SPECIFICATION OF CNC ABRASIVE WATERJET CUTTING MACHINE

S.No.	Specification	
1	**Working Envelope Requirements**	
1.1	X travel	4000 mm or more
1.2	Y travel	2000 mm or more
1.3	Z travel	150 mm or more
1.4	B axis (about X or Y axis) on the head	± 60deg
1.5	C axis (about Z axis) on the head	540 deg (i.e. 1½ rotation) or more
1.6	Max work piece size	4000 mm X 2000mm (minimum)
1.7	Max job weight	3500 Kg or higher
2	**Hydraulic System**	
2.1	Continous Operating Pressure range at the delivery end	900 to 4000 bar with infinitely adjustable pressure setting
2.2	Delivery rate of water at max pressure	Not less than 3.8 liter/min with Ø 0.35mm orifice
3	**Abrasive Water Jet (AWJ) cutting head**	
3.1	Type of Cutting	Abrasive Water Jet and Pure Water Jet Cutting
3.2	Type of Head for AWJ	Injection type with orifice and focusing nozzle
3.3	Cutting mode	Open and Submerged jet cutting
3.4	Alignment	Facility for precision alignment of orifice and focussing nozzle.
3.5	Safety	Protection for focusing nozzle against collision
3.6	Orifice and Nozzle diameters	Support for different sizes of orifices and focusing nozzles.
3.7	Minimum Orifice diameter	0.35 mm or lesser
3.8	Sheilding for containing spray within envelope	
3.9	The B, C axis alignment facility	Incase of any disturbance, the B, C axis should be alignable using standard alignment facility & should be operated with a standard program. Operator should be able to do the alignment using alignment software.
4	**CNC Work Cell**	
4.1	Type	Back lash free and positive Rigid type chassis
4.2	Programmable axes	X Y, Z, Rotary (rotation about X or Y axis), Tilting (rotation about Z axis)
4.3	Simultaneous controllable axes	X, Y, Z, Rotary (rotation about X or Y axis), Tilting (rotation about Z axis)
4.4	Minimum Positioning Speed	greater than 4 m/min in X, Y axes
4.5	Accuracies of motion at 20°C (± 2°C/ hour) required (as per ISO 230)	
4.5.1	Accuracy Over 1 meter	± 0.04mm or better
4.5.2	Repeatability	± 0.05mm or better (over entire work envelope)
4.5.3	Squareness	0.03 mm/m or better

4.5.4	Straightness	0.035 mm/m or better
4.5.5	Bevelling accuracy	± 0.1 deg
4.5.6	Bevelling repeatability	± 0.1 deg
4.6	Motion Transmission	Backlash free precision ball screws
4.7	Guide Ways	Precision ground LM guide ways
4.8	Protection	Ballscrews, bearings, & guides are to be covered with bellows to protect from dirt, dust and moisture.
4.9	Catcher tank material	Good quality Mild Steel or better material of minimum 6mm thickness with corrosion resistant Paint.
4.10	Slats/ Work support grid	Should support job weight of 1200 kg/sq.m. and made of high grade Steel. Should be replaceable for easy replacement. No need to replace entire grid in case of local wear.
4.11	Work table_height	Lesser than 1000 mm from the ground (for easy loading and unloading of jobs)
4.12	Water level in the tank	Should be controlled automatically
5	**Controller Specifications**	
5.1	Type	PC based controller system made by OEM specifically for waterjet cutting machine
5.2	Motors & Drives for axes	Brushless AC Servo motor with suitable AC Digital Servo drive with closed loop feedback
5.3	Display	Colour Graphical Display
5.4	Simulation	Programming and cutting path simulation
5.5	Memory	1 GB or more inbuilt memory for storage of programs
5.6	Memory backup	Support DVD drive & USB
5.7	Printer Interface	Parallel port/ USB to interface printer
5.8	Diagnostics	Capability to diagnose the problems in all the sub systems with direct English Instructions.
5.9	AWJ Specific Capabilities	
5.9.1	Automatic compensation for the adverse jet behavior around sharp corners and curves, unwanted blemishes due to acceleration in feed rate and taper on the cutting edges due to floppy behavior of the jet while cutting both internal and external profiles.	
5.9.2	Real time programming, Program preview, edit mode, background editing and online help.	
5.9.3	Kerf width compensation	
5.9.4	Optimal stack height calculator to optimize time by stacking materials	
5.9.5	Built-in array nesting routines to optimize part placement for optimum material use	
5.9.6	Automatic piercing methods for faster material piercing	
5.9.7	The axes shall be programmable simultaneously or independently for straight as well as bevel cutting with full compensation for taper	
5.9.8	High/ Low pressure piercing for machining tough/ fragile materials	
5.10	Pump controls	
5.10.1	Pump operating pressure should be automatically controlled. So also dual pressure for cutting brittle & laminated materials	
5.10.2	Diagnostic functions for following should be included in controller to warn the operator for any deficincy - a) Low hydraulic oil level b) High hydraulic oil temperature c) Low inlet water pressure d) High bleed down valve temperature (a & b applicable if intehsifier pump is used)	
6	**CNC Programming Features**	
6.1	Support for standard formats of file transfer such as DXF/ DWG/ IGES/ STEP	

6.2	Automatic gathering of part history and statistics for future reference and reporting purpose	
6.3	Automatic tool path generation, including lead-ins and lead outs	
6.4	Precise time estimation for accurate job costing and reporting	
6.5	Automatic Speed reduction in Software at sharp corners, small holes and curves to have better edge finish.	
6.6	Nesting module both automatic and manual in software	
6.7	Automatic MIS report generation system to be provided.	
6.8	Spiral cutting cycles for different materials like marble, glass, SS etc. to be provided in the software.	
6.9	Ability to pierce all holes first in low pressure while handling brittle & laminated materials	
6.10	The program should determine cost per part based on pre-defined parameters	
6.11	Ability to set multiple user home should be provided for operator convenience	
6.12	Possibility to run Dry Run should be provided	
7	**Power Supply Rating**	440V AC, 50 Hz, 3 –phase
8	**Abrasive delivery system**	
8.1	Capacity	200 kg or more
8.2	Metering	Accurate metering unit for variable abrasive flow rates
8.3	Water resistant	The metering system should be water resistant to avoid clogging.
8.4	Level control	The Abrasive hopper should have low level warning
9	**Job Locating and Alignment**	
9.1	For precise movement of cutting head	Manual Pulse Generator (MPG) or Roll Around control panel
9.2	Alignment	Precision Optical Locator/ Laser Edge Finder
10	**Accessories**	
10.1	Solid waste removal system	Online system to remove solid wastes/ abrasives/ debris from the catcher tank.
10.2	Tilting arrangement for cutting head	i. To provide compensation for taper and ii. To cut one dimensional bevels up to an angle of 60° on 360° envelop
10.3	Drill Head attachment to make pilot drills in case of laminates to initiate abrasive cutting **else** piercing of laminated materials to be enabled in the AWJ itself to avoid de-lamination	
10.4	Werner Finley Chiller unit suitable for machine	
10.5	Crompton Booster Pump as per requirement	
10.6	Chicago Pneumatic Compressor with Drier as per requirement	
10.7	ServoMaxThree phase Servo Stabaliser with Isolation transformer as per requirement	
10.8	APC Make UPS as per requirement	
10.9	Thermax Reverse Osmosis System suitable for the machine	
10.10	Dynamic Contour Follower/ All Terrain Follower/ Height Sensor cum crash preventor or any system to realtime maintain the stand-off distance automatically between the nozzle and the material being cut, throughout the cutting process.	

11	**Consumables**	
11.1	Orifices (Ruby)	Diameter (mm) Qty
		0.35 100
11.2	Mixing Tube/ Focusing Nozzles (Sintered Carbide)	Diameter (mm) Qty
		1.02 50
11.3	Abrasives	Garnet Mesh 80 – 1000 kgs
12	**Spares**	
12.1	Essential/ Critical Spares	For 2 years or 5000 hrs of smooth running of the machine
12.2	Other spares (optional)	Spares with specifications and part number that are essential for 10 years of operation of the machine. (**Note**: Cost of these optional spares would not be considered for evaluating L1 vendor)
13	**Performance requirements**	
13.1	The system should be capable of cutting the following materials at the specified cutting speeds employing following parameters.	
13.1.1	Orifice	Ø 0.35 mm
13.1.2	Focusing nozzle	Ø 1.02 mm
13.1.3	Working pressure	4000 bar or more
13.1.4	Abrasive	Indian Garnet 80
13.1.5	Surface roughness	≤ 4 microns Ra through out the cut surface
13.1.6	Kerf taper at the bottom	On a 25mm SS the maximum taper should be less than 25 microns
13.1.7	**Material** **Thickness (mm)**	**Cutting Speed (mm/min)**
	i. Aluminum	
	20	100
	75	15
	100	10
	ii. Stainless Steel	
	20	35
	75	6
	100	4
	iii. Titanium	
	20	50
	75	9
	100	6
14	**Cutting Technology/ Data**	
14.1	Required software tools/ database	For selection of cutting parameters for different materials like Stainless Steel (AISI304), Aluminium Alloys, Ti alloys, Inconel-718, Nimonic-263, Ceramics, Perspex and Glass at different thickness ranging from 5 mm to 100 mm.

15	**Warranty**	
15.1	One year or 2500 working hours comprehensive warranty for the entire system, against manufacturing defects shall be provided commencing from the date of commissioning.	
15.2	Extended warranty period options up to three years	
15.3	Free software/ hardware updates during warranty period.	
16	**Training**	
16.1	Training for 4 (four) persons to be provided before the delivery of the machine at works, in the following aspects.	
16.1.1	Introduction, Basic Instructions, basic calculations for power at nozzle exit for setting of pressure and selection of cutting speeds, operation of the machine Programming and applications	2 weeks
16.1.2	Mechanical and Electrical Maintenance including safety	1 week
16.2	Two engineers shall be trained in operation and programming and two engineers in mechanical and electrical maintenance.	
17	**Documentation**	
17.1	Three sets of following manuals to be supplied in ENGLISH.	
17.1.1	Machine Layout details	
17.1.2	Operating instructions of machine and control	
17.1.3	Programming manuals	
17.1.4	Maintenance manuals including list of spares parts and trouble shooting details etc.	
17.1.5	Electrical, electronics, pneumatic and hydraulic circuit diagrams of machine and control system	
17.1.6	Test charts of the machine.	
18	**Quality Acceptance/ Quality Test Plan**	
18.1	Accuracy and geometrical accuracies test report of the supplied machine should be attached.	
18.2	Machining and inspection of test specimen to be carried out at ARDE after installation and commissioning of machine.	
18.3	Installation and commissioning of the machine shall be done by the supplier at ARDE	
18.4	Accuracy tests (Geometrical and positional accuracies) as per ISO 230 standards should be carried out.	
18.5	Proving out standard system and program features shall be done at ARDE.	
18.6	Onus of demonstrating the accuracies with calibrated ball bar and/ or laser interferometer at ARDE rests with supplier	
19	**Special Terms**	
19.1	Machine quoted should be from the standard range of production of the firm. No proto type or developmental basis machine will be acceptable.	
19.2	Quoted model machine should have been working for the last 5 years	
19.3	Software and High pressure pump should be from OEM.	
19.4	The make, brand and details of the bought out items should be mentioned in the technical bid. ARDE reserves the right to ask for a particular brand and make of the bought out item to normalise the offer. In case there is any change in the technical offer that vendor is giving and the one asked by ARDE then opportunity to give a fresh offer would be given.	

19.5	The vendor should have supplied at least 3 nos of machine of similar configuration in India. The vendor should submit the following information where similar machines have been supplied, for qualification of their offer.
19.5.1	Name and postal address of the customer/ company where similar machine is installed.
19.5.2	Name and designation of the contact person of the customer.
19.5.3	Phone, Fax No. and e mail address of the contact person of the customer.
19.5.4	Month and year of commissioning.
19.5.5	Application for which the machine is supplied.
19.5.6	One performance Certificate from the customers regarding satisfactory performance of machine supplied to them. The certificate should be current and on the letterhead of the customer. It should contain information regarding model/ size of machine, year of commissioning and performance of machine.
19.6	ARDE reserves the right to verify the information provided by vendor. In case the information provided by vendor is found to be false/ incorrect, the offer shall be rejected.
19.7	The vendor/ supplier should have been dealing with Abrasive Waterjet Cutting Machines in India for at least 3 years.
19.8	The vendor should give an undertaking for continuous support for the supply of Spares and Service for at least ten (10) years, from the date of commissioning.
19.9	The vendor should have Service - after - sales set-up in India, details of which should be provided including addresses of agents/ Service centers in india. Competency and experience of the Local Service Agency are to be provided.
19.10	Standards for design, manufacture and testing of the machine shall be in accordance with Internationally Accepted Standards. Supplier should enclose the details of the same.

NOTE:

The vendor should mention **quantitative and qualitative remarks** in front of each of the parameter mentioned in this document. Also, vendor should furnish itemwise/ parawise compliance of other RFP documents clearly indicating **ACCEPTED/ NOT APPLICABLE**.

(PS Prasad) Sc 'F'
GD (PMU)