

HLL BIOTECH LIMITED

INTEGRATED VACCINES COMPLEX, Chengalpattu

nne pharmaplan®

User Requirement Specifications

Equipment/System	Water Cooled Chiller		
Identification #	U-CHW 01TO06	Document#	URS/U/CHW01
Effective Date	2014.05.22	Revision#	01
Tender No	HBL/IVC/HVAC/CHILLER/2014-15/01		




User Requirement Specifications Chilled Water Generation System Equipment ID: U-CHW 01 to 06

Revision index

Revision	Date	Reason for revision
00	2014.03.22	First Draft
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CONTENTS


1.	APPROVAL SIGNATURES.....	3
2.	OVERVIEW.....	4
3.	CODES & STANDARDS	8
4.	DESCRIPTION OF PACKAGE SYSTEM:	9
5.	GENERAL REQUIREMENTS.....	14
5.1	Safety Requirements:.....	14
5.2	Name Plates:	14
5.3	Painting:.....	14
6.	MATERIAL SPECIFICATIONS	15
6.1	General.....	15
6.2	Appropriate Materials	15
6.3	Piping.....	15
6.4	Non-metallic materials.....	15
6.5	Insulation materials	15
7.	Available Utilities	16
8.	TESTING, COMMISSIONING & INSPECTION:.....	16
8.1	QAP	16
8.2	Testing:.....	17
8.3	Inspection:	17
8.4	Factory Acceptance Test (FAT):.....	17
8.5	Site Acceptance Test (SAT):.....	18
8.6	Installation.....	19
8.7	Commissioning	19
8.8	Training.....	20
9.	PRIORITY OF DOCUMENTS:	20
10.	DOCUMENTATION:	20
10.1	List of Documentation:	21
11.	DELIVERY AND INSTALLATION:.....	23
10.1	Installation.....	23
10.2	Spare part	24
12.	GUARANTEE:.....	24
13.	QUALITY ASSURANCE:.....	25
14.	ATTACHMENT:.....	25
15.	ABREVIATIONS.....	25

Annexure List

Sl.No.	Drawing / Document No.	Detail
1	NPI/120310/DS/U/CHW 01.	Data Sheet for Chilled Water Generation System

HLL BIOTECH LIMITED

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	Effective Date	2014.05.22	Revision#	01	
	Tender No	HBL/IVC/HVAC/CHILLER/2014-15/01			

1. APPROVAL SIGNATURES


This document is prepared by project team of NNE Pharmaplan for the Integrated Vaccines Complex (IVC)+(NPI project number: 120310) of HLL Biotech limited under the authority of their Project Manager. Hence, this document before being effective shall be approved by the QA team/Engineering team of HLL Lifecare limited, and authorized by the appropriate Project Authority.

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2. OVERVIEW

2.1 Project introduction

HLL Biotech Limited (HBL), a subsidiary of HLL Lifecare Limited, (a CPSU under Ministry of Health & Family Welfare, Government of India, is implementing "an Integrated Vaccines Complex (IVC) - a project of national importance' at Chengalpattu, near Chennai. The proposed complex is a state of the art facility with cGMP compliance for manufacturing vaccines required for the immunization programme of Government of India.

For this purpose, NNE Pharmaplan has been appointed as consultants for setting up this facility, incorporating the latest standards of GMP and best practices

2.2 Objective

This document is mainly prepared to define the requirements for the chilled water generation system. The system is a package unit assembled and tested in the vendor's place.

The VENDOR being the organization which will respond to this tender by a quotation and subsequently is contracted accordingly.


It is the responsibility of the VENDOR to get familiar with the local situation prior to the start of the design work either by studying building and layout drawings or by an inspection on site.

The client expects from the vendor a careful review of the supplied documents with special regard to:

- Consideration of recent knowledge in science and technology
- Consideration of local regulatory requirements
- General engineering rules as well as other regulations and guidelines to be considered
- Qualification/suitability/adequacy for the planned use/scope of work
- Warranty to provide a defect free, operative performance/service
- In case the text of an item in the specification allows different interpretation the vendor/bidder is obligated to indicate this in the proposal. Unclear passages have to be mutually clarified with the client prior to signing the contract. If the vendor fails to do this, the interpretation of the client applies.

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2.3 Scope of Work

The scope of work/service shall include but not limited to, design, supply, installation, testing, erection, and commissioning & Validation, inspection, transportation, loading, unloading, of water cooled Centrifugal chillers with VFD. The vendor should accordingly consider all necessary items required for effective installation and performance of the system, whether mentioned or not in the specifications. Cost required for FAT shall be quoted separately.

Water cooled chiller shall be designed in accordance to provide 4°C at the outlet of chiller and 11.5° return from the plant.

S. No	Equipment	Capacity (TR)	Quantity (Nos.)	Phase
1	Water cooled Centrifugal Chiller	750	6	Phase-I

The vendor shall clearly indicate the battery limits, the termination points, utilities required, etc., in the detailed offer.

The vendor shall come back with any suggestions if, found to be more effective and efficient / better than that specified in this specification.

The Client shall be entitled to inspect and audit the supplier's Quality Management System (QMS) and the facilities, if desired, prior to any business agreement.

The vendor should take full responsibility for the function of the chilled water generation system.


This requirement and respective document attached shall define the minimum requirement to be met by the vendor.

The Vendor shall supply the chiller package that is necessary to meet process requirement including all temperature transmitter, pressure transmitter required for the package unit. The package shall have a common steel base structure with all system components, related valves and including the following equipment, but not limited to:

- Compressor with lubrication system
- VFD for Chillers (VFD should be Factory calibrated and Unit Mounted / Free Standing).
- Condenser (Cooling media is water)
- Expansion Valve
- Evaporator
- All piping, fittings (including mounted appurtenances) within chiller & auxiliaries.
- Victaulic coupling / Counter Flanges for condenser and evaporator inlet/outlet.

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- Steel Base structure
- Instrumentation
- Control Cable between chiller power & control panel and its relevant equipment, automatic valves, instruments and local control cabinet.
- Power Cable between chiller power & control panel and its local control cabinet.
- Refrigerant and lubricant for first filling
- Chiller shall be equipped with 2 oil filters for changing filter online.
- Motor
- Insulation of cold surfaces, using closed-cell rubber insulation.
- Differential pressure switches for both evaporator and condenser
- Low noise and low vibration levels shall be guaranteed by supplier.
- Vendor should provide Software selection sheet at duty conditions to prove the performance of the chiller.
- Vendor shall provide Software selection sheets at duty conditions from 100-20% with constant ECWT to prove the performance of the chiller. This is to check surge free operation of chiller.
- Vendor shall provide software selection sheets at higher condenser water entering temperature of 33 & 34 deg C at 20% of load to verify stable and surge free operation at higher lift conditions
- Plant Manager to control the complete High side HVAC system viz., Chiller, Primary, Secondary and Make water Pumps, Cooling Tower and Condenser water pump.
- Chiller should be capable to perform trouble free operation at 20% of full load condition at constant condenser entering temperature as per duty conditions.
- Necessary software selection and technical documents like surge curve to be provided along with technical offer.


2.3.1 Control

Microprocessor based controller with provision to export the data for Plant Manager, provision of Ethernet Connectivity to Plant Manager (Bidder to specify details).

Microprocessor with HMI panel shall provide access to real time & historical trends and events relating to the respective control loop, alarm screens and alarm acknowledgement. The instruments, gauges, transducers etc. required to display the parameters listed below are in the scope of successful vendor.

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	Tender No	HBL/IVC/HVAC/CHILLER/2014-15/01			

- ✓ Chiller Run Status
 - ✓ Chiller On / Off command
 - ✓ Compressor Run Status
 - ✓ Compressor Gas Pressure
 - ✓ Current
 - ✓ Expansion Valve Position
 - ✓ Date and time
 - ✓ Chiller operating hours
 - ✓ Entering (inlet) chilled water temperature
 - ✓ Leaving (outlet) chilled water temperature
 - ✓ Entering (inlet) cooling water temperature
 - ✓ Leaving (outlet) cooling water temperature
 - ✓ Evaporator refrigerant temperature
 - ✓ Oil pressure
 - ✓ Oil-sump pressure
 - ✓ Evaporator pressure
 - ✓ Number of starts
 - ✓ Leaving evaporator temperature
 - ✓ Motor Amperes
 - ✓ Motor Amperes at set point
 - ✓ Remote reset signal
 - ✓ Critical sensor value at the time of fault
 - ✓ Any other
 - a. Power and control circuit terminal blocks
 - b. ON/OFF control switch
 - c. Vendor to specify the Controls & other Features involved in the system
- Data display: Bidder to specify all the data available to display.

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2.3.2 Alarms & Safety features

The control panel of process chiller shall have minimum of the following alarms and safety features:


- Motor over load
- Over voltage
- Under voltage
- Short circuit
- Bearing oil temperature
- Low evaporator refrigerant temperature
- High motor temperature
- Low oil pressure
- VFD fault
- Chilled Water No-flow Alarm
- Chiller Trip Alarm
- Any other

3. CODES & STANDARDS

ARI 550/590. 2003	Performance rating of water chilling packages using the vapor compression cycle
ARI 575:	Air Conditioning and Refrigeration Institute. Standard Method of Measuring Machinery Sound within Equipment Rooms (Base of all data presented or field testing of equipment with relation to sound requirements).
ASME Section VIII	American Society of Mechanical Engineers Code for Unfired Pressure Vessels (Design, construction, testing and certification of pressure vessels).
ANSI-B 9:	American National Standards Institute. Safety Code for Mechanical Refrigeration (overall general safety requirements, relief device sizing, etc.)
ANSI-B 31.5:	American National Standards Institute -Code for Refrigerant Piping.
ASHRAE 15:	Safety code for Mechanical refrigeration
ASHRAE 23:	Methods of testing and rating positive displacement refrigerant compressors and condensing units

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ASHRAE 30: Methods of testing liquid chilling packages

4. DESCRIPTION OF PACKAGE SYSTEM:

4.1 Design Basis

- Type: Centrifugal Chiller.
- Capacity: 750 TR (At Duty Condition)
- Operating Temperature: 4 -11.5°C.
- Configuration: 6 No's
- Cooling Media: Water Cooled
- Refrigerant: R 134a

Noise level: m85 dB (A) 1 meter from equipment the sound levels shall be within the permissible limits and tolerances while measuring the performance in accordance with AHRI Standard 575-08, Method of Measuring Machinery Sound within Equipment Rooms.

Chiller shall be designed for following duty conditions


- Summer DBT: 39.4°C
- Monsoon DBT: 28.3°C
- Winter DBT: 18.3°C
- Max R H: 88%
- Min. R H: 41%
- Altitude (above MSL): 30 Feet

4.2 Compressors

- The compressor shall be a single-stage centrifugal type powered by a / semi-hermetic / open-drive electric motor liquid refrigerant/Air cooled, two pole squirrel cage induction type.
- Motor safeties, and overload protections shall be provided to avoid any motor failures. Also, thermistors to be embedded in the motor windings to trip the motor in case the winding temperatures exceed beyond preset limit.
- Compressor castings shall be designed for working pressure and shall be hydrostatically pressure tested for R-134A units.

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	Tender No	HBL/IVC/HVAC/CHILLER/2014-15/01			

- The unit shall be capable of operating with lower temperature cooling tower water during part-load operation in accordance with ARI Standard 550/590.

4.3 Lubrication System

Lubrication oil shall be force-fed to all compressor bearings, gears and rotating surfaces by an external variable speed oil pump. The oil pump shall vary oil flow to the compressor based on operating and stand-by conditions, ensuring adequate lubrication at all times. The oil pump shall operate prior to start-up, during compressor operation and during shut down. Compressor shall have an auxiliary reservoir to provide lubrication during shut down in the event of a power failure. The oil reservoir shall be designed in accordance with ASME or applicable pressure vessel code. Oil shall be filtered to allow maintenance without removal of refrigerant charge. An automatic oil return system to recover any oil that may have migrated to the evaporator shall be provided. Oil piping shall be completely factory installed and tested. Service valve shall be provided if the OEM specs call for it.

Lubrication oil system shall include oil pump, 2 oil filters, oil pit, oil cooler, etc

4.4 Condenser & Evaporator:

- Type: Shell & Tube type Heat exchanger.
- Standard: TEMA C, ASME Sec VIII Div-1 latest edition

Evaporator (Chiller):

The unit shall be equipped with a direct-expansion flooded or hybrid falling film type evaporator with single/two refrigerant circuits.

Evaporator shall be of the shell-and-tube, flooded type designed for 150 psig working pressure on the refrigerant side. Shell shall be fabricated from rolled carbon steel plate with fusion welded seams. Copper tube sheets shall be drilled and reamed to accommodate the tubes.

The refrigerant side shall be designed, tested and stamped in accordance with ASME Boiler and pressure vessel code, section . VIII division 1 or TEMA C. Tubes shall be of high-efficiency, internally and externally enhanced type having plain copper lands at all intermediate tube supports to provide maximum tube wall thickness at the support area.


Each tube shall be roller expanded into the tube sheets providing a leak-proof seal, and be individually replaceable.

The evaporator shall have a refrigerant relief device sized to meet the requirements of ASHRAE 15 Safety Code for Mechanical Refrigeration

The chiller shall be provided with following connections and accessories, as separately identified in the schedule of quantities.

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- Refrigerant inlet and outlet pressure gauges
- Drain and vent connections with stop valves
- Electronic temperature and pressure gauges shall be provided.
- De-scaling valves
- Water flow switches at the outlet
- Ribbed rubber isolator or pads to eliminate transmission of vibration up to 90%

Chiller shall be insulated with Nitrile rubber of required thickness as per manufacturer's recommendation. Insulation shall be applied to cooler shell, flow chamber, suction connection and all the necessary parts (wherever required). The insulation shall be set with compound recommended by the insulation manufacturer and shall be applied sealing the joints. The insulation shall be applied in such a manner that water boxes and covers shall be removable without damaging it.

Unless specified otherwise, the fouling factor for Evaporator shall be 0.00025 sqft hr ° F/ BTU

Condenser:

Condenser shall be of the shell-and-tube type, even pass, designed for 235 psig working pressure on the refrigerant side. Shell will be fabricated from rolled carbon steel plate with fusion welded seams. Copper tube sheets shall be drilled and reamed to accommodate the tubes. Tubes shall be of high-efficiency, internally and externally enhanced type having plain copper lands at all intermediate tube supports to provide maximum tube wall thickness at the support area. Each tube will be roller expanded into the tube sheets providing a leak-proof seal and shall be individually replaceable.

The condenser shall be water cooled design. It shall be complete with the following connections and accessories:

- Water inlet and outlet (with grooved coupling).
- Drain and vent connections with stop valves.
- Electronic temperature and pressure gauges shall be provided.
- De-scaling valves
- Water flow switches at the outlet


Unless specified otherwise, the fouling factor for condenser shall be 0.001 sqft hr ° F/ BTU. It shall be complete with the accessories.

4.5 Electric Motor

Motor shall be energy efficient (EEF -1 efficiency) and suitable for 415 volts, 3 phase, 4 wire, 50±3% Hz

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supply. Hermetic / semi hermetic motors shall be totally enclosed refrigerant cooled, two pole, squirrel cage induction type. In case of open compressor type motors shall be screen protected, drip proof, squirrel cage induction type. Motor shall be designed and guaranteed for continuous operation. Insulation of motors shall be Fqclass. Temperature rise of motor under rated service conditions shall not exceed 80 Deg C (by resistance method of measurement) over an ambient of 40 Deg C. the motor shall be provided with a combination of ball and roller bearing. Motor should have min IP 55 / IP 54 / IP 23 protection. Motor to suit the need of VFD. Earthing terminal shall be equipped in terminal block.

Terminal box of sturdy construction shall provide enough space for terminating, connecting and earthing of copper conductor cable. All terminal boxes shall be located at the same side of the motor and have terminal and cable glands suitable for the specified cables.

Starting current at rated voltage and frequency shall not exceed 2 times the full load current at the rated voltage and frequency. The total efficiency shall include losses of the auxiliaries such as independent excitation, motor-driven fans, lube-oil pumps etc. Over voltage surge protection shall be provided to protect motor.

4.6 Refrigerant Circuit

Each refrigerant circuit shall include: a discharge valve, a leaving fluid valve, an electronic expansion device controlled by a stepper motor, equipped with a liquid sight glass to show the opening, a filter drier with removable cartridge, pressure and temperature sensors that can be removed without draining the refrigerant charge, one high-pressure switch with automatic reset per compressor complete with refrigerant charge. All refrigerant circuit components shall be welded for total and lasting leak-tightness.

4.7 Power Control Boxes

- The unit shall operate at 415 volts, 3 phases, 50 Hz without neutral and shall only have one power connection point.
- The control circuit voltage shall be 24 V maximum, supplied by a factory-installed transformer.
- The unit shall be equipped with a factory-installed interlockable disconnect/isolating switch.
- The power and control circuit wiring shall be arranged so that isolation of one circuit of chiller shall be possible for both power and controls.


4.8 Chassis/Enclosure

Chassis and enclosure made of galvanized sheet steel. Painted in oven-baked polyester powder paint in light grey colour. The removable panels and the doors shall be accessible.

4.9 Isolation Pads:

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Included with the unit are four vibration isolation mounts, consisting of 1" thick neoprene isolation pads, for field mounting. The pads are to be mounted under the steel mounting pads on the tube sheets, suitable for ground floor installation.

4.10 Unit Control

The chiller shall be equipped with microprocessor control panel regulating all unit operating and safety parameters in order to optimize energy efficiency and minimize the possibility of the refrigerant circuit shutting down due to a fault. The control system shall ensure the following functions:

- Entering and leaving water temperature control by PID loop with equalization of the compressor operating times and number of compressor start-ups.
- Protection against excessive compressor cycling by auto adaptive control algorithm acting on the leaving water set point dead band.
- Optimization of the condensing pressure with a floating set point based on the outside temperature and the thermal load in order to limit power consumption.
- Dynamic evaporator superheat control via the electronic expansion valve / **automatic expansion device as per manufacturer's standards** in order to maximize the use of the evaporator capacity, whilst protecting the compressors against migration of liquid refrigerant.
- Automatic compressor unloading when an abnormally high condensing pressure is detected to prevent the shutdown of the refrigerant circuit due to a high-pressure fault.

4.11 Machines-Operator Interface

- This shall include status and fault LEDs, two numeric indicators, a synoptic refrigeration system display and a command keyboard.
- The interface shall permit display of water temperatures, compressor suction/discharge pressures and temperatures, set point, compressor operating times and the number of compressor start-ups.
- Chiller diagnostics and parameter setting by selecting one of the following menus:
 - Information, temperatures, pressures, set points, inputs, test, configuration, alarms, alarm history, operating time.


4.12 Automatic Operation

The chiller shall be equipped with a programming timer, permitting

- Unit on/off setting

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- Changeover to the second set point (unoccupied mode)
- Demand limitation
- The control shall ensure the following operating modes
 - On/off mode based on the outside temperature
 - Set point reset based on the cooling water temperature or the return water temperature
 - Manual reset high pressure switch
 - Automatic reset high pressure switch managed safety device with limited thresholds
 - Automatic reset low pressure switch managed safety device with limited thresholds
 - High pressure safety valve
 - Anti-freeze probe on evaporator outlet
 - Chilled water temperature probe located on the evaporator inlet
 - Mechanical flow switch fitted as standard.

5. GENERAL REQUIREMENTS

5.1 Safety Requirements:

Vendor shall consider all safety requirements in accordance with good engineering practices and local regulation.

The noise level of the system shall be as low as possible, and must not exceed 80 dB (A) measured at operator working place. The sound levels shall be within the permissible limits and tolerances if measurements are performed in accordance with AHRI Standard 575-08, Method of Measuring Machinery Sound Within Equipment Rooms

In the event of equipment malfunction or loss of utilities, the unit must contain all necessary protection devices to ensure that the equipment and the article remain in a safe condition.

5.2 Name Plates:


Each item shall carry a nameplate in accordance with client's standard which shall be fitted in a conspicuous position on brackets projecting 25 mm / Equivalent from the vessel or insulation as applicable. Equipment tag number shall also be included.

5.3 Painting:

Outside carbon steel surfaces (other than machined) shall be thoroughly cleaned, scale free and shall be painted according to vendor's specification duly approved by client. Chiller shall be provided with anti-corrosive paint.

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6. MATERIAL SPECIFICATIONS

6.1 General

All valves and filters arranged for easy operation, service and handling. Utilities are provided according to installation drawing.

6.2 Appropriate Materials

Appropriate materials of manufacture must be selected and specified on the specific application and process requirements and certificates must be supplied as requested by the customer/purchaser or as usually necessary.

Material of labeling on equipment and instruments shall be of durable type. They shall be resistant against cleaning detergents (e.g. 70% ethanol). Installation of tags has to withstand temperature influence and mechanical demands typical for normal transport, installation and operation, so that they are captive to the equipment.

6.3 Piping

The pipe class specified for chilled water piping is ERW carbon steel pipes and fittings:

Pipe according to ASTM A135, ERW, Schedule -10 for sizes above 40 NB and ASTM A135, ERW, Schedule -40 for sizes below 40 NB

Apart from the pipes, the piping system consists of:

Ball valves / Butterfly valves (manual operated)

Check valves, strainers etc.

Pressure gauges and temperature gauges

Pipes, elbows, T-pieces, reducers

Detachable connections Pipe supports, hexagon bolts and nuts.

6.4 Non-metallic materials

Cables shall be resistant against heat, pressure and steam.


6.5 Insulation materials

Any material used for insulation must be free of asbestos. Insulation material shall be of low chloride content and shall comply with current standards for thermal insulation in contact with Austenitic Stainless Steel. Thickness of insulation is to be specified by the vendor.

Vendor shall mention the thickness & insulating material details in the offer. Vendor shall carry out the insulation works including the material supply & installation. The special insulation works to be applied

HLL BIOTECH LIMITED

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	Equipment/System	Water Cooled Chiller			
	Identification #	U-CHW 01TO06	Document#	URS/U/CHW01	
	Effective Date	2014.05.22	Revision#	01	
	Tender No	HBL/IVC/HVAC/CHILLER/2014-15/01			

on Chiller skids shall also be provided by Vendor. Vendor shall provide all the details of insulation works. The insulation of Chiller units shall be selected based on thermal design and the performance guarantee of the package.

The appropriate space for insulation application shall be duly considered by Vendor during package detail engineering phase.

7. Available Utilities

The following media interfaces are provided:

- Electrical power 415V/ 3 Phase/4 Wire/ 50 Hz
- Compressed air
- Soft water
- Cooling water

Connecting points of all utilities, consumption and capacities of the required utilities shall be advised with the quotation.

All drain waters from the system shall be led to the waste water system. There shall be prevention for Re-Contamination from the waste water system.

8. TESTING, COMMISSIONING & INSPECTION:

Inspection and tests shall be made by Vendor in accordance with requirement requisition document and/or any correlative standards and codes.

Testing and commissioning will be carried out by the VENDOR. The Client's representatives have the right to participate in testing and commissioning.

During testing and commissioning future operators/technicians shall be trained in all equipment / system functions (e.g. preparation, start-up, operation, shut down, maintenance, etc. - as far as applicable).

All testing and commissioning documents, recordings and reports shall be in English language.


The VENDOR shall notify the customer/purchaser one month in advance of the start of FAT.

8.1 QAP

Vendor to submit a detailed quality assurance policy along with offer for hold, review, witness points at factory and at site.

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	Effective Date	2014.05.22	Revision#	01	
	Tender No	HBL/IVC/HVAC/CHILLER/2014-15/01			

8.2 Testing:

If in case Vendor proposes a testing procedure the same shall be approved by Client.

8.3 Inspection:

Client reserves the right to carry out inspection & further performance at any time during fabrication before shipment. Inspection shall be done by the Client or their representative and / or their nominated inspection authority.

8.4 Factory Acceptance Test (FAT):

Pre-requisite for shipping is client / client's representative witnessed and approved FAT and FAT record.

The FAT shall consist the following checks:


- Check conformance to the Specifications provided and the specifications of Vendor.
- Check for completeness of equipment group.
- Check for dimensions.
- Check for materials.
- Verify the correctness of Name plate data.
- If possible - simulation of some complete operation cycles, Verification that all alarms and interlocks work as specified.
- Review of the complete specified documentation package.
- Review of equipment conformance with relevant codes and guidelines.
- Equipment performance test. This shall include the routine test & the performance. The performance test shall include the power consumption, noise level, PLC simulation test, etc., under varying capacity conditions.

A prior notification shall be issued to client for witnessing the FAT.

Prior to shipment, chilling machines shall be subjected to inspection and witness of performance tests and sound test by Consultant and Owner's representative to verify various performance parameters as confirmed by vendor earlier at the time of award of contract. Performance test of 1 # chiller shall be carried out as per procedure laid down by AHRI at 100%, 75%, 50% and 25% loading at constant ECWT of 89.6 deg F. Chilled water leaving temperature shall be kept constant to design value for partial load testing. The chiller sound pressure level tests are to be performed in accordance with AHRI Standard 575-94, Method of measuring machinery sound within equipment room.

HLL BIOTECH LIMITED

INTEGRATED VACCINES COMPLEX, Chengalpattu

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	Effective Date	2014.05.22	Revision#	01	
	Tender No	HBL/IVC/HVAC/CHILLER/2014-15/01			

Fouling factor simulation for condenser and evaporator shall be done as per ARI-550/590-2003. Incremental temperature difference (to be calculated based on Normative appendix-C of ARI-550/590-2003) on account of designed fouling factors shall be added in condenser water entering temperature and shall be subtracted for leaving chilled water temperature. Chiller shall produce design refrigeration capacity and guaranteed power consumption at these corrected set of entering condenser water and leaving chilled water temperature. Outside tube surface area (for condenser and flooded evaporators) and inside tube surface area (for DX-Evaporator), being inputs for ARI mathematical model for fouling, shall be submitted along with the offer.

Vendor's internal testing done before handing of the FAT should be documented properly according to their internal procedures. Tests reports should be available before client / client representatives' arrival at Vendor shop for FAT.

The tests shall be carried out at vendor's expense. Utilities for operating the equipment shall be provided by Vendor.

If the test record does not meet and perform in accordance with Vendor warranty obligations Vendor will, at its expense, implement all the necessary modifications and afterwards the tests will be repeated.

After the approval from the client / client representatives' approval, the system will be prepared and shipped to the site.

The acceptance of any piece of equipment or component by client or their representative does not relieve the Vendor of any responsibility for complying with the provisions of this specification or of any guarantee.

8.5 Site Acceptance Test (SAT):


The final acceptance tests at site will be carried out after compressor delivery on site and mechanical completion of the system. The purpose of the SAT is to verify that the system is supplied, installed and that it operates according to the relevant specifications. The SAT testing includes:

- Check of completion of open items from FAT
- Check of transport damages
- Check scope of supply
- Proper operation of the systems
- Site performance test
- Verification of final documentation.

As far as site performance test is concerned, the supply includes: detailed test procedure, check lists and Vendor's specialist assistance during the test according to a schedule to be agreed upon.

HLL BIOTECH LIMITED

INTEGRATED VACCINES COMPLEX, Chengalpattu

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	Equipment/System	Water Cooled Chiller			
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	Effective Date	2014.05.22	Revision#	01	
	Tender No	HBL/IVC/HVAC/CHILLER/2014-15/01			

Vendor has to depute a person for site supervision and assistance during commissioning and start-up of the package unit. The procedure and schedule of the performance test and relevant acceptance criteria shall be defined / agreed upon between vendor and the client.

Vendor shall record all the results of the tests carried out and submit the report to the client for approval.

8.6 Installation

The Manufacturer shall be responsible for unloading & installation of Water cooled Chiller and other accessories.

The Manufacturer shall also be responsible for the re-assembly of sections or components of the packaged equipment, if any, including piping, wiring, instrumentation and any other equipment and components shipped separately or in sections.

Client shall provide the following:

- Foundations if any required (Successful Bidder shall submit detailed fit for construction foundation drawings within two weeks from the date of placement of order by Client)
- Connecting utilities
- Electrical, utility services and drain hook-ups

The manufacturer shall also be responsible for the reassembly of sections or components of packaged equipment if any including piping, wiring, instrumentation, other equipment & components shipped separately or in section

The system must be transported to the erection place and placed in position under the supervision of the Vendor representative.

8.7 Commissioning

The commissioning plan shall be submitted to the Client 4 weeks prior to the commissioning dates and the approved document shall be used during the commissioning.


All the commissioning spares / consumables shall be supplied by the Manufacturer. Any component / instrument failure or damage noted during commissioning shall be replaced by the Manufacturer at no additional cost.

Commissioning may include, but is not limited to the following tests:

- Equipment, components and instruments installation check (with verifications of drawings, BOM etc.)
- Instrument calibration check
- Document check (especially components literature)

HLL BIOTECH LIMITED

INTEGRATED VACCINES COMPLEX, Chengalpattu

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	Tender No	HBL/IVC/HVAC/CHILLER/2014-15/01			

8.8 Training

The Vendor shall provide operator training at site for not less than 2 days at no extra cost. The training imparted shall include, but not be limited to, the following:

- Start-up and shut-down procedures
- Typical operations
- Emergency shutdown
- Safety training
- Troubleshooting procedures
- Control system & instrumentation operation and diagnostics
- Control system hardware maintenance
- Servicing and preventative maintenance schedules and procedures

The Vendor shall ensure that the operation and maintenance manual is available at site for reference. The Vendor shall issue certificates to the persons trained by them after successful completion of training at no extra cost.

9. PRIORITY OF DOCUMENTS:

In case of conflicts between the engineering specification, data sheets and other reference code and standards, priority shall be given in the following order:

- Local authorities codes
- Client's Data Sheets
- Client's Purchase Contract
- Refer to codes and standards
- Vendor's Documents (agreed by Client).

10. DOCUMENTATION:

General: Chiller package is not a qualified package. However, vendor shall follow Good Engineering Practices.

All documentation for the chiller shall be distinctly marked with Unique Name, Identity No. and Version No.

All documentation must be in English.


Specified list of all delivered documents, such as test protocols, drawings and specifications.

The documentation shall be delivered as four paper copies and one electronic version (CD-ROM). The documentation shall have final status.

The documentation provided by the vendor must allow

HLL BIOTECH LIMITED

INTEGRATED VACCINES COMPLEX, Chengalpattu

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	Equipment/System	Water Cooled Chiller			
	Identification #	U-CHW 01TO06	Document#	URS/U/CHW01	
	Effective Date	2014.05.22	Revision#	01	
	Tender No	HBL/IVC/HVAC/CHILLER/2014-15/01			

- Training of operators
- Operation, maintenance and calibration (Complete technical documentation)
- Testing or Qualification of equipment incl. generation of related documents (Testing plan, IQ & OQ).
- Dimensions for space needed for installation.
- Unit size dimensions.
- Utility consumptions
- Weights

Vendor should provide a document list of his standard documentation together with examples for review and final approval by client. The review & approval of design documents will be as per good engineering practices. Client will check installation of compressor against design documents issued for construction according to good engineering practices.

Vendor shall submit before order placement the detailed supplier document index (to be approved by client), listing all drawings and documents that will be supplied and their delivery dates.

It is included in the vendor scope of work the preparation and supply of all documents (i.e. drawings, calculations, etc.) and all obligations requested by local Authorities, in order to fulfill the applicable laws & regulations. Vendor shall provide the following list of documents for the complete package:


10.1 List of Documentation:

VENDOR shall provide the following documents for the complete package unit:

Document Name	Remark
General	
Functional design specification	
List of the used material: List of spares & consumables for trouble free operation for two and five years separately from the date of commissioning.	
Process description, functional description	
Guarantee/ Warranty: 18 Months from the date of supply or 12 months from the date of commissioning whichever is earlier.	
Schemes for approval	
Quality Assurance Policy	

HLL BIOTECH LIMITED


INTEGRATED VACCINES COMPLEX, Chengalpattu

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	Equipment/System	Water Cooled Chiller			
	Identification #	U-CHW 01TO06	Document#	URS/U/CHW01	
	Effective Date	2014.05.22	Revision#	01	
	Tender No	HBL/IVC/HVAC/CHILLER/2014-15/01			

	P&ID drawings	
	Layouts, overview plan	
	GA Drawings	
	Electrical & Control circuit diagram and panel layout with dimensions.	
Instrumentation		
	Input/output signal list	
	Parameter list of intelligent instruments, valves	
	Specification of hardware components and specification of battery limits	
	List of components	
	List of instruments	
Operation / Service / Electronic Data Service		
	Operation and maintenance manuals (including parts from sub- vendors)	
	Lists of spare parts with ordering information	
	Detailed manuals for single equipment	
	Technical datasheets for single equipments (including capacities)	
	Documentation of first calibration (certificate)	
	Calibration procedure (calibration plan)	
	List of alarms including Trouble shooting	
	Scheme of program work flow.	
	Documentation of displays, tools for configuration	
	Source Code on disk. Software Installation CD.	
	Certificate of warranty	
	Maintenance contact	
	Plan of software structure (Overview of modular functions)	
	Version of installed software user levels	
	Certificate of data security	
Safety		
	Safety Procedures	

HLL BIOTECH LIMITED

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	Equipment/System	Water Cooled Chiller			
	Identification #	U-CHW 01TO06	Document#	URS/U/CHW01	
	Effective Date	2014.05.22	Revision#	01	
	Tender No	HBL/IVC/HVAC/CHILLER/2014-15/01			

Training

	Documented trainings for operators	
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11. DELIVERY AND INSTALLATION:

Vendor shall be responsible for the delivery of the complete chiller Package Unit to **HLL Biotech Limited, (IVC), Chengalpattu, Near Chennai.**

Vendor shall be responsible for the positioning and installation of the complete Package Unit.

The responsibility for packing, transport and insurance is with the Vendor of the system. The costs must be included in the offer as separate price.

Before packing and dispatch, the system must be well cleaned inside as well as outside and dried. For the transport, the system shall be completely empty and dry. The packing shall be rigid to protect the PU against damage.

All nozzle flange faces should be protected from rust and shall be further protected with a wood or metal cover to prevent damage during shipment. Threaded connections are to be protected with thread protectors. Machined surfaces are to be covered with temporary metal protective. Both partly fabricated and completed items liable to suffer distortion during transit and erection shall be braced. Open ends shall be covered to keep out dirt and other foreign matter. Spare gaskets, bolts, nuts, etc., and any other loose items shall be boxed separately from the main equipment. Such boxes shall be suitable for site storage and clearly and permanently marked to show:

- Order number
- Item number (for which the parts are intended)

The item number shall be prominently painted on the side of the equipment.

All loose items have to be carefully fixed or packed in a separate box.

The Package Unit shall be equipped with appropriate lifting lugs and provisions for transport allowing easy loading, offloading and transportation inside the building.


10.1 Installation

The erection and installation of the system is part of the scope of supply.

The manufacturer shall also be responsible for the reassembly of sections or components of packaged equipment if any including piping, wiring, instrumentation, other equipments & components shipped separately or in section

HLL BIOTECH LIMITED

INTEGRATED VACCINES COMPLEX, Chengalpattu

nne pharmaplan®	User Requirement Specifications				 <div>HLL BIOTECH LIMITED (Subsidiary of HLL Lifecare Limited) (A Government of India Enterprise)</div>
	Equipment/System	Water Cooled Chiller			
	Identification #	U-CHW 01TO06	Document#	URS/U/CHW01	
	Effective Date	2014.05.22	Revision#	01	
	Tender No	HBL/IVC/HVAC/CHILLER/2014-15/01			

The system must be transported to the erection place and placed in position under the supervision of the Vendor representative.

10.2 Spare part

The spare parts for commissioning and start-up are included in Vendor scope of supply. List of commissioning and start-up spare parts has to be included in the bid based on the selected Manufacturer's models.

Recommended Spare parts required for two years of trouble free operation shall be listed and quoted separately item by item.

Transducer Cond, High and low oil: 1 No

Transducer, Evaporator: 1 No

Sensor- entering and leaving Chilled Water: 2 Nos.

Sensor Entering and leaving Condenser Water: 2 Nos

Oil Temperature Sensor: 1 No.

Oil Filter: 1 No

12. GUARANTEE:

➤ Mechanical Guarantees:

Vendor shall guarantee all equipment and components against defective materials; faulty design and poor workmanship and any failure resulting from normal usage for the guarantee period specified in the Purchase Order (at least 1 year after hand over and or agreed start operation).

Vendor shall guarantee that units will operate in safe, efficient and reliable manner under the stipulated conditions of service and environmental.

If any defects, failure or operational problems occur during the guarantee period, Vendor shall make all necessary improvements, repairs and replacements at no cost to the Client, in accordance with the Purchase Order.

➤ Performance Guarantees:

All equipment shall be guaranteed for satisfactory performance at all operating condition specified at the pertinent paragraphs of this specification with no negative tolerance.

If any performance deficiency or defects occur during the guarantee and warranty period, Vendor shall provide any modification / improvement, repair and replacements free of charge.

Vendor shall also guarantee the power and utilities consumptions.

HLL BIOTECH LIMITED

INTEGRATED VACCINES COMPLEX, Chengalpattu

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User Requirement Specifications

Equipment/System	Water Cooled Chiller		
Identification #	U-CHW 01TO06	Document#	URS/U/CHW01
Effective Date	2014.05.22	Revision#	01
Tender No	HBL/IVC/HVAC/CHILLER/2014-15/01		



13. QUALITY ASSURANCE:

The VENDOR must have a well-implemented QM-system, e.g. ISO 9000 certification. Capability and experience in working for the GMP-related industry must be proven. Auditing of QM-system with focus on software development methods / strategy has to be possible.

A quality assurance plan has to be delivered latest with placement of order.

14. ATTACHMENT:

1. Data Sheet for Water Chiller . Document No.: NPI/120310/DS/U/CHW01

15. ABBREVIATIONS

QMS	Quality Management System
PU	Package Unit
EU	European Union
CE	the abbreviation of French phrase "Conformité Européene" which literally means "European Conformity"
GMP	Good Manufacturing Practice
OEM	Original Equipment Manufacturer
ASTM	American Society of Testing Materials
ASME	American Society of Mechanical Engineers
ARI	Air-Conditioning and Refrigeration Institute
ASHRAE	American society of Heating Refrigeration and Air-Conditioning Engineers
TEMA	Tubular Exchanger Manufacturers Association
PLC	Programmable Logic Controller
ERW	Electric Resistance Welding
PID	Process and Instrumentation Diagram
VFD	Variable Frequency Drive
HMI	Human and Machine Interface
FAT	Factory Acceptance Test

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INTEGRATED VACCINES COMPLEX, Chengalpattu

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User Requirement Specifications

Equipment/System

Water Cooled Chiller

Identification

U-CHW
01TO06

Document#

URS/U/CHW01

Effective Date

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01

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HBL/IVC/HVAC/CHILLER/2014-15/01



SAT	Site Acceptance Test
DQ	Design Qualification
IQ	Inspection Qualification
OQ	Operation Qualification
PQ	Performance Qualification