Appendix

Sr. No.	Equipment	Specification Detail	Qty.
1	Vapour compression system test rig.	**Capacity** - 1/3 -0.5 TR **Technical Specification:** **Compressor:** - ISI Hermetically Sealed (Danfoss/ Emerson) **Condenser:** - Air Cooled Condenser with Variable speed fan. • Temperature sensor to be place at all U bend to predict the temperature profile in refrigerant side in addition to inlet an outlet of the condenser. • Also the detail of condenser geometry (tube size, fin, its pitch and spacing, etc. and its material should be provided. • Provision for measuring air temperature, air velocity at inlet and outlet of the condenser. **Water Pump:** - To equalize the water temperature. **Evaporator:** - Calorimeter type. • The inner chamber of the calorimeter -made of Stainless Steel. • Duly thermally insulated. • Immersion type-cooling coil inside. • A dip type Electrical immersion heater to vary the initial temperature of the water for balancing the refrigeration effects. • Outer chamber of the Calorimeter -fabricated out of Stainless Steel Sheet. **Control Panel:** - Following controls and components should be provided on a board with galvanized ski pass material with powder coating (or MS with Powder coating/PU Paint). Calibrated refrigerant flow meter with Digital Display. **Expansion Device :** Capillary Tube **Digital Temperature Indicator:** Digital Temperature Indicator 'RTD' thermocouples in following points. For refrigerant side 1. Compressor Inlet 2. Compressor Discharge 3. Condenser Inlet	**01 Unit**

		4. Condenser outlet 5. Inlet of expansion device 6. Exit of Expansion 7. Evaporator inlet 8. Evaporator outlet 9. For water temperature at inlet and outlet in evaporator. Pressure measurement arrangements with Pressure sensors & Digital display at Compressor Inlet 1. Compressor Inlet 2. Compressor Discharge 3. Condenser outlet 4. Evaporator inlet **MS Stand:** - The unit should be assembled on heavy-duty square pipe structure base. **Refrigerant:** - Freon -134a **Note: Equipment must have a provision for safety cut-offs, and all component has to be place in single platform.**	
2	Heat Pump test rig	**Capacity** - 1/3 - 0.5 TR **Technical specifications:** **Compressor:** - ISI Hermetically Sealed Compressor (Danfoss/Emerson) **Condenser:** - Water immersed (Cu tube) **Evaporator:** - Water Immersed (Cu tube) **Expansion Device:** Thermostatic /Automatic Expansion Valve **Measuring Controls and Components:** Refrigerant & water flow meter with digital display. **Water Pump:**- One for Condenser, 2nd for Evaporator **Digital Temperature Indicator:** - provided with selector switch for various Temperature applications. Location of temperature measurement: For refrigerant side 1. Compressor Inlet 2. Compressor Discharge 3. Condenser Inlet 4. Condenser outlet 5. Inlet of expansion device 6. Exit of Expansion 7. Evaporator inlet 8. Evaporator outlet 9. Water side at inlet and outlet (for condenser and evaporator)	**01 Unit**

		Pressure measurement arrangements with Pressure sensors & digital display 1. Compressor Inlet 2. Compressor Discharge 3. Condenser outlet 4. Evaporator inlet **Control Panel:** - Following controls and components should be provided on a board with galvanized ski pass material with powder coating. (Or MS with Powder coded/PU paint). **Refrigerant: - Freon - 407C/410A/134a** **Base:** - All the above controls and components should be provided on a board with galvanized ski pass material with powder coating. Finally accommodate on Heavy Duty Angle square pipe Base. **Note: Equipment must have a provision for safety cut-offs, and all component has to be place in single platform.**	
3	Ice Plant Test Rig	**Capacity** 25-45 Kg/Day **Technical specifications:** **Compressor:-** ISI Hermetically Sealed (Danfoss/Emersion) **Condenser:-** Air Cooled. (Cu tube, Al fin with suitable capacity and variable speed. • Temperature sensor to be place at all U bend to predict the temperature profile in refrigerant side in addition to inlet an outlet of the condenser. • Also the detail of condenser geometry (tube size, fin, its pitch and spacing, etc. and its material should be provided. • Provision for measuring air temperature, air velocity at inlet and outlet of the condenser. **Glycol Tank Cabinet:-** The Inner and Outer tank of Ice Plant shall be made of Stainless Steel Sheet with suitable insulation. HPLP Cutout Required. **Suction line Heat Exchanger -** Co-axial type with bypass valve, (capable to perform with and without flowing refrigerant from suction line heat exchanger) **Expansion Device:** Thermostatic/Automatic Expansion Valve **Cooling Coil:-** Water Immersed Type. **Agitation:-** One Lot **Ice Cans:-** Made of G.I.Sheet. **Primary Refrigerant:-Freon-407C/410A/134a**	**01 Unit**

		Secondary Refrigerant:- Glycol **Measuring Controls:-** The following controls and components should be provided on a board with galvanized ski pass material with powder coating. (Or MS with Powder coating/PU paint). **Digital Indicator:-** **Digital Temperature Indicator:** Digital Temperature Indicator with 'RTD' thermocouples in following points. For refrigerant side 1. Compressor Inlet 2. Compressor Discharge 3. Condenser Inlet 4. Condenser outlet 5. Inlet of expansion device 6. Exit of Expansion 7. Evaporator inlet 8. Evaporator outlet Pressure measurement arrangements with Pressure sensors & digital display. 1. Compressor Inlet 2. Compressor Discharge 3. Condenser outlet 4. Evaporator inlet **Base:-** All the above controls and components should be provided on a board with galvanized ski pass material with powder coating. Finally accommodate on Heavy Duty square pipe Base. **Note: Equipment must have a provision for safety cut-offs, and all components has to be place in single platform.**	
4	Refrigerant Tool Kit, Leak Detection, Evacuation And Charging of Refrigerant Training Setup	Includes 1. Digital Weighing balance 2. Vacuum pumps 3. Combined voltmeter and ammeter 4. Gauge manifold 5. Complete refrigeration maintenance kit 6. Complete charging/discharging demonstration kit 7. Complete oil change demonstration kit 8. portable welding gas, burner and joint kit, including testing equipments 9. Three different refrigerant cylinder for charging demonstration filled with (R134a, R22, R407C/R410A) 10. Complete set leak detection kit and their maintenance kit. 11. Including essential measuring device for all above.	**01 (set of each unit)**

		Control Panel:- Individual kits, controls and components should be provided on a board with galvanized ski pass material with powder coating. (Or MS with Powder coded/PU paint). **Note: Detail list of component and specification, included in each kits to be provided, in the quotation.**	