

me pharmaplan	User Requirement Specifications				<i>HBL</i>
	Equipment/System:	Process Chromatography System and Chromatography Columns			
	Identification No:	-	Document No:	URS/CMY 02	
	Effective Date:	19-11-2015	Revision No:	01	

User Requirement Specifications Process Chromatography System and Chromatography Columns

Block Code	Area	Identification #	Quantity	Capacity
B1	Hep B	B1-CMY 01 (Process Chromatography)	1	5 to 180 LPH
B1	Hep B	B1-CGC 01 (Glass Chromatography column)	1	450/500 mm (D/H)

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	Equipment/System:	Process Chromatography System and Chromatography Columns		
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URS Annexure List:

URS Annex No.	Detail
1	Layout showing location of the installation of the Process Chromatography system and Chromatography columns for Hep B block

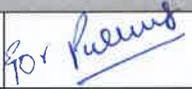
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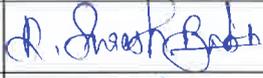
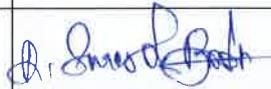
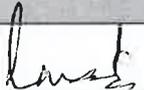
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1.0 APPROVAL SIGNATURE

This document is prepared by the Process, Validation and GMP Compliance team of "NNE Pharmaplan India" for the project "Integrated Vaccines Complex, Chengalpattu, Chennai" (project number: 120310) of HLL BIOTECH LIMITED (Chennai) under the authority of their Project Manager. Hence, this document before being effective should be reviewed by HBL user/s and project/ engineering team, approved by team lead of user department and QA and authorized by the appropriate Project Authority.

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2.0 EQUIPMENT DESCRIPTION

The chromatography system shall consist of following parts in order to operate as required by the user

Sl. No.	Parts	Hep B
1.	cGMP compliance	Required
2.	Type	Gradient
3.	Flow rate	8 to 180 LPH
4.	Operational temperature	2°C to 30°C
5.	Operating pressure	Up to 6 bar
6.	MOC of the system tubing	Polypropylene
7.	Size of the flow path	6 mm
8.	Number of inlets ports required	4 (Minimum)
9.	Number of outlet ports required	6 (minimum)
10.	Bubble trap	With provision to bypass, with low level and high level switch
11.	Provision for CIP inlet and outlet	Required
12.	pH sensor	Pre and Post column pH measurement is required (pH range: 0 to 14)
13.	Conductivity sensor	Pre and post column conductivity sensors required (range: 0 to 900 mS/cm)
14.	Air sensor (3 Nos)	1 No. to be present in the inlet port to detect and stop the motor pump if air bubble is detected, 1 no. after bubble trap and 1 no. to be considered for column inlet.
15.	Pressure sensor (3 Nos)	1 pressure sensor before bubble trap, one before column and 1 post column required.
16.	Mass flow meter	1 no. Mass flow meter type
17.	Diaphragm protection pressure sensor	Required in pump
18.	UV	Simultaneous detection of minimum two wavelengths (260nm and 280nm), from single lamp source. Light Source should be mercury free
19.	Temperature sensor (2 nos.)	Measurable range: 0 to 100 °C 1 no. of temperature sensor for pre column, and 1 no. for post column.
20.	Port for injection of sample for HETP	A sample inlet port near column inlet for HETP measurements and HETP during purification process
Sl. No.	Parts	Hep B
21.	Diaphragm Pumps	Multistage-To transfer buffer and sample with minimum to nil pulsation disturbances and shear force to sample.
22.	Valves	To control the flow rate of the process liquids in feeding lines entering the column.

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23.	PLC or equivalent control system	To control all the above parameters and operations. Also it should store data of each sample and unit operation. Data retrieval should be possible. Connectivity to a Central SCADA System has to be an integral part of the System.
24.	Product hold up volume a) Bubble trap full b) Bubble trap minimum c) Column outlet to fraction outlet d) Sample inlet to column inlet	Should be minimum (Vendor to specify hold up under each condition)
25.	ASME-BPE Compliance	Required
26.	Accessories	The package should include and supply all required accessories such as (not limited to) connectors, tubings, seals, O-rings, flanges, bolts, nuts, clamps, Allen screws and keys, springs, gaskets and washers to connect the chromatography system to chromatography column and to operate as specified by the user.

Column: Chromatography columns specifications are as under:

SI No	Specifications	Hep B
		Requirements for 450mm Column
1	MOC of column tube	Borosilicate
2	cGMP Compliance	Required
3	Column inner diameter	450 mm
4	Column tube Height	500 mm (Minimum)
5	Number of adaptors	2 No. (adjustable top adaptor and fixed bottom adaptor)
6	No. of Columns	1
7	Column medium support mesh size	20±5µ
8	MOC of Column medium support mesh	Poly propylene
9	Column support stand with lockable wheels and in-built level indicator	Required
10	Pressure rating (min)	2.5 bar
11	Temperature rating	+2°C to 30°C
12	Graduated volume level marking on Column tube	Required
13	100% compatibility to connect and operate with chromatography system	
14	Compliance of all product contact polymeric	

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		materials with USP class VI tests for in-vivo toxicity and animal origin-free certification	
15	Accessories		The package should include and supply all sufficient quantities of accessories/spares such as (not limited to) column medium mesh support, connectors, tubings, seals, O-rings, flanges, bolts, nuts, clamps, Allen screws and keys, springs, gaskets and washers to connect the chromatography column to chromatography system and to operate as specified by the user.
16	Vendor to provide all necessary accessories along with the column to connect and operate with the supplied chromatography system		

Note: All points of the IRS except the below mentioned would be applicable for the equipment

- 4.1.11, 4.1.13, 4.1.17
- FDA Guidance for industry- Documentation for sterilization Process Validation
- ANSI/NSF 49-2008, ISO 14664
- 5.4 – Specifications – ($< 0.5\mu$ Ra for filling line and $< 0.8\mu$ Ra for lyophiliser) and external surface matte finish ($< 1.2\mu$ Ra).

Note:

I.	This Technical Specification is the basis for an inquiry to a vendor and therefore the basis for the vendor's proposal.
II.	The vendor is asked to state in "REMARKS" column with "yes" if the described requirement will be completely fulfilled and with "no" in case the requirement will not or cannot be fulfilled with the proposed equipment. In case of an deviation a comment must be inserted or enclosed as a separate annexure by referring to the respective URS specification number.
III.	The vendor must clearly comment each item of the Technical Specification. The comments must be in English language. If extra cost for necessary options becomes necessary the item must be clearly stated.
IV.	In case that the requirement includes a question or request or information from the vendor, the answer / information should be stated in the "REMARKS" column.
V.	The final version of this document including the vendor's comments will become basis of a potential purchase order or contract.
VI.	The Technical Specification serves to define a summary of all vendor's requirements concerning scope of delivery and services.
VII.	The vendor is responsible for technically unobjectionable function of the equipment. This TS is not intended to dictate a technical design to the vendor. If agreed upon with the vendor, the vendor can apply his practically proven design.
VIII.	Special Instruction a. If no comments against any specification shall be considered as "NO" and b. If there is no reply / comments against the complete URS by the vendor then it shall be treated as unresponsive / technically non-compliant and rejected.
IX.	All the instruments and controls mentioned in the URS(s) are expected to be standard supply and part of your standard equipment model. In case of any deviation or redundancy or

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	additional scope of supply is noticed, vendor is required to obtain clarification from HBL before submitting the quotes.
X.	The makes requested are standard international makes. In case of any deviation, vendor to seek clarification from HBL before submitting the offers.
XI.	Refer document Installation Requirement Specification and Specific Instructions with URS; NPI_120310_IRS_S1_01
XII.	Refer Tender document with URS; NPI_120310_EQP_TD_18

Specifications	Remarks
3.0 PROCESS DESCRIPTION	
3.1 Input & Charging method	
3.1.1 The column packing material shall be introduced into the column from the medium container.	
3.1.2 All the column buffers shall be introduced into the packed column through feeding lines	
3.1.3 The feed shall be introduced into the packed column through feeding lines from containers	
3.2 Brief Process Steps	
The system is used for separation /purification, buffer exchange, volume reduction etc	
The process chromatography workstation should be designed to control the following steps involved in the chromatography process.	
3.2.1 CIP of the process chromatography system and column.	
3.2.2 Equilibration of the column according to the designed program.	
3.2.3 Sample loading into the column.	
3.2.4 Elution with the buffer solution and collection of the purified product.	
3.2.5 Product transfer to the collection container for further processing.	
3.2.6 Sanitization and Regeneration of the column.	
3.2.7 Recording of the process data.	
3.3 Output & Discharging method	
3.3.1 Transfer of the purified product to the respective holding container for next process	

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4.0 PRODUCTIVITY REQUIREMENT

4.1 Desired/ suggested capacity

The equipment should be suitable to operate at the flow rate of 8 to 180 litres per hour

4.2 Standard batch size

Not Applicable

4.3 Change Over Time

Not Applicable

4.4 Other Productivity Requirement

Not Applicable

5.0 CONTAINMENT

The chromatography system and column should be validated as leak proof system to contain its integrity till the end of the process

6.0 GMP REQUIREMENTS

6.1 Process control

6.1.1 It must be possible to select the flow direction of the column in a recipe.

6.1.2 It must be possible to select that the column is bypassed in a recipe.

6.1.3 It shall be possible to download data/parameters listed below from the PLC to the Chromatography system before start and during the operation:

- All Phase activities/ parameters from beginning to end
- Program recipes
- Alarm acknowledgements
- Ready signals

6.1.4 It shall be possible to upload/download data/parameters listed below between the Chromatography system and the PLC before start and during the operation:

- Process values (Flows, Temperature, Pressures, Conductivities, pH)
- Alarms / alarm conditions
- Status values
- Loggings
- Calculation of HETP
- Calibration of pH & conductivity sensor
- Calibration of UV sensor
- Handshakes for:
 - Alarm acknowledgements
 - Parameter downloads/ uploads
 - Process activities(start/ stop, loggings)

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6.1.5 It must be possible to stop an ongoing sequence at any time during the cycle and the system must return to the initial stage.

6.1.6 It must be possible to pause the system and continue from the same point in the sequence when pause is removed.

6.1.7 The system must have an emergency stop. At restart after an emergency stop the system must start at the same point in the sequence.

6.1.8 Based on risk assessment, the system must use secure, computer generated, time-stamped audit trails to independently record

- Identity of operator entering or confirming critical data.
- date and time of operator entries

6.1.9 The system must be able to record attempts to unauthorized access.

6.1.10 Changes in the control recipe must be recorded with date, time and user ID.

6.2 Failure mode detection

Equipment shall be capable to detect the following failure, notify the operator with alarm (0-10% of the specified range of process parameters) and shutdown the process (if it exceeds 10% of the set value):

- a) Operating Temperature
- b) Operating Pressure
- c) Conductivity
- d) pH
- e) Flow rate
- f) Air bubble
- g) Diaphragm failure
- h) High pressure in Column inlet and outlet
- i) UV

6.3 In -Process control

Should have a provision for sampling of product solution in safe condition, by means of a three way valve with a needle valve that can be placed for this purpose at any point from where the sample needs to be drawn.

6.4 Level of instrumentation

Sufficient and suitable instrumentation for the process, safety and productivity control as indicated in the following table:

Type of control	Purpose	Instrumentation
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Temperature	To monitor and indicate the product temperature	Temperature sensor with indicator and controller
Pressure	To monitor, indicate and control the column working pressure of process chromatography workstation	Pressure sensor and transmitter
pH (pre and post column)	Monitoring of pH	pH sensor and transmitter
Conductivity (Pre-column and post column)	To indicate and monitor throughout the process	Conductivity sensor and transmitter
UV	To indicate and monitor the elution	UV detector
Flow rate	To control the liquid flow into the system and column	Mass flow meter
Time	Timer control of process and monitoring CIP process	Timer (HMI)

6.5 Batch data display and record printing

Basic / standard data acquisition to be done by SCADA or equivalent system. This shall be mainly to collect and store the data in industrial PC. Data output should be in non-editable format with print out option.

6.6 GMP requirements (Others)

6.6.1 Vendor to give code numbers for each component

6.6.2 All ports/valves/filters and tubing connections shall be sanitary type, in compliance to ASME BPE.

6.6.3 All the tubings for CIP, WFI and waste shall be sanitary type, in compliance to ASME BPE.

6.7 Specific requirements

6.7.1 The Column should have a net type bed support.

6.7.2 process chromatography system- Equipment size should not exceed 900mm [W] x 1300mm [L]

6.7.3 Pressure control loop must be provided during column packing and during process

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6.7.4	The equipment should operate with minimum operator involvement. The equipment control panel must be provided with a Human machine interface based on English language with appropriate number (a minimum of 10 different recipes) of recipe of process parameters.	
6.7.5	It should also have a PC to operate the system and store the batch documentation generated during the entire process.	
6.7.6	The equipment should control all critical parameter automatically by using PLC or vendor defined processor located in the control panel of the workstation. Critical process parameters are listed in the preceding sections.	
6.7.7	Human – machine interface must be used to enter the process details, which should appear in the print out. Print out must provide results of all critical process parameter and failure alarms.	
6.7.8	Access to all I/O values and system status bits shall be provided through a data communication link.	
6.7.9	An operator-interface panel shall be provided and mounted on the equipment. This panel shall provide the necessary switches, indicators, devices to operate the equipment.	
6.7.10	Fully automatic PLC/ PC based operation. The chromatography system software supplied should be fully compatible with Windows 8 operating system.	
6.7.11	The equipment should have provision for running the column in both the ways. (Upward & downward).	
6.7.12	Should have provision for column selection (connecting two and selecting one column for operation).	
6.7.13	It shall not be possible to change parameters or process values without logging in locally on the Chromatography System	
6.7.14	The system should have a drain point with non-return arrangement.	
6.7.15	Sanitary connectors are recommended for nozzles and valves.	
6.7.16	The layout must be taken into account while determining the layouts of the system.	
6.7.17	A proposal of a possible installation layout should be added to the documentation.	
6.7.18	The manufacturer has to give the clear details on the total weight and the dimensions of the equipment.	
6.7.19	The heat given off by the unit must be stated (inside the room).	
6.7.20	The construction of the complete system should be described in the documentation in detail.	
6.7.21	System to be skid mounted with sufficient clearance above the floor and behind the skid (when placed against the wall) to allow cleaning.	
6.7.22	All parts (valves, transmitters etc) should be easy to access and facilitate routine maintenance.	
6.7.23	In-line calibration of pH and conductivity sensors shall be possible.	
6.7.24	The equipment should be 21 CFR Part 11 compliant.	

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6.7.25	The equipment should have provision to connect to the alternate power supply (UPS).	
6.7.26	The system and column components should be chemically compatible for the components (exposed to product) 2M sodium chloride, 2M sodium hydroxide and ethanol.	
6.7.27	Bubble trap should be by-passable with low level and high level switch.	
6.7.28	The system should be CIPable.	
6.7.29	UV lamp should be manageable (i.e on/off) as required by the user during process	
6.7.30	The chromatography system should be operationally compatible with 450 mm and higher columns sizes for Hep B	
6.7.31	Calibration of UV detector should be done automatically and the same should be completed within 15 minutes before sample loading. Alarm and interlock shall be provided if calibration is not done.	
6.7.32	The chromatography system should be compatible with automatic column packing.	

6.8 Spares and consumables for system and columns

6.8.1	Essential Spares for continuous 1 year of operation after warranty period should be provided.	
6.8.2	Essential consumables/kits for continuous 2 years of operation should be provided.	

7.0 CONSTRAINTS

7.1 Equipment location and available space

<p>This equipment will be installed in the Purification and Chromatography Room of Hep B, IVC Chengalpattu</p> <p>Equipment Location: Room number: B1G043 Floor: <u>Ground Floor</u> Plant: Hep B Room Area: 49 m2 False ceiling height: 3.0 m Room temperature: 22±2 °C Relative Humidity: Not more than 55 %</p>	
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7.2 Available Utility

<p>a) Electricity: Single (220 V) & 3 phase (420 - 440 V) (Report Requirement)</p> <p>b) Compressed air 6-8 bar (Report Requirement)</p>	
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8.0 ABBREVIATION

Abbreviation	Definition
CIP	Clean in place
BPE	Bioprocessing equipment
ASME	American Society of Mechanical Engineers
CFR	Code of federal regulations
DQ	Design Qualification
HETP	Height equivalent theoretical plate
HMI	Human Machine Interphase
LPH	Liter per hour
MOC	Material Of Construction
NA	Not applicable
PLC	Programmable Logic Controller
QA	Quality Assurance
SCADA	supervisory control and data acquisition
SS	Stainless steel
UPS	Uninterrupted Power Supply
UV	Ultraviolet
CMY	Chromatography

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9.0 REVISION INDEX

Revision	Date	Reason for revision
00	24-06-2015	First Draft for Client's Review
01	22-09-2015	Updated as per the comments received from client dated 07-07-2015
02	02-11-2015	Updated as per the comments received from client dated 28-10-2015

URS Annexure 1: LAYOUT POSITION

Room No: B1G043:

Purification and Chromatography

