

## Annexure –I

Detailed specification of **Chilling Unit** of Advance/ Span./ Werner Finley make (Indian make only):

1. To maintain desired cooling temperature of water circulated inside induction brazing machine . The water must be circulated with in-line water pump having 100% stand-by, manual ball – valves, strainer, etc. as part of the unit. There must be multiple rotary compressors for 25% , 50% & 75% part-load operation and atleast 25% extra stand-by provision with necessary automatic solenoid anti-freeze cut-outs, etc. monitored by central monitoring microprocessor. The unit must be refrigerant in the condenser and the compressor.
2. Cooling capacity: Min.75000 Kcal/Kr. Or as required for effective cooking with 100% operation of the induction  
Brazing machine (as required by OEM).
3. Electrical supply: 440V± 10%. 3-ph. 50HZ.3-Wire system. No neutral will be provided. For single phase supply,  
If required, sufficient capacity transformer will be supplier's scope.
4. Ambient Condition at Bhopal :
  - i) Summer: 46°C dbt/ 32°wb
  - ii) Winter: 7°C dbt/ 13% RH
  - iii) Monsoon: 33°C dbt / 98% RH
- 5.. Operation: Continuous.
6. Refrigerant: Non-CFC gas.
7. Make & detail of the accessories in the Chilling Unit must be as follow:

Sl.No.	Item	Description	Make
1.	Compressor	Non-CFC energy efficient Hermetically sealed having EER of more than9.0	Copeland/Danfoss
2.	Condenser	Air Cooled 4 row Copper Tubes (22 SWG ) with Aluminum Fins, designed for high heat dissipation.	ATCO/reputed make.
3.	Condenser Fan	Axial-flow type.	Nadi/GE
4.	Evaporator	SS316 energy efficient internally grooved Pipe with inert-gas MIG welding, dipped in 22G SS304 Tank of sufficient capacity, preferably more than 5001 ltr.	ATCO/reputed make.
5.	Pump	In-line ss316 Impeller Pump with Mechanical Seal.	Grundfoss/Bell&Gosset
6.	Microprocessor-based Temperature Indicator Cum controller	Modular Microprocessor with Digital Differential Controller having PT-100 Thermister. It must have digital setting range from + 10°C to + 25°C having fault diagnosis features, 3 minutes time delay, equal run time of compressor,	Carel/Dixell

		etc	
7.	Pressure Switch	HP/LP Cut-out Switch.	Danfoss/Sporlon
8.	Expansion Valve Filter Drier	Automatic Thermal Expansion type. Silica-gel Type.	Danfoss/Sporlon Danfoss/Sporlon
10.	Accumulator	Receiver Type.	Alco
11.	Electrical Control	Comprising of MCB, Switchgear, OLP, Relays, Contactors, Wiring, etc.	Seimens Finolex
12.	Phase Preventer	SPP with Phase Reversible Protector	Minilec
13.	Structure	M.S. tubular frame covered with 18 G I Sheet, hinged type CRCA door, lifting hook at top and mechanical dust filter.	Reputed make
14.	Insulation	All portion of the unit that comes in contact with cold air.	Vido flex

8. Refrigeration system must incorporate 'Dual Backpressure Control System' which gives rapid & efficient cooling. The compressor is initially operates on 'high back pressure mode' to quickly bring down the water temp and as it approaches the set point, this system switches the compressor to a 'low back pressure mode' resulting in precise temp. control and power saving. Also, ' Hotgas bypass Valve' must be installed in the refrigeration circuit to prevent freezing and ensuring stable operation.
9. The chiller must be designed to work in extremely harsh industrial environment and needs protection from heat, dust, fumes, corrosive or oily vapours, moisture, etc. The condenser coil must resist dust accumulation & must transfer heat efficiently.
10. There must be centralized fault indication in case of power failure, high pressure, low/high temperature of water, fan defect, etc
11. Over-load relay will be provided for the compressor-motor, fan-moto and pump-motor, with individual protection. Incase of an OLR trip a signal will be generated & the total system will be tripped off. Unless the problem is rectified & the reset button is pressed to reset, the system will not switch on.
12. When there is a pump fault, the compressor & pump will switch on only after rectifying the problem & pressing the restart button.
13. The compressor will be switched off & alarm signal will be generated if the anti-freeze signal is sensed, the compressor will restart only after the reset after pressing the reset button.
14. The chiller unit must have individual circuit breaker of Siemens make which must operate on excess current & temperature.
15. All wiring inside the chiller must be neatly laid with proper fixing & individual wire ferrule.
16. The complete control circuit inter-locks with necessary accessories must be complete from the stand-point of major operating & safety controls in double door constructed control panel as per IP-65 with hinged front opening door.
17. The surface of the complete chilling unit must be PU based powder coated of Sapplire Blue colour.

18. The chiller unit must be tested for on-load cooling from zero to full load as supplier's works before dispatch. The certificate for the same must be enclosed with the three sets of "operation & maintenance" manual. All bought-out items literature must be enclosed.
19. **Warranty:**  
The supplier shall Warranty/Guarantee for the successful operation of the equipment for a period of 12 months from the date of successful commissioning at BHEL works. Equipment/ sub-assemblies/components found defective due to deficiency in design, material or workmanship shall be replaced by new ones and such replacements shall carry the successful operation for further period of 12 months from the dated of replacements.
20. **Performance Guarantee:**  
The chilling system are to be guaranteed for desired performance for 12 months from the dated of handing over of the unit to BHEL. During this time if it is observed that the system is not giving desired performance, the bidder shall do any type of rectification/modification required free of cost.
21. Supplier have to provide O&M manual. Spared part list, GA layout drawing of the chiller with pipe size& location, schematic electrical wiring & control circuit drawing, microprocessor programming details, etc. in 4 sets with the supplied equipment.
22. Training for operation & maintenance needs to be provided at OEM induction brazing machine supplier's work after installing the chiller unit