if started direct on line.	Star delta or Auto transformer type.
2.3.3	AC slip ring type motor.	Resistance type air/fan-cooled.
2.3.4	AC synchronous or synchronous induction motor.	Suitable makers standard.
2.3.5	DC motor.	Resistance type/Thyristor type.

2.4 The control gear for AC/DC motors shall incorporate the following protection devices as concomitant accessories:

2.4.1 **No Voltage Protection**: No voltage protection shall be provided so that the machine will not start up again by itself when, following an interruption, the supply is restored.
2.4.2 **Short Circuit Protection**: To protect against short circuits due to insulation failure or faulty connections, HRC fuses shall be provided for each motor. The rating of the fuse shall be such as to take care of the over current due to motor starting.
2.4.3 **Overload Protection**: To prevent motors from overloading, overload protection shall be provided separately for each motor. Three-phase motors shall be protected by overload tripping devices on each phase.
2.4.4 **Single Phasing Protection**: A separate current-sensitive delayed-action single phasing preventer shall be provided for each motor separately. Overload protection shall not be treated as a single phasing preventer.

2.5 Control equipment shall be mounted in separate drip-proof enclosures. Control enclosures and compartments are to be so designed as to give adequate protection against the ingress of dust, oil, coolant, or chips. All control devices, like contactors, etc., shall be front mounted on a rigidly fabricated metal panel for ease of operation. All other electrics shall be installed so that they are readily accessible when the doors and covers are opened. Hinged covers shall be interlocked with the machine tool control to prevent operation of the machine when the cover is open.

2.6 The motor shall be totally enclosed with or without a fan-cooled frame. Screen-protected drip-proof type motor may be provided if it is mounted inside protective enclosures.

2.7 The electrical equipment shall comply with the requirement of the Indian Electricity Act and Rules (latest).

2.8 All instruments shall be of the industrial grade "A" (IS-1248) switch board type, the range of the instrument shall be such that the maximum load expected in the circuit shall produce a deflection of 60% to 80% of the full scale.

2.9 The supplier shall furnish 3 sets of complete electrical and electronic wiring diagrams in full detail to enable the maintenance staff to locate faults in the circuits. Three sets of part catalogues, maintenance manuals, and operating instructions with details of coils and windings used in the equipment to facilitate repairs and maintenance should also be supplied.

2.10 For motor main class minimum "B" class insulation shall be provided .if any other classes of insulation are proposed, detailed justification for providing different classes of insulation shall be given.

2.11 Motors shall be designed to withstand frequent starts, stops, and reversals as demanded in the operation of the machine.

2.12 Two earthing terminals shall be provided on all electric motors, including the control gear.

2.13 POWER SUPPLY:

2.13.1 The machine shall be suitable for operation on 415/230 volts, 3-phase, 50 cycles AC, 3-wire or 4-wire system with neutral solidly earthed. The supply voltage may vary up to +10% and -20%. The frequency may vary up to +3%. However, full rated power of the motor shall be available at the lower voltage. The firm should confirm satisfactory performance of the machine at incoming power supply in the range of 415V +10% / -20% and 50Hz +3% frequency or should provide a voltage stabilizer as specified in clause 2.13.2 below of the required capacity.

2.13.2 The voltage stabilizer, if required, shall conform to the following:
2.13.2.1 **Input Voltage**: 320 to 460 volts, 3-phase, 4-wire supply
2.13.2.2 **Output Voltage**: 415 volts
2.13.2.3 **Regulation**: ±1% from No Load to Full Load
2.13.2.4 **Rate of Correction**: 20 volts per second per phase
2.13.2.5 **Waveform Distortion**: NIL

2.13.2.6 **Efficiency**: Not less than 97%

2.13.2.7 **Winding and Class of Insulation:** Copper wire wound with "B" class of insulation or Better quality.

2.13.3 In case of machines equipped with NC, SS, CNC, Thyristor-controlled devices, and other sophisticated electronic gadgets including microprocessors, which are susceptible to power line spikes and surges, a suitable voltage stabilizer and ultra-isolation transformer of adequate capacity to cover the entire electrical load of the machine shall be offered as a concomitant accessory conforming to the specification for the voltage stabilizer as mentioned in clause 2.13.2 above. The isolation transformer parameters are as follows:

2.13.3.1 **Transformer Ratio**: 1:1

2.13.3.2 **Winding**: Copper wire wound with "F" class insulation or better

2.13.3.3 **Protection**: To arrest spikes and surges of the order of 3 KV for 200-400 microseconds duration

2.13.3.4 **Common Mode Rejection Ratio**: 120 dB

2.13.3.5 **Isolation**: Capacitance of 0.005 pF; Resistance greater than 1000 Mega Ohms.

2.13.4 The voltage stabilizer shall be equipped with a protective relay to trip the AC power supply to the machine instantaneously with audio and visual indication to the operator. Settings of the protective relay for low and high voltage shall be 320 volts and 460 volts respectively. The protective relay shall be provided as a concomitant accessory on machines with an electrical load below 30 KW.

2.14 ATMOSPHERIC CONDITIONS:

2.14.1 The ambient temperature at the site where the machine will be installed may vary from 0°C to +50°C throughout the year. The relative humidity may be as high as 100%. The atmosphere is expected to be dusty. The machines offered shall be suitably tropicalized to operate under these atmospheric conditions without any adverse effect on their performance.

2.15 The temperature rise shall not reach such a value that there is a risk of injury to any insulating material or adjacent parts.

2.16 The drive shall be capable of operating at any required speed, independent of the load, in accordance with the requirements of the machine.

3.0 GENERAL CHARACTERISTIC:

3.1 RIGIDITY AND STABILITY

3.1.1 The machine shall be robust, rigid, and of sturdy construction. It shall be designed to meet the heavy-duty demands of various operations in a normal workshop environment for such machines. It shall be free from vibrations, even when working at full capacity.

3.1.2 All machine castings shall be made of close-grained, high-grade cast iron like Meehanite or equivalent materials meeting IS-210 Standards to ensure durability and rigidity. The casting shall be thermal stress relieved to ensure stability and continued accuracy.

3.1.3All machine fabrications of critical load-bearing assemblies like beds, columns, etc. shall be adequately strengthened and stress-relieved.

3.1.4 Changes in ambient temperature shall not affect the performance of the machine.

3.1.5 There shall be no change in the machine's performance either upon switching on or after continuous operation.

3.1.6 There shall be no resonant vibrations throughout the working range of the machine at all load levels.

3.2 SAFETY CONTROLS

3.2.1 The machine shall incorporate safety devices to protect the operator and the machine against all possible operational and machinery failures.

3.2.2 Suitable interlocks shall be provided to prevent machine operations in the event of:
3.2.2.1 Faulty sequence of operation.
3.2.2.2 Fluctuation in supply voltage.
3.2.2.3 Resumption of power supply after power failure.
3.2.2.4 Non-positioning of safety guards.
3.2.2.5 Failure of hydraulic system (where applicable).
3.2.2.6 Failure of the lubricating system (in case of automatic lubrication, including a drop in pressure).

3.2.3 A fault or damage in the control circuit or re-establishment after a power supply interruption must not lead to dangerous situations. In particular:

3.2.3.1 The machinery must not start unexpectedly.
3.2.3.2 The machinery must not be prevented from stopping if a stop command has already been given.
3.2.3.3 No moving part of the machinery or piece held by the machinery shall fall or be ejected.
3.2.3.4 The protection devices must remain effective.

3.2.4 The machine shall be fitted with an emergency stop device to avert actual or impending danger. This device must be:

3.2.4.1 Conveniently located.
3.2.4.2 Clearly identifiable.
3.2.4.3 Able to stop the machine as quickly as possible without causing additional hazards.
3.2.4.4 The emergency stop must remain engaged, and it should only be possible to disengage it by an appropriate operation. Disengaging the control must not restart the machinery but should permit restarting.
3.2.5 Safety features shall also include:
3.2.5.1 Safety devices against overload for all mechanical and electrical items to the extent possible.

3.2.5.2 Safety stops against over-running of slides.

3.2.5.3 Adequate workplace protection shall be provided to ensure the safety of personnel and equipment during operations. This may include physical barriers, safety enclosures, and necessary warning systems as per applicable standards.

3.2.6 Guard and protection devices shall protect exposed persons against risks related to moving transmission parts (such as pulleys, belts, gears, rack and pinion, shafts, etc.) and moving parts directly involved in the process. These shall meet the following requirements:

3.2.6.1 Be of robust construction.

3.2.6.2 Not give rise to any additional risk.

3.2.6.3 Not be easy to bypass or render non-operational.

3.2.6.4 Be located at an adequate distance from the danger zone.

3.2.6.5 Cause minimum obstruction to the view of the production process.

3.2.6.6 Be rigidly connected and not prone to rattling.

3.2.6.7 Enable essential work to be carried out without dismantling the guard or protection device.

3.2.7 A load meter shall be provided to indicate the load on the machine. The meter shall have a suitable mark to indicate the maximum load the machine can take. Full details of the safety features and how each one functions must be explained in the offer, or a patented fail-safe relief valve, which prevents overloading and ensures 100% safety, should be provided.

3.3 OPERATIONAL CONTROLS

3.3.1 The operation of the machine shall be by push buttons or levers. The basic rules for the direction of operation of controls and the corresponding direction of movements of the machine tools shall be as per IS: 2987-1985.

3.3.2 The control devices shall be:

3.3.2.1 Clearly visible and identifiable.

3.3.2.2 Ergonomically positioned for safe operation without hesitation or loss of time and without ambiguity.

3.4 LIGHTING

3.4.1 Integral lighting suitable for the concerned operations, where lack of lighting may cause risk despite ambient lighting, shall be provided.

3.4.2 The manufacturer must ensure that there are no shadow areas likely to cause nuisance, no irritating dazzle, and no dangerous stroboscopic effects due to lighting provided by the manufacturer.

3.4.3 Integral parts requiring frequent inspection, adjustment, and maintenance must be provided with appropriate lighting.

3.4.4 The machine lighting should be of low voltage to prevent any hazard to the operator.

3.5 MACHINE MAINTAINABILITY

3.5.1 The machine shall be designed to require the minimum possible maintenance and to provide trouble-free service.

3.5.2 All assemblies/parts of the machine shall be easily accessible for maintenance.

3.5.3 The machine shall not require major disassembly for checking and replacing a particular part, especially for parts requiring periodical check-up and replacement.

3.5.4 The manufacturer must provide means of access (e.g., stairs, ladders, catwalks, etc.) to allow safe access to all areas used for production, adjustments, and maintenance operations.

3.6 WEAR COMPENSATION ADJUSTMENT

3.6.1 The original built-in accuracy of the machine shall be capable of being maintained conveniently and economically by suitable adjustments for taking up wear on slides, bearings, and lead screws. The system of adjustments incorporated shall be explained in the offer.

3.7 COOLANT SYSTEM (WHERE APPLICABLE)

3.7.1 A suitable coolant system with pump, motor, tank, and filter shall be provided. The coolant pump shall be as per IS: 2161-1962. The filter shall be of reusable type and indigenously available. If a reusable filter cannot be offered, the filter cartridge shall be readily available in India, and the source of supply shall be indicated. Adequate filters for 2 years of working on a double shift basis shall be offered as spares. Details of the coolant system shall be indicated in the offer.

3.7.2 The supply of coolant shall be ample. Provision to recirculate the coolant shall be available. A chip and coolant tray shall be provided. The volume of coolant flow shall be indicated and shall be adjustable.

3.7.3 An enclosure shall be provided to prevent the coolant from splashing outside the machining zone. Details of the enclosure shall be provided. Specific requirements of the coolant system for grinding machines, etc., shall be clearly indicated.

3.8 LUBRICATION SYSTEM (WHERE APPLICABLE)

3.8.1 The machine shall be provided with an automatic lubricating system to ensure delivery of an adequate quantity of lubricant to areas requiring continuous lubrication. Suitable arrangements must be provided for indication of lubrication system failure.

3.8.2 The system shall include an interlock to prevent machine operation or starting in the event of lubrication system failure.

3.8.3 Reusable filters capable of filtering chips, dust particles, etc., shall be provided. Indicators showing the clogged condition of filters shall be available. The filters shall be indigenously available. If reusable filters cannot be offered, the filter cartridge shall be readily available in India, and the source of supply shall be indicated. Adequate filters for 2 years of working on a double shift basis shall be offered as spares.

3.8.4 A lubrication and filter cleaning chart shall be displayed on a metal plate at a conspicuous location on the machine, indicating:

3.8.4.1 Specific locations of points on the machine to be oiled, lubricated, or greased.

3.8.4.2 Periodicity of lubrication of these points.

3.8.4.3 Filters to be cleaned.
3.8.4.4 Periodicity of cleaning filters.
3.8.4.5 Periodicity of replenishing lubricating oil for the centralized system.
3.8.4.6 Any other relevant information.

3.8.5 Points where manual lubrication is needed shall be separately indicated. The frequency of lubrication shall also be clearly mentioned.
3.8.6 Lubricating oils used in the machine shall be available in India. The successful tenderer will be required to indicate brand names of approved oils manufactured by various Indian oil companies.
3.8.7 The first fill of lubricating oils used in the machine shall be provided with the machine. Details of the lubricating system provided shall be indicated.

3.9 PNEUMATIC SYSTEM (WHERE APPLICABLE)

3.9.1 The compressed air supply will be provided by the customer at the machine within a pressure range of 4.5-7.5 kg/cm² and moisture content of 1000 ppm. The machine's pneumatic system should be designed accordingly. An alarm shall be provided for low air pressure.

3.9.2 A suitable filter/moisture trap shall be provided by the contractor in the system of pneumatic air intake. The filter shall be reusable and indigenously available. If a reusable filter cannot be offered, the filter cartridge shall be easily available in India, and the source of supply shall be indicated. Adequate filters for 2 years of working on a double shift basis shall be offered as spares.

3.9.3 An air pressure regulator, if necessary, shall be provided by the tenderer.
3.9.4 The pneumatic control equipment shall be of a reputed make, and the makes shall be indicated.

3.10 HYDRAULIC SYSTEM (WHERE APPLICABLE)

3.10.1 The hydraulic circuit must be equipped with the following safety and inspection equipment:
3.10.1.1 Pressure gauges at all places where pressure needs to be set or inspected.
3.10.1.2 Safety valves for the hydraulic circuit, if the relief valve does not fulfill this function.
3.10.1.3 Equipment for checking the temperature in the circuit or pump, where necessary.
3.10.1.4 An arrangement to show if the filters (including those in the pump set) are clogged and need cleaning. The filters shall be of reusable type and indigenously available. If a reusable filter cannot be offered, the filter cartridge shall be readily available in India, and the source of supply shall be indicated. Adequate filters for 2 years of working on a double shift basis shall be offered as spares.
3.10.1.5 An alarm for low oil level.
3.10.2 The sump aggregate shall have the following:

3.10.2.1 Oil level sight gauges or any other equipment showing the minimum and maximum oil levels in the sump.
3.10.2.2 A drain plug at the lowest portion of the tank.
3.10.2.3 It shall be possible to drain the oil from the tank without disconnecting any pipes or

other fittings.

3.10.3 The temperature of oil in the hydraulic circuits shall not exceed 60°C in any case. Suitable arrangements shall be incorporated to ensure that the oil is not overheated under local weather conditions during continuous normal operation of the machine.

3.10.4 Facilities for bleeding air in case of an air lock shall be provided.

3.10.5 The hydraulic reservoir, pump, and allied equipment shall be suitably segregated from the machine to remove major sources of heat.

3.10.6 Hydraulic oils used in the machine shall be available in India. The successful tenderer will be required to indicate brand names of approved oils supplied by various Indian oil companies.

3.10.7 The first fill of hydraulic oils used in the machine shall be provided with the machine.

4.0 TECHNICAL LITERATURE:

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

4.1.1 The tenderer shall furnish a full description of the system proposed to be used, with details of type, number, make, capacity, and salient features along with technical literature for the controller, robot, digital drives, variable motors, manipulators, feedback system, welding power source, torch cooling system, safety barrier, torch and handling system, and PLC, if used, etc.

4.2 The technical literature shall be provided for the complete machine, including imported and indigenously purchased components/sub-assemblies. The successful tenderer will have to furnish four (04) copies each of the following manuals directly to the consignee along with the machine. Out of these 04 sets, the bidder shall be required to submit one set of all documents in the best available condition one month prior to the training for the machine. One set of technical literature should cover the following details wherever applicable:

1) Operational & Maintenance manual of the machine.
2) Operational & Maintenance manual of the servo-controlled voltage stabilizer.
3) Operational & Maintenance manual of the ultra isolation transformer.
4) Instruction & Maintenance manual for the Hydraulic Oil Cooling Unit.
5) User manual for the Tool changer system (if provided).
6) Technical & Maintenance manual for the Hydraulic System.
7) Technical & Maintenance manual for the Lubrication System.
8) Operator Guide for the CNC Control System (if provided).
9) Programming Guide for the CNC Control System (if provided).
10) Diagnostic & Troubleshooting Guide for the CNC Control System *including drives, teach pendant, motors, PLC, Power supplies and all PCB's & Modules* (if provided).
11) Start-up Guide for the CNC Control System (if provided).
12) Machine Software Listing (if provided).
13) Soft and hard copies of the PLC Program in ladder form with cross-reference listing and PLC project file.
14) Drawings of tooling & fixtures, hard copies in A-2 size as well as soft copy in PDF format.
15) Wiring diagram, in which the length of wires must be mentioned, hard copies in A-3 size as well as soft copy in PDF format.

16) Mechanical drawings (spindle assembly, table assembly, column assembly), hard copies in A-1 size as well as soft copy in PDF format.
17) Spare part manual with *OEMs Part ID, Suppliers part lists no., Quantity installed in machine, Circuit code, Location & Tentative price including cables with length and cores in hard copies* A-4 size as well as in PDF format.
18) Layout drawings in A-1 size, clearly showing the position of all types of electrical components in the machine.

Note: All manuals and literature should be in English/Hindi.

5.0 SPARES

5.1 Since the machine will be under comprehensive preventive maintenance during the warranty period of two (02) years and under CAMC for five (05) years after the warranty period, it is the sole responsibility of bidders to stock such spares as required for smoother execution of PMC during the warranty and CAMC in order to achieve response time in compliance with machine availability as per stipulated requirements.

6.0 CONSUMABLES:

6.1 The list of consumable spares shall be furnished and quoted along with their unit rates and part numbers.

6.2 Consumables as per the following table shall be supplied along with the machine or as per an agreed timetable, if ordered.

S.No.	Description	Quantity/per robot
1	Nozzle	500 Nos.
2	Tip Cutout	1000 Nos.
3	Insulator	500 Nos.
4	Insulating plate	500 Nos.
5	Liner	500 mtr.

7.0 SPECIAL FEATURES:

7.1 Special features incorporated in the machine, if any, shall be indicated separately in the bid, clearly indicating the advantages.

8.0 DEVIATIONS:

8.1 The tenderer shall certify that the offered machine fully meets the specification. Various design features Incorporated in the machine to fulfill different technical performance requirements shall be fully explained in the offer.

8.2 However, the tenderer may propose minor deviations from these specifications giving suggested alternatives design in order to reduce initial or recurring cost or to improve reliability, quality and

safety of operation which do not affect, or in any way interfere, with the stipulated performance standards improve safety / reliability or would reduce recurring maintenance / operating cost of the machine, can be considered for acceptance.

8.3 In such eventuality, the tenderer shall clearly indicate the details of these deviations and reasons thereof and their implications as per the format.

8.4 All Deviations shall be clearly indicated in the clause wise deviation statement in a tabulated form.

8.5 Offers without clause wise compliance statement table will not be taken for evaluation.

9.0 INSPECTION OF EQUIPMENT AND TESTING AT MANUFACTURER'S WORKS

9.1 Rigidity of the machine shall be demonstrated to the satisfaction of inspecting officer/appointed inspector or inspecting agency at the manufacturer's works.

9.2 The manufacturer shall demonstrate the machine cutting capability performance as required by this specification to the inspection agency.

9.3 A sample inspection chart for inspecting the equipment should be supplied along with the bid. The inspection charts should indicate all the tests that are carried out during manufacturing of the machine and also the tests to be offered to inspection agency.

9.4 The tenderer will submit the quality assurance plan (QAP) being followed at the manufacturer's works for ensuring quality of the products offered.

10.0 TRAINING

10.1 Free training by the firm shall be imparted in operation and maintenance of the machine as follows.

10.2 Two week training in Laser system should be provided for operation and allied robot programming (part program) for four persons. Two persons from offline programming section must be included for in-house training of the supplied offline Nesting software.

10.3 Two week training for troubleshooting, repair and maintenance of all mechanical, hydraulic, electrical & electronics equipments including CNC Control & AC Servo Drive, PLC and for four persons (two mechanical and two electrical/electronics) at RCF premises.

10.4 Subsequently, technical experts from the manufacturer will fully and adequately provide training to operators and maintenance staff nominated by the consignee at RCF at the time of commissioning and prove out of machine for 2 weeks during commissioning of the line.

Note: All training should be imparted in English/Hindi only.

11.0 FOUNDATION & RELATED DRAWINGS

11.1 For each machine, the supplier shall first submit *01 copy* of foundation drawings with details of construction of foundations, complete layout of machine elements like bed, hydraulic tank, coolant tank, electrical panel, Servo Controlled Voltage Stabilizer etc. and other related diagrams (Mechanical, Hydraulic, Electrical & Electronics) along with machine weight, overall dimensions, electrical load with length of 3phase, 415VAC electric power cable for approval as per time schedule specified in Section-IV to each consignee for approval and to enable the consignee for making necessary arrangements for Installation & Commissioning of Machine on receipt.

11.2 After getting approval from consignee, the supplier shall submit 6 copies of approved GA foundation drawings and related diagrams for the machine as per time schedule specified in Annexure-IV from the date of approval of GA drawing for information only. This information should be furnished on the pattern indicated in detail in the following IS Specifications (Latest) or relevant international standards

IS: 2974 (Pt.I Para 4.1) for reciprocating type machine.

IS: 2974 (Pt.III Para 3.1) for rotary type machine (medium & high frequency)

IS: 2974 (Pt.IV para 4.1) for rotary type machines of low frequency.

IS: 2974 (Pt.V para 3.1) for impact type machines other than hammers.

11.2.1 Turn-Key contracts:-

11.2.1.1 The supplier shall arrange certification by a RCC Consultant, who should be a Chartered Engineer registered with the Institution of Engineers, that:-

a) The design of the machine foundation &

b) Construction of the foundation is in accordance with the latest version of the relevant part of the Indian Standard for

Code of Practice for design & construction of machine foundation as specified in

IS:2974.

The original certificate issued by the consultant for certification of both the design & construction of the foundation and a copy of his registration certificate from the Institution of Engineers shall be submitted by the supplier to the consignee.

11.2.1.2 The supplier shall stand a warranty for the foundation along with the machine. He shall arrange to rectify any defects (e.g. sinking or cracking) occurring during the warranty period in the foundation. He shall also be responsible for uprooting and reinstalling the machine if so required for carrying out the repairs to the foundation. The warranty period would be extendable by the time period

for which the machine remains out of commission due to the defect in the foundation or a period of one year, whichever is more.

11.2.1.2 The payment for the construction of the foundation and installation & Commissioning of the machine would be released only after submission of a certificate as required as per clause 11.2.1.1 above, which has to be certified by the consignee. This certification shall be done while issuing the PTC for the machine.

11.2.1.3. Detailed specifications of the quantity and quality of the material etc. of the turnkey work is to be specified by the firm along with the offer so that these can be incorporated in the contract to ensure right quality as well as quantity of the material etc.

11.3 APPROVAL OF GA DRAWING

To be governed by Time Schedule in Annexure-G and following stipulations.

11.3.1 General Arrangement Drawings will be sent by the 'Contractor' to the Consignee as per Time Schedule annexed in LOA / AT. The 'Contractor' should ensure that drawings sent to consignee are complete in all respects as specified in technical specification. The GA drawings shall be approved by the consignee and given back to the contractor, as per the Time Schedule in the LOA/AT.

11.3.2 Delays in submission of drawings by Contractor will be added to the delay in supply of machine, in case, submission of GA drawing is delayed beyond stipulated time as per time schedule, LD will be levied. Thus the number of days delay in submission of GA drawing plus the number of days delay in supply of machine together will be taken as the delay in supply of machine, for the purpose of calculations of LD. However if the contractor supply the machine before original delivery period as per AT, the number of days by which machine has been supplied earlier than original delivery period, will be subtracted from the delay in submission of GA drawings and LD will be levied accordingly. Delays in approval of the drawings by consignee will not be on account of Contractor, except as detailed below.

11.3.3 In case Consignee finds some deficiencies in the Drawings and returns the same for rectification to the 'Contractor', the contractor must return the rectified drawings within 30 days from the date of issue of letter by Consignee. This period will not be counted towards LD calculation. The consignee shall ensure that all deficiencies in the Drawings shall be pointed for clarifications to the firm together at one time only, instead of piecemeal multiple references.

11.3.4 A repeat back reference(s) by Consignee to Contractor pointing out further defects/deficiencies in the Drawings, will be considered a delay on account of the contractor, except for special circumstances like change in location, review of arrangement etc. Thus, Contractors must take utmost care in ensuring completeness as per requirements of the Consignee.

11.3.5 Where GA Drawing cannot be approved by consignee due to clear site not being available etc., the Consignee must inform Contractor explaining the exact delay. However, initiative must be taken by Contractor to obtain such a certificate from Consignee.

11.3.6 In their own interest, contractor must maintain a log of events in this respect, with clear dates and regularly inform consignee to avoid wrong levy of LD. Consignee must cooperate with Contractor by providing all assistance, including clear information about any expected delays in site availability, promptly and in writing.

11.3.7 Firm should also visit the site before dispatch of machine, to assess the condition of path to be used for movement of trailer.

11.4 DISPATCH OF THE MACHINE FROM MANUFACTURER WORKS:

11.4.1 The supplier should normally dispatch the machine only after the foundation is ready for installation and commissioning of the machine on arrival.

11.4.2 In case of delay on part of consignee in providing the clear site for construction of foundation or any other facility as specified in the contract to the supplier, the supplier will report the matter to consignee in writing.

11.4.3 In case of proving of components at manufacturer works, the supplier should request for the material / parts as soon as possible after receiving contract keeping allowance of transit time etc., of approximately 60 days for consignee to handover the material / parts after receipt of the request accompanied by appropriate and valid bid guarantee. In the event of consignee certifying the non-availability of "prove out" components, such components will be deemed to have been proved out at manufacturer works. However the firm will prove out these components at consignees premises during commissioning, subject to the availability.

12 INSTALLATION, COMMISSIONING AND PROVING TESTS: (ON TURNKEY BASIS)

12.1 Joint Check – The contractor or his agent would be required to carry out a joint check at 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 receipt inspection be done immediately on receipt of the machine by consignee & bidder's representative to avoid commissioning delays due to shortages/transit damages. After receipt of the machine as above a Joint Receipt Inspection note (JRI) as per Annexure- B shall be prepared by the consignee and the firms representative indicating the tentative time schedule for various activities of installation and commissioning. After preparation of JRI, the material should also be accounted in UDM and digitally signed Receipted Delivery Challan (if applicable), Receipt Note and RO should be issued through UDM by consignee.

12.2 **RESPONSIBILITIES OF CONSIGNEE AND BIDDER**

12.2.1 The consignee shall be responsible for-

i. Provision of a clear covered (except where shed is in the scope of contract) site for construction of foundation as per the schedule to ensure its readiness before arrival of machine at site

ii. In case where construction of shed is also in the scope of contractor the consignee shall ensure site is encroachment and encumbrance free

iii. Electricity, water and compressed air for installation and commissioning of machine shall be provided free of cost within one week of arrival of machine at site.

iv. Wherever a road mobile crane has to be arranged by the supplier for material handling, a clear approach for it up to the site has to be provided.

v. Clear covered space for storage of material/equipment required for working/ construction of foundation and installation of the machine etc.

vi. The consignee shall arrange the raw material for prove out at their end within 7 days of the dry run of the machine (installation, power connection, auxiliary connection like air, water connection) failing which such components will be deemed to have been proved out. The components supplied by the consignee in time will be required to be proved out within specified time schedule thereafter.

12.2.2 The bidder shall be responsible for-

i. Design of foundation as well as flooring (if required) of sufficient thickness, suiting local soil conditions at the site.

ii. Advise consignee in time regarding schedule for requirement of clear site for construction of foundation and other infrastructure, resources & facilities required.

iii. Construction of foundation as well as flooring (if required) of sufficient thickness suiting local soil conditions, for machine shall be completed by the bidder at the site provided by the consignee before receipt of the machine at their premises.

iv. Provision of all tools and equipment, technical and unskilled manpower, material handling accessories/ equipment and material for installation and commissioning.

v. Unloading of the machine on receipt (both imported and indigenous machine) and its movement to the site of installation including provision of road mobile crane.

vi. The bidder should ensure the proper earthing for the machine and its peripherals/accessories.

12.3 Consignee will provide only 415 V+10%-15%, 3 phase 50 Hz+3% AC supply at a single point (mains). All types of cables, connections, circuit breakers etc. required for connecting power supply point to different parts of the machine/control cabinets, shall be the responsibility of the bidder. Requirement of grounding/earthing with required material shall also be incorporated by the bidder during construction of foundation.

Electrical work like laying of power/electrical cables & earthing wires from mains to machine control panel as well as within the machine, with supply of all materials shall also be carried out by the supplier.

12.4 The supplier shall demonstrate machine performance and prove out the claimed capability for successful commissioning at the consignee's works as *per clause 2.3 & 2.4.* The M&P shall be deemed to be "commissioned" at consignee premises on the date when it is tested and meets with the specified capabilities/functions according to the technical specifications. In addition to above, in case of tooled-up M&P, the M&P shall

be deemed to be "Commissioned" at consignee premises on the date when "prove out" components specified as per the relevant clause of technical specification have been successfully proved out meeting the productivity requirements of Technical specification. The consignee shall arrange the raw material for prove out at their end within 7 days of dry run of the machine (installation, power connection, auxiliary connections like air, water etc.) failing which such components will be deemed proved out. The components supplied by consignee in time will be required to be proved out within as per specified time schedule thereafter. Any delay in providing the "raw material or any other input" for proving out shall not be logged on supplier's account.

A Joint Commissioning Note (JCN) to this effect shall be made as per the format at Annexure-C After issue of JCN the performance shall be watched for a period of one month, after which the PTC shall be issued. The issue of PTC cannot be delayed by more than 60 days from the issue of JCN. If some minor breakdowns are noticed after the issue of JCN, these shall be attended as per warranty obligations and suitable extension of the warranty period.

12.5 If an assembly/sub-assembly requires to be taken back to the manufacturer's premises for repair/replacement either before commissioning or during warranty, the manufacturer or his agent would be required to submit BG of suitable amount. In case the entire machine has to be taken back, a Bank Guarantee for the cost of the machine 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.

The performance appraisal report/ Warranty Discharge certificate in the format as per the Annexure-E would be issued by consignee on completion of warranty period should be prepared by the consignee and given to the firm. Copies of this performance appraisal report/ Warranty Discharge certificate should also be sent to PCMM, PFA/RCF and CPE. On getting the performance appraisal report/ Warranty Discharge certificate, the firm will request PCMM for release of WBG. If this report is not received within the validity of WBG, the WBG should either be extended for one year or encashed as the case may be as provided under the rules.

13.0 SERVICE FACILITY IN INDIA AND TECHNICAL SUPPORT

13.1 The tenderer will clearly spell out in the offer the facilities available with him or his agent for providing adequate after-sales service in India during warranty period. The complete details such as organization for after sales service, availability of technically competent engineers and warehousing facilities for spares should be clearly indicated. Bidders not offering complete servicing/repair facilities in India to ensure quick response to maintenance/ servicing calls are not likely to be considered.

13.2 After the warranty period and AMC period, if any, the manufacturer or his agent shall agree to provide service supports for trouble shooting and obtaining spare parts. The manufacturer shall be obliged to provide spare parts required by the purchasers for a period of *15 years* from the date of commissioning of the machine at the consignee premises.

13.3 Tenderer who are OEM, shall undertake to supply spare parts for a period of expected life of machine. Other tenderers shall submit undertaking from OEM for supply of spare parts for a period of expected life of the machine.

13.4 During warranty period, the supplier or his authorized agent shall attend for break down as and when receipt of intimation of the breakdown as soon as possible, but in no case later than 24 hours of receipt of intimation of the breakdown. For this suppliers shall ensure the availability their technician at RCF during warranty period.

14.0 BOUGHT OUT ITEMS

14.1 The bidder shall furnish along with the offer a list of all critical items/ sub-assemblies which are bought out by the bidder and proposed to be used, along with the manufacturer's name, brand model etc. The successful bidder may be required to produce invoices to ensure genuineness of such products / verification by the Inspecting agency.

14.2 The bidder should clearly indicate that in case of components/sub assemblies taken from reputed companies such as Vickers, Rexroth, RITTAL, THK, and Shenburger etc., the parent company has already entered into contract with their Indian units/affiliates for undertakings repairs/after sales service during warranty and post warranty.

S.No.	Sub-assembly	Make
1.	Robot	ABB/KUKA/FANUC/YASKAWA/IGM/CLOQ
2.	Welding Power source	MILLER ELECTRIC/LINCOLN ELECTRIC/FRONIUS/CLOQ/
3.	CNC& Drive Controller	SIEMENS/FANUC/Heidenhain/ Mitsubishi/HMT NUM/*KUKA/IGM*
4.	Hydraulic system	Rexroth/Vickers/Yuken/Atos/Parker
5.	Feedback Devices	Heidenhain /Ballerf/Fagor/Sony/Siemens/Fanuc/ *KUKA*
6.	Ball screws	THK/INA/Rexroth/Star/Shenberger/NTN/Tsubaki/ Gamfier
7.	Air conditioner for Control cabinet	RITTAL/WarnerFinley/Kelvin
8.	Spindle Bearings	FAG/SKG/Timken/NTN/KOYO
9.	Centralized lubrication system	Vogel/Cenlub/Rexroth
10.	Electrical Control Cabinet	RITTAL/Siemens or of other reputed make with IP55Protection level
9.	Servo Controlled Voltage Stabilizer	Neel/Unity/Servomax/Consul/Aplab/Neelkanth
10.	Ultra Isolation Transformer	Neel/Unity/Servomax/Consul/Aplab/Neelkanth
11.	Ball bearing, roller bearing & main thrust bearings	SKF/FAG/NBC/Timken/NTN
12.	Electromagnetic clutch	Vortex
13.	Toolings	Sandvik/Kennametal-Widia/Taegu-Tec/Iscar
14.	A.C. Motors	NGEF/BBL/ABB/KEC/Crompton/Siemens/Allen Bradley/ *KUKA*

15.	Brake motors	Siemens/KEC/Crompton/NGEF/BBL/ *KUKA*
16.	Proximity Switch	Elap/Schneider/Omron/Scanner/*LAPP*
17.	Contactors	Siemens/BCH/ABB/Schneider/L&T
18.	Limit switches	BCH/Siemens/L&T/Teknic/Euchener/Honeywell,USA
19.	Push button	Teknic/Siemens/Schneider/BCH
20.	O Rings and rubber seals	Merlin/Parker/Busak/Hunger/Merkel/Soloseal/ Walkersolo/Halite
21.	Hydraulic pumps &valve	Yuken/Rexroth/Vickers/MicoBosch/Parker/ Atos/Voith
22.	Pneumatic Control Equipment	Festo/ShavoNorgen/Shradder Scovil/Electro Pneumatics/Parker/SMC Pneumatics
23.	Control gears	L&T/Siemens/BCH/ABB/Schneider
24.	Filters	Hydac/Hydroline/Parker/Rexroth/EPE,Germany/ Vickers/Purolator
25.	Belts	Fenner/Hilton/Dunlop
26.	Cable/wire	Siemens/Indramat/Hubershnuer/Finolex/Havells
27.	Gear reducer	Elecon/Greaves/Shanthi/ZF/New Allenbury/ Bongfilivali
28.	Chains	T.I. Diamond/Rollon
29.	Sprocket	Rollon/T.I.Diamond
30.	Voltage stabilizer & ultra isolation transformer	Neel/Servomax
31.	AC Drive	Fanuc/Siemens/ABB/AllenBradley/Schneider/ *KUKA*
32.	AC servomotor	Fanuc/Siemens/ABB/AllenBradley/Schneider/ *KUKA*
33.	PLC	Siemens/Messung/Hitachi/Mitsubishi/ ABB/Allenbradley/Fanuc/Schneider/ *Beckhoff*
34.	Couplings	Fenner/Love Joy Inc., USA
35.	Hour Meter	L&T/Havells
36.	Ammeter &Voltmeter	AE/Meco
37.	Rubber sheets	Rubber Products Ltd.
38.	Air circuit breaker	Siemens/L&T
39.	Connectors	Harting/Kontact/L&T/Omron
40.	Hydraulic oil air cooler type heat exchanger	Rittal/Wernerfinley/Pfamenberg
41.	Chiller type heat Exchanger	WARKIN/ADVANCECOOLING/SPAN ASSOCIATES/FREEZTECH
42.	Hydraulic Oil	IOCL/BPCL/HPCL/Castrol/ESSO
47.	Hydraulic seam less tubes	Parker/Maharashtra seamless/Indian seamless
48.	MCCB	Schneider/ABB/Siemens/L&T

15.0 **COLOR**:The machine and its accessories shall be painted in Apple Green Color No.281 to IS:5-1978,(if any specific color code standardized by BIS is available, the same be given). The machine can also be painted in equivalent RAL/DIN/other International Standards. If there is a standard color scheme of the manufacturer, the same can also be considered and may be specified

16.0 **WARRANTY OBLIGATION** –The following conditions regarding Maintenance and reliability shall also apply:-

16.1 The machine shall be designed for a life *of 15 years* with regular maintenance and all the structural members of the machine and the foundation shall be guaranteed for *15 years* against cracks breakages etc. during the course of normal operations. Tenderer would submit suitable undertaking.

16.2 In addition to warranty obligations as per IRS condition of contract, the warranty period would also cover comprehensive preventive maintenance, which will be inclusive of all spares, material and labour cost. All maintenance consumables like lubricants and grease except hydraulic oil / machine coolants shall form part of the scope of the preventive maintenance during the warranty. The cost of preventive maintenance to be carried out during warranty period should be quoted separately.

16.3 The payment of preventive maintenance schedule carried out during warranty period shall be made by consignee annually at the end of each year after completion of the work and issue of certificate by the consignee.

16.4 The machine shall at all times give contractual out-put and accuracy. Any deficiency or break down for a total of 01 hr. or more for a day would be treated as failure for the day, for the purpose of extending warranty period in terms of IRS condition of contract.

16.5 The tenderer shall ensure that, in case a failure is reported by a consignee, qualified service engineers shall visit the site within 24 Hours from the date of complaint on calendar day's basis. The period of 24 Hours (excluding date of complaint) after the failure reported shall be treated as grace period, which will not count towards breakdown time for up to one failure per month and a maximum of 3 failures per quarter. In case the number of failure exceeds one failure per month or three during any quarter of warranty, grace period of only one day will be permissible for such additional failure. Complaints shall be lodged by consignee by fax, phone, e-mail, WHATSAAP MESSAGE or per bearer at address given by the tenderer.

16.6 The details of preventive maintenance to be provided during warranty period shall be indicated by the tenderer giving details of type of preventive schedule, periodicity on items to be checked, items to be replaced and expected plant down time. Preventive maintenance schedules shall be conducted on weekends as far as possible or any other day through mutual agreement with consignees. Total breakdown hours shall be calculated after discounting grace period and preventive maintenance period.

16.7 Maximum permissible down time till the machine is restored back to the contractual output and accuracy levels, in any quarter of the year during the warranty period, shall be 150 hrs. To ensure this, a record of breakdown (duly signed by shop in-charge) in hours on quarterly basis should be maintained by the consignee and joint report with the contractor shall be made for each breakdown attention. At the end of first and second year of warranty, these details of breakdown hours during warranty period should be reported as per performance appraisal report. The firm will then request consignee for release of WBG annexing the performance appraisal report and the breakdown details mentioned above.

Penalty will be levied on the machine supplier, for breakdown period on working days basis (excluding holidays) after discounting for the grace period. Penalty will be calculated as percentage of annual preventive maintenance charges and will be deducted from the respective annual payments as under.

Breakdown period	**Applicable penalty**
Up to 150 hours in each quarter and not exceeding 500 hours annually	Nil
Exceeding 150 hours - up to 200 hours in any quarter and not exceeding 500 hours annually	5 % of annual preventive maintenance charges
Exceeding 500 hours -up to 750 hours annually	10% of annual preventive maintenance charges
Exceeding 750 hours - up to 1000 hours annually	25% of annual preventive maintenance charges

Exceeding 1000 hours annually	50% of annual preventive maintenance charges and Encashment of Warranty Bank Guarantee besides other action like noting adverse performance of the bidder and / or agent for future tenders and their offer in the Subsequent tenders will not be considered for placement of any order.

Note: - Bidders to ensure for availability of 02 manpower, one is expert in maintenance and another is for the PMC and to attend the breakdown of machine immediately for 24x7 Hours during the warranty period. In the event that the aforementioned manpower should not be associated with a Railway employee, particularly an RCF (Rail Coach Factory, Kapurthala) employee, the firm is required to submit undertaking before deploying the said manpower and obtain approval of the Railway Authority for the tendered machine.

17.0 PAYMENT TERMS:

80 % on Receipt of machine and thereafter 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.

List of Bogie Side Frame and Bogie Bolster components to be proved out on Robotic Welding manipulator .

S.No.	Type of Coaches	Description	Drawing No.	Material Specification	Welding operation to be done	Qty to be proved out in 02 Shift (16Hrs) .
1.	LHB coaches	Side Frame LH &RH	LW03210 alt-c & LW03209 alt-c , Assembly	S355J2W+N. EN10025-05.2004	1) Side Frame Welding of tacked components as upper web LW03 228 alt-a with outer web 1267408 2. Welding upper web LW03 228 alt-a with inner web 1267409 . 3 . Lower web 1267407 with outer web 1267408 . 4. Lower web 1267407 with inner web 1267409. 5. Spring pot 1267452 with upper web LW03 228 alt-a (OC). 6 . circular welding of Spring pot 1267452 with upper web LW03 228 alt-a (IC). 7 . Spring pot 1267452 with outer web 1267408 . 8 . Spring pot 1267452 with inner web 1267409 . 9 . Control arm support LH& RH , LW 03246 alt-b & LW 03247 alt-b) with Lower Web 1267407 .	05
2	LHB Coaches	Bolster	LW04001 alt-f	S355J2W+N. EN10025-05.2004	1. Welding of Bolster upper Plate 1267440 alt 00R and lower plate LW 04133 alt-a with side web 1267443 . 2 . Outer welding of Dom cum Air Reservoir LW04140 alt-c& LW04152 alt-c with upper plate 1267440, Lower plate LW04133, Vertical damper support RH &LH LW04135& LW04136	06
3	TC/NDTC & Motor Coach Vande Bharat	Longitudinal Beam LH &RH	C-A675UV2-134094 alt-4 & C-A675UV2-134577 alt-4	S355J2W+N. EN10025-05.2004	Full Welding as per drawing of tacked components of Longitudinal Beam LH & RH (Item No. 1- 9 will be provided tacked welded)	04

NOTE:– 1. Prove out components are based on the RCF current production programme ,If any components is not available at the time of commissioning than any other suitable components from the revised production Plan may be taken.

2. Firm will prove out Qty in 02 shift (16 Hrs) as per Annexure-1 , Set up time, Welding time , loading time, unloading time & inspection time including in proved out Qty.

SSE/P&P/MFG
03/09/2024

The Effective Range of Robotic Welding Manipulator must cover all components as per Annexure-A.

ANNEXURE-B

JOINT RECEIPT INSPECTION NOTE

Date……..
Sub: Receipt of consignment for machine…….
Ref: RCF PO NO…….

1.	Name of consignee/Railway	
2.	Machine name	
3.	Quantity	
4.	Name of supplier	
5.	Consignment of the machine received on	

It is certified that the consignment of the machine has been received complete and in good condition as per specification shown in the contract.
Tentative plan for installation and commissioning of the machine is as under:

1.	Date of clear site provided	
2.	Contract	Turnkey/Non-turnkey
3.	Status of readiness of foundation:	
3(a)	Already constructed on	
3(b)	Under construction & likely date of its completion	
3(c)	Construction yet to be started from ……. and & likely date of its completion	
4.	Status of availability of electrical power, water and compressed air etc.	Available/Not-available
5.	Number of components to be proved out on the machine	
6.	Likely date for start of erection	
7.	Likely date for switch-on the machine	
8.	Likely date of completion of commissioning of the machine	

Representative of firm SSE/CONSIGNEE SSE/MECHMTC

SSE/ELN.MTC Representative of consignee
Designation (Minimum Gazetted level)

ANNEXURE-C

JOINT COMMISSIONING NOTE

Date:……

Sub: Commissioning of (name of machine)…….

Ref: RCF PO…….

1.	Name of consignee/Railway	
2.	Machine name	
3.	Quantity	
4.	Name of supplier	
5.	Machine received on	

1. All the parameters of the machine are found okay. The proving test on the machine was conducted from …… to …….. and machine is working satisfactorily.

2. Machine has finally been commissioned on…….. . The machine has been handed over for regular use and kept under one month observation to watch its performance.

3. Following minor deficiencies (if any) found during joint observation trials are to be attended/rectified by the firm during one month observation and before issuing the PTC for the machine:

a.

b.

c.

Representative of firm SSE/CONSIGNEE SSE/ MECH. MTC SSE/ELN MTC SSE/PLG

Representative of consignee
Designation (Minimum Gazetted level)

ANNEXURE-D

PROFORMA OF CERTIFICATE TO BE ISSUED BY CONSIGNEE AFTER SUCCESSFUL PROVE OUT / COMMISSIONING OF THE MACHINE

No. ……. **Dated ……**

M/s …….

Sub: Certificate for commissioning/prove out of machine.

Ref: **RCF PO NO……**

1. This is to certify that the machine as detailed below, has been received in good condition along with all the concomitant / standard and special / optional accessories & spares in terms of above referred AT (subject to remarks in Item No. 2) and the same has been installed and commissioned:

a) Description of the Machine (s): **----------**

b) Machine No. (s) : ----------

c) Quantity : **----------**

d) Bill of lading No. : ----------

e) Name of the vessel : ----------

f) RR / LR / Despatch particulars: ----------

g) Name of the consignee : ----------

h) Date of first submission of GA/foundation drawings (if applicable): **----------**
Indicate delays in number of days: On Railways account: Nil
On Firm's account : Nil
Total : Nil

i) Date of final approval of GA/foundation drawings (if applicable): **----------**
Indicate delays in number of days: On Railways account: ----------
On Firm's account :----------
Total : ----------

j) Date of receipt of the machine: **----------**

k) Date of Joint verification : **----------**

l) For machines ordered on non-turnkey basis: **Not Applicable**
i) Date of power supply provided for the machine by the Railways: -
ii) Date of call to the contractor after site/foundation /Installation etc is ready by the Railway: -

m) For machines ordered on turnkey basis
i) Date of Intimation of readiness of site for starting foundation Work: ------
ii) Date of readiness of foundation by the contractor: ------
iii) Date of readiness of other infrastructure facilities like shed, track linkage etc. -----
iv) Date of power supply provided for the machine: -------

v) Indicate delays in number of days: On Railways account: -------
On Firm's account: -----
Total: -------

n) Time allowed for commissioning after date of call as per L (ii) above or after date of readiness of site as per m (iv) above. Number of days allowed ------ days from the date of receipt.

o) Date of commissioning of the machine: ------
Indicate delays in commissioning in number of days: ----- days.

i) On firm's account due to reasons such as non arrival of engineer, problem in machine/toolings etc.:----

ii) On Railway's account due to reasons such as non provision of Raw/Trial material, Crane, staff, measuring tools/gauges etc:----

p) Whether delay in supply of the machine (if any), has caused any loss / inconvenience to the Railways (Yes / No) ------

If Yes, extent of loss in monetary terms Rs……----……..

(Details to be enclosed if loss is quantifiable. However, if loss is not quantifiable then indicate "Not Quantifiable" in the space provided)

2. Details of Accessories / Spares not yet supplied and recoveries to be made on that account…….**……**

3. The proving test has been done to our entire satisfaction and the operators have been trained to operate the machine as per provisions of A/T. If not, the amount to be recovered on this account. Rs. **……**

4. You have failed to fulfill the contractual obligations with regard to the following;
a) ……. **……**
b) ……. **……**

5. The amount of recovery on account of non-supply of accessories and spares is given under para no. 2, 3 above and loss/damage on account of your failure to fulfill the contractual obligations as given in para 4 above will be advised to you. These shall be recovered from your bills / performance guarantee bond. in terms of General Conditions of contract,.

6. The issue of commissioning/PTC certificate proves only the technical acceptability and functioning of the machine on the date of issue of the certificate. This issue of PTC does not amount to wavier of any of the terms and conditions of the contract or delay in supply of drawings, machine or commissioning thereof and it does not absolve the supplier of its liability for any loss or damage suffered by the Railways do to the same.

Signature: _____
Name: _____
Designation: _____

Office Stamp: _____

Copy to:-
1) PCMM/RCF,
2) PFA/RCF,
3) PCME/RCF,
4) CPE/RCF..

Signature: _____
Name: _____
Designation: _____
Office Stamp: _____

Note: Sr. Scale Officer having independent charge is also authorized to sign this certificate.

ANNEXURE-E

PERFORMANCE APPRAISAL FORM/ WARRANTY DISCHARGE CERTIFICATE
APPRAISAL ON COMPLETION OF WARRANTY PERIOD

Dated:……

To, M/s. ……

1.	RCF PO No.	
2.	Consignee/Railway	
3.	Name of supplier	
4.	Machine Name	
5.	Machine received on	
6.	Machine commissioned on	
7.	PTC issued on	
8.	Warranty period expired on	
9.	**Performance during warranty period:**	
9(a)	Total number of breakdowns	
9(b)	Total downtime in number of days	
10(a)	Any warranty complaint pending on date	Yes/No
10(b)	If yes, then the date and nature of defect(s)	

11. In case, Reliability clause of the machine during warranty period is also given in Bid Document, then following details of breakdown hours for preceding eight quarters may also be furnished.

Quarter	Period From -------To--------	Breakdown hours
1		
to		
8		

In view of the foregoing, the successful Warranty Completion, all obligations in respect of Warranty for the said machine on part of _____ (Supplier Name) stand discharged/ not discharged as on ____ (date)

Signature----------
Name----------

Designation: DY.CME (User Shop)
Office Stamp

PCMM/RCF

PFA/RCF

CPE/RCF

Note: This appraisal may please be sent immediately on completion of warranty period. If any extension of warranty period required, may please also be mentioned with details.

ANNEXURE-F

PROFORMA FOR ASSESSING MANUFACTURING CAPABILITY OF THE OEM

Tender No. .... Date of Opening

1. **NAME OF THE OEM/ Tenderer**
2. **LOCATION & ADDRESS**

Postal Address

i) Head Office

ii) Works/Factory

Telephone No. (with STD code)/ Mobile Number

i) Regd. Office

ii) Works/Factory

3. **DESCRIPTION OF FACTORY/WORKS**

i) Total Land area (in Sq. meters)

ii) Total covered area(in Sq. meters)

iii) Different Sub-units (with details of covered/uncovered area, etc.)

iv) Special features, if any:

4. **NO. OF PERSONNEL EMPLOYED(CATEGORY-WISE)**

i) Managerial*

ii) Supervisory*

iii) Skilled artisans

iv) Unskilled* The qualification may also be indicated.

5. **GENERAL INFORMATION- TECHNICAL**

Description of different departments in the Factory/Works and function of each department, along with an organization chart

Detailed description of machinery and plant in each department (make and year of procurement /commissioning to be provided. For special type of equipment /machinery copy of pamphlets/write-ups to be furnished so as to supplement the description).

Details of raw-materials held in stock (state whether imported/indigenous).

Production capacity of the quoted items

i) Per month

ii) Per year

List of other items, which the firm regularly manufactures and corresponding production capacity.

6. **DESIGN CAPABILITY**

Details of Qualified Personnel (indicating qualification and experience) Other facilities available.

7. **MANUFACTURING PROCESS**

Level of in-house facilities

Important items of work done by outside vendors.

Brief details of manufacturing process relevant to the items quoted.

8. **AFTER-SALES-SERVICE**

Facilities available at works and branch offices/ authorized service centres/ service delivery partners.Assessment of quality of service including response times.

Signature.....

Annexure-G

	DELIVERY SCHEDULE CHART:
	In the event of acceptance of the offer, the machine shall be supplied as per the following Milestone Chart: Name of the Machine: ROBOTIC WELDING MANIPULATOR Specification No. MECH/M&P/3900/2

S.No.	Activity	Activity Code	Outer Limit of Time Schedule expected by RCF	Offered by Bidder.
1.	Issue of LOA	D1	-	
2.	Submission of PBGBy Successful Bidder	D2	D1+30 days	
3.	Issue of PO / Contract By RCF (after verification of PBG)	D3	D2+30 days	
4.	Opening of LC by RCF (if required)	D4	D3+30 days	
5	Submission of GA drawings and requisition for the trial component (s) (if applicable) to consignee by Successful Bidder/Supplier along with information on power and other utilities required for machine.	D5	D3 + 30 days	
6.	Approval of GA drawings by consignee (to be governed by clause 11.3).	D6	D5+ 25 days	
7.	Confirmation of availability of clear site by consignee.	D7	By D6 (i.e. at the time of approval of GA drg.)	
8	Completion of foundation.	D8	D7+45 days or latest by D10	
10	Supply/ Delivery of machine.	D9	D6 + 180 days	
11	Issue of Joint Receipt Note as per annexure-II and railway to give call to supplier for the commissioning of machine.	D10	D9 + 7 days	
12	Generation of Receipt note through UDM by consignee.	D11	D10 + 7 days	
13	Installation, commissioning and proving out of machine by supplier	D12	D11 + 60 days or	

14.	Issue of PTC by plant.	D13	D12 + 30 days	
15	Generation of CRC in UDM by Consignee	D14	D13+7 days.	
16	Warranty by supplier	D15	D12 + 2 years	
17	CAMC by supplier	D16	D15+5 years	

Notwithstanding the delivery period indicated elsewhere in the tender document, the delivery indicated in this schedule shall be taken as overriding and final.