M/s BHARAT IMMUNOLOGICALS AND BIOLOGICALS CORPORATION LTD

TENDER DOCUMENT

Construction and Commissioning of Pilot scale GMP compliant manufacturing Facility or Production of Clinical Grade Bacterial Vaccine on a Turnkey basis

Civil structure internal wall demolition, floor finishing, HVAC, Modular panels, Clean room equipment and allied ancillaries

Consultant	Client
BioBridge Healthcare Solutions Pvt. Ltd	**M/s BIBCOL**
Head Office: #13, Rachana blossom, Jagdishnager, Aundh, Pune 411007	Chola, Bulandshahr – 203203 Uttar Pradesh Tel: +91 5732 238758
Local office: #1410, 14th Floor, Block D&E, Chandigarh City Center (CCC), Zirakpur - 140603, Punjab Tel: +91 1762 503462	
Email: ganesh@biobridge.in	

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Section I : General Details

1.0 INTRODUCTION:

BIBCOL invites sealed bid in two parts from eligible and experienced individual or a consortium of Turnkey contractors for supply, installation, commissioning and qualification of bacterial vaccine pilot plant at its Chola (Bulandshahr) factory campus.

BIBCOL is a central PSU under administrative control of Department of Biotechnology, Ministry of Science and Technology, Government of India and is located at village Chola of Bulandshahr district of Uttar Pradesh, 70 Km from Delhi.

BIBCOL has decided to diversify into bacterial vaccine production with the help of technology provider of international repute and is looking for a Turnkey contractor for bacterial vaccine production facility within given existing building identified for the purpose

BIBCOL has sufficient excess land and utilities like power, water, HVAC plant with spare chilled and hot water, black steam etc., which can be utilized for diversification. It has also earmarked an area in existing building for establishment of manufacturing of the multivalent vaccine.

2.0 SCOPE OF WORK

The scope of the tender covers civil structure internal wall demolition, floor finishing, HVAC, modular panels, clean room equipment and allied ancillaries.

1. Demolition and finishing of the internal walls and flooring of mezzanine floor of the existing facility
2. HVAC system including AHU and ducting
3. Modular panels
4. Clean room equipment
5. Cold rooms
6. Epoxy flooring
7. Electrical MV and LV system
8. Integrated Building Management systems including access control
9. Critical utilities system piping and Pendent based distribution (WFI/DI/CA/PS etc).
10. Miscellaneous items

1.0 TIMELINES FOR THE PROJECT

1. Project Completion Period – 10 months, to be reckoned after 15 days from the date of issue of the PO.
2. A Pre-Bid Meeting will be conducted by BIBCOL. Interested parties can participate before submission of the proposal, and to assess the work to be undertaken.
   All technical queries regarding this Request for Proposal must reach BIBCOL before the pre-bid meeting.

3. Pre bid meeting date and time - 05.01.2021 at 2.00 PM
4. Last date of Submission of Bid – 18.01.2021 by 3.00 PM
5. Date of Opening of the Technical Bid – 18.01.2021 at 3.30 PM

4.0 INSTRUCTIONS TO TENDERERS

1. The sealed tenders should be addressed to HOD (Purchase), M/S Bharat Immunologicals And Biologicals Corporation Ltd, OPV Plant, Chola, Bulandshahr 203203 UP
2. The tender submission date is **18.01.2021 by 3 pm**
3. The tender should be submitted in 2 sealed envelopes with title of the project on the envelops
   a. Technical bid
   b. Price bid
4. Documents to be submitted with Technical Bid:
   a. Detail about organization and its main activities.
   b. Organization structure
   c. Three years balance sheet and P&L accounts.
   d. Client list related to the work, along with copies of work orders.
   e. List of manpower with qualification and experience.
   f. Description of proposed plan for execution of the turnkey project with time lines.
   g. Registration certificate of organization
   h. GST and PAN details
   i. Any other relevant information.
   j. EMD: EMD of 2.5%in the shape of DD in favor of BIBCOL to be submitted along with the technical bid. Without EMD, the bid shall not be accepted. EMD shall be adjusted against performance security of successful bidder, and the EMD of unsuccessful bidder shall be refunded or returned within one month of award of order to successful bidder. In any case, the EMD of unsuccessful bidder shall be returned within three months of receipt of EMD with tender.

5.0 Only those price bids will be opened who qualify the technical criteria.

6.0 Each page of original tender documents should be signed by authorized signatory of the tenderer

5.0 ELIGIBILITY CRITERIA:

Eligibility criteria for the prospective vendor(s)/ contractor(s) / firm(s) (hereafter, "vendor") are noted below. The vendors must ensure that they satisfy all criteria in this section before submitting their bids. If any of the conditions mentioned here is not met, the offer may be rejected.

1. The vendor must have at least five years of experience in design, supply, installation, commissioning, testing and validating at site of cleanrooms and allied utilities along with the process vessels.

2. The vendor shall have an average annual turnover of at least INR 5 crore over last three years, ending 31st March 2020. The relevant Assessment order / IT certificate should be attached.

3. The vendor should have completed, within the previous five years ending 31st December 2019: At least one similar turnkey project for vaccine / biopharma facility of not less than INR 5 crore in a single order,

OR

At least two similar turnkey projects for vaccine / bio-pharma facility of not less than INR 4 crore each in a single order,

OR

At least three similar turnkey projects for vaccine/bio-pharma facility of not less than INR 3 crore each in a single order.

The value of executed works shall be brought to current costing level by enhancing the actual value of work at simple rate of 7 % per annum, calculated from the date of completion to the last date of receipt of applications for tenders.

'Similar turnkey project' means one which involved designing, supplying, building, installing, commissioning, testing and validating ISO 5 (Class 100) cleanrooms, allied utilities, process equipment and integration of all relevant services in a turnkey manner. Out of these projects, at least one must have been executed in a reputed government institute/ government department/ undertaking/ autonomous body/ reputed private organization.

In each of the above case, documentary evidence in the form of Work Order/Purchase order indicating the nature and value of along with reference/contact person & address, telephone/ E mail details should be submitted for verification. The Completion Certificate of the job issued by the respective client is necessary. The experience certificate and statement showing the value of existing commitments and on-going works as well as the stipulated period of completion, remaining for the each of the works listed shall be issued by the firm.

4. The vendor must provide the documentary evidence as below
   a. Should have carried out facility design, supply and commissioning as per cGMP guidelines of Schedule M, WHO cGMP, etc., w.r.t development / manufacturing projects for vaccines or biologicals in India OR abroad.

b. At least 2 projects for human vaccines equipment manufacturing, installation and validation
c. ASME / U stamp quality (reference certificate required for previous project)
d. Export equipment list (Minimum two reference with project completion certificate)
e. Certification and audit as per required by client for export job (Like TUV, KEA etc.,)
f. ISO certification

5. The vendors who do not individually meet the criteria in clauses 1 to 4 of 5, may form a consortium of companies to qualify the above criteria. In such case, it is necessary that majority of the partners of the consortium have comprehensively fulfilled all the qualifying criteria given in this document in clauses 1 to 4 of 5. Further, there should be one vendor ("lead bidder") in the consortium who shall submit the indent and shall take responsibility of bidding, commissioning, validation and operation. The lead bidder shall be liable for the entire scope of work and risks involved thereof. The lead bidder must have experience of executing turnkey project, supported by documentary evidence.

6. Foreign vendor(s) should have their establishment in India or at least have their branch office / representative office in India for execution, follow-up, and maintenance. This establishment/ branch office/ representative office shall be registered in India. They shall have technically skilled personnel and project team in India. The details of the branch in India/representative in India shall be produced. They shall produce documentary proof of MOU duly registered in India. If the relevant Documents are not submitted, the offer is liable to be rejected by BIBCOL. Even after submission of documents, if the foreign company does not possess the qualified personnel to take care the project during Construction & thereafter Annual maintenance, the offer is liable to be rejected at the discretion of BIBCOL.

7. The vendor should have the capability for measuring the facility as per the ISO-14644 guidelines and should possess instruments such as particle counter, DOP photometer with generator, anemometer, LUX level meter, and sound level meter. The vendor should submit the list of instruments and equipment available to execute the work and validation. In addition, one should have the documentation ability as per DQ, IQ, OQ, and PQ standards.

OR

The vendor should hire / subcontract the validation work to a reputed validation firm/team having all the above mentioned calibrated instruments with approval from BIBCOL.

8. The vendor(s) should have adequate technical, quality control and quality assurance staff for the contract. Designation, Name of the Person and Total Years of relevant Experience at the current firm should be provided for the following posts: Head - Execution, Head Design – Technical, Project manager – Technical, Manager – Quality, Project Engineers – Execution, Safety Engineer, Site Supervisor and Technicians, Validation Engineers, Documentation Engineer and Service Engineer.

9. The vendor should possess PF registration with Regional Provident Fund Commissioner in force.

10. The vendor should have ESI registration with regional Director ESI

11. Corporation in force.

6.0 GENERAL TERMS AND CONDITIONS (Applicable for all Parts)

1. BIBCOL shall not be responsible for any expense incurred by the bidder in connection with the preparation of this bid.

2. The selected Turnkey contractor shall sign an agreement with client for execution of work and shall adhere to the agreed timelines for execution of work. The various activities shall be having timelines within overall project completion time.

3. Performance Security:
   The selected contractor shall submit the performance security in the shape of DD or payment to the bank account of client @ 5% of total project cost. Turnkey contractor may also submit the bank guarantee in place of DD.

4. BIBCOL reserves right to cancel or reject any or all tenders without assigning any reason thereof.

5. BIBCOL reserves the right to deal with the proposal in any manner without assigning any reason for the same.

6. The bidders shall make a presentation for proving the capabilities and expertise along with details of the projects executed.

7. The Price bid shall for all items mentioned in the tender document with item wise rates and total amount. Conditional price bid shall not be accepted.

8. Pre-Bid meeting. Post the publication of the tender, BIBCOL shall organize a pre- bid meeting with interested Turnkey contractors where all queries raised by tenderer will be resolved in the presence of consultant at site.

9. Schedule of Payment:
   The turnkey contractor shall specify the payments terms in the price bid which will be based on milestone basis, supplies and installation at site

10. Dispute:
    If any dispute arises between the parties, the concerned party may submit its concern or disputes to the Managing Director BIBCOL in writing and the decision of Managing Director BIBCOL shall be communicated to the party and if not satisfied the party may prefer the arbitration as per arbitration act.

11. The two bids "Technical & Commercial" and "Price bid" shall be submitted in two separate envelops with clearly captioned on the top of envelop as Technical & and Price Bid respectively. Two sealed envelopes shall be kept in a separate envelop captioned on the top of envelop as, "Bid for Turnkey Contractor for Bacterial Vaccine Manufacturing Facility", to be opened on 18.01.2021 at 3.30 p.m.

    Interested parties qualifying above conditions may submit their bid/tender with the necessary documents and EMD on or before 3.00 p.m. on 18.01.2021

NOTES:

- Tenderer should quote the rates for all the items
- The rates quoted shall be the total landed value of any item inclusive of royalties, rents, GST or any other duties/taxes/levies applicable on the material
- Inclusive of delivery at BIBCOL Project Site, Chola Bulandshahr

Section II : Technical Details

1.0 PROJECT INFORMATION

1	Owner :	M/s Bharat Immunologicals and Biological Corporation Ltd, OPV Plant Site, Chola, Bulandshahr - 203203 Uttar Pradesh Tel: (05732) 238758 Fax: (05732) 238757
2	Project Title :	Construction and commissioning of Pilot scale GMP compliant manufacturing Facility for production of Clinical Grade Bacterial Vaccine on a Turnkey basis
3	Project Location and office :	BIBCOL OPV Plant, Chola village, Bulandshahr, Uttar Pradesh
4	Consultants Office :	M/s BioBridge Healthcare Solutions Pvt. Ltd, H.O : #13, Rachana Blossom Jagdishnagar, Aundh, Pune 411007, Maharashtra Branch office: #1410, 14th Floor, Block D&E, Chandigarh City Center (CCC), Zirakpur - 140603, Punjab
5	Nearest Railway station :	Bulandshahr
6	Time allotted for the project :	10 months from award of contract

2.0 DEFINITIONS

1. Owner
Shall mean M/s Bharat Immunologicals and Biologicals Corporation Ltd (BIBCOL) and shall include their successors and assigns, as well their authorized representatives

2. Consultant
Shall mean BioBridge Healthcare Solutions Pvt. Ltd, (BioBridge) and shall include their authorized representatives appointed by the consultant.

3. Engineer-in-charge
Shall mean the engineer appointed by the owner to supervise all the activities of project.

4. Site supervisor

Shall mean the supervisor appointed by the consultant to supervise all the activities of project.

5. Tenderer

Shall mean the company/agency who quotes against the tender enquiry for undertaking the work

6. Contractor

Shall mean the successful bidder whose tender had been accepted by the Owner and to whom the order has been placed by the owner and shall include his heirs, legal representatives, successors etc.,

7. Permanent works

Shall mean all the works included in the schedule of quantities, and also include additions, alterations, etc., communicated in writing

8. Site

Shall mean the actual place M/s Bharat Immunologicals and Biologicals Corporation Ltd (BIBCOL), Chola, Bulandshahr, UP where the project is executed

9. Project

Shall mean the entire work specified in the contract documents inclusive of extra items/work/quantities(if any) executed during the contract

10. Purchaser

Shall means BIBCOL.

3.0 ACCEPTANCE LETTER

Shall mean a written consent by the letter of the owner to the tenderer intimating him that the tender has been accepted

4.0 CONTRACT

Shall mean the articles of the contract agreement, the conditions of the contract, schedule of the quantities, specifications, drawings attached, and duly signed by the owner and the Contractor

5.0 DATE OF CONTRACT

Shall mean the date on which the Owner has issued the acceptance letter

6.0 CONTRACT PERIOD

Shall mean the period as mentioned in the tender documents during which the contract needs to be executed

7.0 COMPLETION CERTIFICATE

Shall mean the certificate issued by the Owner to the contractor after successful completion of the project. This certificate will be issued on the basis of consultants certificate to the owner about the completion of the job

8.0 EXTRA ITEMS

Are those items not appearing in the BOQ but are required during the execution stage of the project, and rates are to be derived as per the formula given in the conditions of the contract

9.0 CONDITIONS OF CONTRACT OR PURCHASE ORDER

1. The contractor shall examine all the contract documents thoroughly including the scope, nature and magnitude of works he has to execute in accordance with the contract documents.
2. Any error, discrepancy or omission in the documents, shall be brought to the notice of the owner/consultant. The decision of the owner shall be final and binding.
3. There may be change in layout as per site conditions and tenderer shall not be entitled to any claims due to such changes
4. Delay in work execution due to reasons beyond contractor control
5. Force majeure - In case of force majeure the owner may extend the period by the affected period
6. Time Schedule – The successful tenderer shall submit a time schedule for project execution before commencing the work and shall execute the work strictly as per the schedule submitted and approved by the Owner/Consultant
7. Compensation for delay
   If the contractor fails to complete the work at site on or before the dates fixed for the completion, he shall without prejudice be liable to pay liquidation damage (LD) i.e. 1 percent of the contract value for every week that the whole or part of the week remains incomplete. However the total amount of LD will not exceed 10 percent of contract value
8. Variation in scope of works
   - Variation in quantity
     The consultant/owner has the right to increase or decrease the quantity of work or delete/add certain items of work. However such changes shall not entitle the contractor for any compensation, claims regarding the scope of work
   - Variation in drawings/specification

The variation in scope may be by way of changes in drawings regarding dimensions but specification remains same. In such case the contractor shall not be entitled for any claim due to change

In case of change of specification the difference of amount (on either plus or minus side) shall be established on unit rate by owner in consultation with consultant and the same shall be acceptable by the contractor

9. Arbitration Act
   - All disputes regarding specification, designs, drawing instructions, and quality of work, quality of material used for work or any other matter related to work shall be referred to the sole arbitration to be appointed by the consultant
   - The venue of the arbitration shall be Chola, Bulandshahr, UP
   - The award of the arbitrator shall be final, conclusive and binding on all parties related to the contract

10. Escalation
    The rates quoted by the contractor in the contract documents shall be final and shall not be subjected to any change due to increase in labor wages, increase in cost of material or other price variations during the project duration

11. Insurance
    The contractor shall at his own expense carry and maintain insurance with reputed insurance companies to the satisfaction of the owner
    - Insurance of works
    - Insurance of on-site employees
    - Workmen compensation
    - Transit insurance
    - Loss of damage indemnity agreement
    - Third party insurance

12. Progress report
    During execution of the contract the contractor shall furnish fortnightly progress reports to the consultant and in the format prescribed by the Consultant

13. Certificate and payment
    - Schedule of rates
      - The payments to be made to the contractor for various items shall be as per as per the finalized rates in the tender document
      - The rates finalized in the tender document shall remain firm till the completion of work including extension of time, if any
      - The bidder shall be paid from time to time by installments as per the detailed schedule of works upon satisfactory completion of work as per the terms of payment mutually agreed upon prior to commencement of the contract

    - Payment terms
      - Mobilization advance - An amount equivalent to 10% of the project cost shall be paid towards mobilization against bank guarantee.
      - 10% against approval of the final detailed engineering drawings

- 40% against pro-rata material delivery at site.
- 25% after installation and testing of individual items of supply at site.
- 15% against commissioning & validation and documentation
- Guarantee valid for 12 months after the date of certification of completion.

14. A detailed contract specifying all the terms and conditions (Applicable as above will be signed between the Client and Contractor and countersigned by the Consultant.
15. A detailed purchase order specifying all the terms and conditions for supply, installation, commissioning and qualification will be provided to the supplier by the client and countersigned by the consultant

10.0 WARRANTY/GUARANTEE

The Supplier warrants that the Goods and equipment, supplied, installed and commissioned under the Contract are new, unused, of the most recent or current models and incorporate all recent improvements in design and materials unless provided otherwise in the Contract.

The Supplier further warrants that the Goods supplied under this Contract shall have no defect arising from design, materials or workmanship (except insofar as the design or material is required by the Purchaser's Specifications) or from any act or omission of the Supplier, that may develop under normal use of the supplied Goods in the conditions obtaining in the country of final destination. The Supplier also guarantees that the Goods supplied shall perform satisfactorily as per the signed/rated/-installed capacity as provided for in the Contract.
This warranty/guarantee shall remain valid for 18 months after the Goods have been delivered at site, and 12 months from the date commissioned and accepted by the Purchaser whichever is earlier. The automation systems, instruments and controls will be guaranteed against system malfunction for a period of one year from the date of commissioning. The Supplier shall also submit a quotation along with the bid towards warranty for one extra year. This will be used at the option of the Purchaser.

The Purchaser shall promptly notify the Supplier in writing of any claims arising under this warranty.
Upon receipt of such notice, the Supplier shall, with all reasonable speed, repair or replace the defective Goods or parts thereof, without costs to the Purchaser other than, where applicable, the cost of inland delivery of the repaired or replaced Goods or parts from the port of entry to the final destination.
If the Supplier, having been notified, fails to remedy the defect(s) within a reasonable period, the Purchaser may proceed to take such remedial action as may be necessary, at the Supplier's risk and expense and without prejudice to any other rights which the Purchaser may have against the Supplier under the Contract.
On-site training of at least two operators or more of the owner’s staff as per conditions of the contract should be included free of cost.
All manufacturers Test certificates along with conditions and results shall be supplied along with the parts/items/equipment/systems

11.0 SPARE PARTS

Supplier shall carry sufficient inventories to assure ex-stock supply of consumable spares such as gaskets, plugs, washers, belts, etc. during the warranty period for supply. Other spare parts and components shall be supplied as promptly as possible but in any case within three months of placement of order.

12.0 INSTALLATION, COMMISSIONING and QUALIFICATION

As soon as practicable after the acceptance of the bid, the Supplier shall submit to the Purchaser for his approval a comprehensive program in the form of PERT network/ bar chart and any other form as may be required by the Purchaser showing the sequence of order in which the Supplier proposes to carry-out the works including the
Design(DQ),
Manufacture,
Factory acceptance test (FAT),
Delivery to site, erection and Site Acceptance Test (SAT)
Commissioning
Installation qualification,
Operational qualifications,
Performance qualification (jointly with User)
Operation and Maintenance manual
After submission to, and approval by the Purchaser of such program, the supplier shall adhere to the sequence of order and method stated therein. The submission to and approval by the Purchaser of such program shall not relieve the Supplier of any of his duties or responsibilities under the Contract. The program approved by the Purchaser shall form the basis of evaluating the pace of all works to be performed by the supplier. The Supplier shall update the PERT Network every month, submit it to the Purchaser and shall inform the Purchaser the progress on all the activities falling on schedule for the next reporting date. This should meet the target date fixed by the purchaser.

13.0 DRAWINGS FOR APPROVAL

The Supplier should visit the site to acquaint himself in respect of existing site conditions and to know the details/information required for understanding the nature and type of works involved in the project. The Supplier shall submit to the Purchaser for approval:

a. Within the time given in the specification or in the program, such drawings, samples, patterns and models as may be called for therein, and in numbers therein required.
b. During the progress of works and within such reasonable times as the Purchaser may require such drawings of the general arrangement and details of the works as the Purchaser may require.

Within two weeks from the date of receipt of the Notification of Award, Supplier shall furnish all necessary drawings as briefly described below which the Supplier shall submit for approval, identifying each drawings by a serial number and descriptive title and expected date of submission. This list shall be revised and extended if necessary,

during the progress of work depending on the nature of the contract also. The Purchaser shall signify his approval or disapproval of all drawings or such drawings that would affect progress of the contract as per the agreed program.

BRIEF LIST OF DRAWINGS (BUT NOT LIMITED TO):

1. HVAC, ducting, AHU, Air flow, RCP drawings
2. Equipment drawings for fabricated items.
3. Equipment layout for production, packing and service blocks.
4. Flow diagrams for various services.
5. Service piping layouts
6. SS piping layout .
7. Electrical cable, conduit/cable tray/cable trench layout.
8. Other miscellaneous drawings as required for erection work.
9. Electrical single line diagram, PCC and MCC general arrangement drawing and wiring
10. Automation system scheme, controls and network diagrams.

Drawings showing fabrication/manufacturing details, dimensions, layouts and bill of materials submitted for approval should meet cGMP & schedule M standards and shall be signed by responsible representative of Supplier and shall be to any one of the following sizes in accordance with Indian Standards.

All drawings shall show the following particulars in the lower right hand corner in addition to Supplier's name:

- Name of the Purchaser.
- Project Title.
- Title of drawing.
- Scale.
- Date of drawing.
- Drawing number.
- Space for BIBCOL, reference or drawing number.

In addition to the information provided on drawings, each drawing shall carry a revision number, date of revision and brief description of revision carried out. Whenever any revision is carried out, correspondingly revision number must be up-dated.
All dimensions on drawings shall be in Metric units.
Drawings (three sets) submitted by the Supplier for approval will be checked, reviewed by the Purchaser, and comments, if any, on the same will be conveyed to the Supplier. It is the responsibility of the Supplier to incorporate correctly all the comments conveyed by the Purchaser on the Supplier's drawings. The drawings, which are approved with comments, are to be re-submitted to the Purchaser for purpose of records. Such drawings will not be checked / reviewed by the Purchaser to verify whether all the comments have been incorporated by the Supplier. If the Supplier is unable to incorporate any comments in the revised drawings, Supplier shall clearly state in his forwarding letter such non-compliance along with the valid reasons.

Drawings prepared by the Supplier and approved by the Purchaser shall be considered as a part of the specifications. However, the examination of the drawings by the Purchaser shall not relieve the Supplier of his responsibility for engineering design, workmanship, quality of materials, warranty obligations and satisfactory performance on installation covered under the contract.
If at any time before completion of the work, changes are made necessitating revision of approved drawings, the Supplier shall make such revisions and proceed in the same routine as for the original approval.

In the event, the drawings submitted for approval require many revisions amounting to re-drawing of the same then the date of submission of the revised drawings would be considered as the date of submission for approval.
The Supplier shall furnish to the Purchaser before the works are taken over, Operating and Maintenance instructions together with Drawings of the works as completed, in sufficient detail to enable the Purchaser to maintain, dismantle, reassemble and adjust all parts of the works. Unless otherwise agreed, the works shall not be considered to be completed for the purposes of taking over until such instructions and drawings have been supplied to the Purchaser.

14.0 RESPONSIBILITY OF SUCCESSFUL BIDDER (single or in consortium)

1) The bidder should prepare all working drawings (shop drawings etc.,) which will be required for the proper execution of the works and all working drawings shall be submitted for approval before executing the work.
2) The parts/items/equipment should be supplied with manuals and technical drawings complete in all respects to operate the systems without any problem.
3) The bidder who is awarded the contract shall maintain and be represented on site at all times while the work is in progress, by a responsible and efficient site engineer who must thoroughly understand all the trades entailed and be constantly in attendance while the work is in progress.
4) Any directions, explanation, instructions or notices given to such site engineer of successful bidder shall be binding
5) The successful bidder shall immediately dismiss from the works any person employed thereon, who if found unsuitable or incompetent or who may misconduct himself and such person shall not again be employed or allowed on the works.
6) The successful bidder under the contract with owner shall strictly comply with the provisions of all labor laws and statutory amendments.
7) All the works shall be carried out in such a way that it does not interfere with normal routine activities of the owner.
8) The successful bidder shall be responsible for the safety of all the persons working at site including visitors etc., and shall report serious accidents occurring at site to the Consultant /Employer. This shall be without prejudice to the responsibility of the bidder.

9) The bidder shall be responsible for damage to property which may arise from operation or neglect by self or his or his employees during the period of contract.

15.0 GENERAL TERMS FOR PROCESS EQUIPMENT&UTILITIES INSTALLATION

1. Mechanical Installation

The installation work would comprise:

a. General installation i.e. positioning and installing all the processing, miscellaneous and service equipment as per approved layout drawings and as per the contract.
b. Supply and installation of structural platforms and tables.
c. Supply and installation of all service and product piping including ancillary items.
d. Insulation and cladding of piping and equipment including supply of materials.
e. Interconnections of services and electrical with equipment.
f. Guide line for expansion work.
g. Clean up of work site.
h. Supply of all cleaning chemicals, passivation, boroscopic, x-rays and lubricants.
i. Testing, commissioning and start-up.
j. Painting including supply of paints as approved by the User.
k. Training of personnel.

Detailed specifications are given in the subsequent clauses.

2. Positioning of Equipment

The work involves preparation of access for moving of the plant and equipment including their fittings from the work site go-down or from the place within the site where they have been unloaded, to the place of erection, decorating and placing on the foundation wherever required. All the civil foundations as per the manufacturer/supplier's drawings shall be part of the scope of supplier. The Supplier shall place the equipment and carry out final adjustment of the foundations including alignment and dressing of foundation surface, embedding and grouting of anchor bolts and bedplates. The Supplier shall be responsible for obtaining correct reference lines for purpose of fixing the alignment of various equipment from master benchmarks provided by the Purchaser.

Tolerances shall be as specified in equipment manufacturers drawings or as stipulated by the purchaser. No equipment shall be permanently bolted down to foundations or structure until the alignment has been checked by the Supplier and witnessed by the Purchaser. The Supplier shall carry out minor alterations in the anchor bolts, pockets etc., at no extra cost and set the equipment properly as per approved layout, drawings and manufacturer's instructions. The Supplier shall supply all the necessary foundation/anchor bolts and bedplates if required without extra cost.

The Supplier shall supply, fix and maintain, at his own cost, during the erection work, all the necessary centering, scaffolding, staging required not only for proper execution and protection of the said work but also for protection of the surrounding plant and equipment. The Supplier shall take out and remove any or all such centering, scaffolding, staging planking etc., as occasion shall require or when ordered to do so and shall fully reinstate and make good all things disturbed during execution of the work, to the satisfaction of the Owner. The Supplier shall be paid no additional amount for the above.

3. SERVICE PIPING INSTALLATION

General Guidelines
All piping systems shall comply with the latest editions of the following regulations wherever applicable.

- **All applicable Indian Standards.**

- **All applicable State Government/Central Government laws/acts.**

- The successful Tenderer has to prepare all erection drawings of the proposed plant including equipment positions and service-piping positions (Isometric, where required), spacing between pipes, all other relevant details and submit these drawings to BIBCOL for approval.

- **Scope of Supply**
  The Supplier shall supply all materials, measuring instruments and all other items as shown in the flow diagram/specifications and schedule of quantities. All the pipes & fittings and insulation material etc. should be of class and make as approved by the Owner. Prior approval of the Owner must be obtained by the Supplier for the class and make of all materials. The Supplier should furnish the details of makes selected by him

- **Scope of Piping Erection**
  This to be performed by the Supplier as outlined below:

  The scope of erection for piping, includes all system covered in the flow diagrams and specifications.

  The Supplier's work commences/terminates at the pipe connections with valves or flanges as specified in flow diagrams/battery limits.

  The Supplier shall also install necessary piping and any specialties furnished with or for equipment such as relief valves, built-in-pass and other items of this type.

  The Supplier shall install primary elements for flow measurements, control valves and on-line metering equipment.

The Supplier shall perform necessary internal machining of pipes for installing orifices, flow nozzles, control valves etc.

The Supplier shall install all pipes, valves and specialties being procured from other sources.

- **Testing of Piping**
  The Supplier shall test all piping & equipment systems mentioned below including valves and specialties and instruments as per procedure mentioned
  a) Steam Distribution piping
  b) WFI water piping
  c) Compressed Air
  d) SS Piping for process, water for injection, chilled water
  e) Waste water

- All piping shall be internally cleaned and flushed by the Supplier after erection in a manner suited to the service and as directed by the Owner.

- For hydrostatic testing and water flushing, the Supplier shall furnish necessary pumps, equipment, instruments and piping etc.

- The details of testing pressures for various pipelines are mentioned below:

S. No.	Name	Test pressure	Test medium
i.	HP Steam pipelines	27 kg/sq. cm	Water
ii.	LP Steam pipelines	8 kg/sq. cm	Water
iii.	Water pipe lines (Soft, raw, chilling and ETP raw & soft)	8 kg/sq. cm	Water
iv.	Furnace oil/LS HS	16 kg/sq. cm	Water
v.	SS pipes	6 kg to 10 kg/sq. cm	Water
vi.	Air	12 kg/sq. cm	Air
vii.	**Refrigeration pipelines:**		
	a) Suction	16 kg/sq. cm	Nitrogen
	b) Discharge	24 kg/sq. cm	Nitrogen
	c) For complete Absolute zero System for 48 hours -		

Note:
1. Duration of test shall be 30 minutes for all pipes mentioned at i, ii, iii, iv & v with no allowable pressure drop.
2. For air line duration of test is 8 hrs with allowable pressure drop of 0.1kg/sq. cm.

3. For refrigeration line duration of test is 24 hrs with allowable pressure drop of 0.2 kg/sq. cm.
4. The vacuum test for complete system should be given for 48 hours at absolute zero.
5. The Owner/Engineer in-charge shall provide only water at available supply point from which the Supplier's temporary piping shall be connected.

- **Other Guidelines**

Color code shall be used to identify pipe material. The Supplier shall be able to identify on request all random piping prior to field fabrication.

The Supplier shall be responsible for the quality of welding done by them and shall conduct tests to determine the suitability of the welding procedure by him.

All piping supports, guides, anchors, hangers, rollers with structural framework shall be supplied and erected by the Supplier. Only anchor fasteners of adequate size shall be provide for support from RCC structures and Hilmit Gun shall be used for fastening the anchors. The kinds of pipe supports like CI clamps, wooden saddles, roller supports and support framework shall be as per the design approved by the Owner prior to taking up the work.

All piping shall be suspended, guided and anchored with due regard to general requirements and to avoid interference with other pipes, hangers, electrical conduits and their supports, structural embers and equipment and to accommodate insulation and conform to buildings structural limitations. It is the responsibility to the piping Supplier to avoid all interference while locating hangers and supports.

Anchors and/or guides for pipelines or for other purposes shall be furnished, when specified, for holding the pipeline in position for alignment. Hangers shall be designed fabricated and assembled in such a manner that they cannot become disengaged by any movement of the support pipes.

All piping shall be wire brushed and purged with air blast to remove all rust, mill scale from inner surface. The method of cleaning shall be such that no material is left on the inner or on outer surfaces, which will affect the service-ability of the pipes.

Effective precautions such as capping and sealing shall be taken to protect all pipe ends against ingress of dirt and damage during transit or storage. The outside of the steel pipes (black) shall be painted with two coats of red oxide paint or as directed by the Owner.

All pipes in the corridor shall be supported from the sidewall.

Pipe support shall be of steel, adjustable for height and primers coated with rust preventive paints and finish coated with dark admiral grey of approved shade.

Where pipes and clamps are of dissimilar material, gaskets shall be provided in between. Pacing of pipe supports shall not exceed the following:

Pipe size	**Spacing between supports**
Up to 12mm :	1.5m
15 to 25mm :	2.0m
30 to 150mm:	2.0m
Over 150mm:	2.5m

Vertical risers shall be parallel to walls and column lines and shall be straight and plumb. Risers passing from floor to floor shall be supported at each floor slab by clamps or collars attached to pipe and with a 15mm thick rubber pad or any resilient material. Where pipes pass through the terrace floor, suitable flashing shall be provided to prevent water leakage. Risers shall have a suitable clean out at a lower point and air vent at the highest point.

Pipe sleeves at least 3mm thick, 50mm/100mm larger in diameter than the pipes shall be provided wherever pipe passes through walls and slabs. Annular space shall be filled with fiberglass and finished with retainer rings where these are located outside clean rooms. And inside clean rooms, annular space shall be filled with silicon sealant. No extra payment shall be made on account of providing the sleeves.

All piping works shall be carried out in a workman like manner, causing minimum disturbance to the services, buildings, roads and structures. The entire piping work shall be organized, in consultation with other agencies work, so that laying of pipe support, pipes and pressure testing for each area shall be carried out in one stretch.

Cutouts details in the floors and slabs for installing various pipe are to be provided by the contractor immediately after receipt of the purchase order, so as to make the cutouts ready by civil contractor.

The contractor shall make sure that the clamps, brackets, clamp saddles and hangers provided for pipe supports are adequate. Piping layout shall take due care for expansion and contraction in pipes include expansion joints wherever required.

All pipes shall be accurately cut to the required size in accordance with the relevant BIS code and burrs removed before laying. Open ends of the piping shall be closed as the pipe is installed to avoid entrance of foreign matters. Where reducers are to be made in horizontal runs, eccentric

reducers shall be used for piping to drain fully. In other locations concentric reducers may be used.

All buried pipes shall be cleaned and coated with zinc chromate primer and bitumen paint, then wrapped with three layers of fiber glass tissue, each layer laid in bitumen.

Auto purge valve shall be provided with all high points in the piping system for venting. Air valve shall be 15mm, pipe size valves with screwed joints. Discharge from the air valves shall be piped through an equal size mild steel, hot galvanized pipe to the nearest drain or sump. These pipes shall be pitched towards drain point.

Tee-off connections shall be through equal or reducing tees. Otherwise ferrules welded to the main pipe shall be used. Drilling and tapping of the walls of the main pipe shall not be resorted to.

- **SPECIAL INSTRUCTIONS AND SPECIFICATIONS**

1. Steam Piping

1.1 Steam piping work can be classified into two categories:
   a) High-pressure steam piping when the working pressure of steam is more than 3.1 kg/sq.cm (50 psi).
   b) Low-pressure steam piping when the working pressure of steam is below 3.1 kg/sq.cm (50 psi).

   All the pipes and fittings used for high pressure steam piping work should conform to IBR and they should be IBR certified and also to be identified with number and mark showing that they are tested by the Boiler Inspector and supported with duly authentic certificates to this effect. ALL HIGH PRESSURE STEAM PIPES SHALL BE SEAMLESS TYPE, SCHEDULE 40.

1.2 The high pressure steam piping after installation should be hydraulically tested in presence of the Boiler Inspector for his approval.

1.3 The high-pressure steam piping work should also include fabrication and installation of pressure reducing stations strictly conforming to IBR.

2. Chilled Water Piping:
   All the piping for chilled water, ammonia, soft and raw water, steam pipes and air shall generally of welded construction. Whenever welding is done for pipes of smaller size special care should be exercised to avoid clogging of flow area with the welding material.

3. SS Piping;

3.1 The pipe supports for SS piping including the clamps shall be of SS pendants with SS pipes. The SS pipe sleeves used for pipe supports and accessories like nipples, clamps, ASE plates etc. shall be supplied by supplier.

3.2 Pipe supports for SS piping are to be provided at distance of not less than 2.5m c/c or as instructed by Engineer-in-charge.

3.3 PROCUDURE TO BE ADOPTED FOR SS WELDING

a) The SS pipes shall be cut square and joints to be prepared without damage to the electro polishing of the pipes.
b) The welding shall be done using ORBITAL welding procedure, with boroscopy and radiography .
c) The joints then shall be cleaned using proper passivation procedures like cleaning with nitric acid, abrasive material such as 3M abrasive weld cleaning cloth so that proper polishing is maintained at the weld joints, etc.,.
d) Weld penetration of the inner side of the pipe shall be avoided.

- **INSULATION OF PIPING AND EQUIPMENT**

Insulation of Chilled Water and Refrigeration Pipeline

All the chilled water pipelines shall be insulated by expanded polystyrene or polyurethane foam or any other high-grade insulation acceptable to the Purchaser.

This insulation could be in pre-formed sections or cast in situ. The insulation with pre-formed sections shall be carried out in the following manner.

1. Before starting insulation work all pipelines shall be tested for 8.5 kg/sq. cm pressure.
2. The surface of the pipes to be insulated should be properly cleaned.
3. Hot bitumen of 85/40 or 85/25 conforming to IS 702 should be applied uniformly @ 1.5 kg per sq. m. on the surface of the pipes
4. A similar layer of bitumen should be applied on the inner surface and on the edges of the insulation sections.
5. The sections should then be stuck to the coated pipes with joints staggered. Adjacent sections should be tightly pressed together.
6. All joints should be properly sealed with bitumen.
7. A thick vapor seal of hot bitumen @ 2.5 kg/sq. cm should be applied uniformly on the outer surfaces of the pipe sections and allowed to dry.
8. In case the insulation sweats or the specified/required insulation properties are not attained, the entire insulation in such region shall be redone with fresh material, entirely at the Supplier's cost.
9. The thickness of insulation may be as per Annexure II.

Note: In situ insulation shall be carried out as per standard procedure**.**

Insulation of Steam and Hot Water Pipe Lines

All the steam and hot water pipelines shall be insulated with mineral wool or equivalent of specified thickness. The insulation shall be carried out in the following manner and should be supplied in the form of properly required sizes.

1. Clean the surfaces to be insulated. Apply a coat of red oxide primer and fix glass wool/mineral wool of specified thickness, tightly to the pipes, butting all joints and tie with lacing wire.
2. It should then be covered with GI wire netting of 20 mm x 24 SWG.
3. In case the insulation does not have the desired insulation properties, the entire insulation will have to be redone at the Supplier's cost to give the desired results.
4. In case of condensate return piping all the steps mentioned above shall be executed except that thickness of the insulation shall be 25 mm.

RECOMMENDED THICKNESS OF EXPANDED POLYSTYRENE FOR PIPE INSULATIONS NORMAL PIPE SIZES

Temp	**15mm**	**20mm**	**25mm**	**32mm**	**40mm**	**50mm**	**65mm**	**80mm**	**100mm**	**125mm**	**150mm**
°C	**1/2"**	**3/4"**	**1"**	**1x1/4"**	**1x1/2"**	**2"**	**2x1/2"**	**3"**	**4"**	**5"**	**6"**
20	25	25	25	25	25	25	40	40	40	50	50
10	25	25	25	40	40	40	40	40	50	50	50
0	40	40	40	50	50	50	50	50	50	50	75
(-)10	50	50	50	50	65	65	75	75	75	75	75
(-)20	50	50	65	65	65	75	75	75	100	100	100
(-)30	65	65	65	75	75	100	100	100	100	100	100

Above data is based on average conditions and should be modified to suit the individual Technical requirements.

Aluminium/SS Cladding

1. The chilled water, refrigeration, water, & hot water/steam lines after insulations shall be covered by Aluminium/SS cladding.
2. Aluminium cladding will be done with 22-gauge aluminum sheet with proper roves and overlaps and screwed in position with 12 mm. self-tapping parker screws.
3. SS sheet cladding will be done with 26 gauge sheet with proper grooves and overlaps and screwed in position with 12 mm self tapping parker screw. The SS sheet cladding will be required only in the internal areas.

All the necessary materials of quantity and make approved by the Owner, required for carrying out insulation, cladding and other works mentioned above, shall be supplied by the Supplier.

- **CLEANING CHEMICALS AND LUBRICANTS**

The necessary quantities of cleaning chemicals and the first charge of oil and lubricants required for the installation, commissioning, testing and start-up of all the equipment till handing over are to be supplied by the Supplier and nothing extra would be paid for these.

- **TESTING, COMMISSIONING AND START-UP**

1. The Supplier shall operate, maintain and give satisfactory trial run of the plant in such manner and for such periods as has been specified in Technical Specifications.

2. The commissioning shall also include the following for each equipment:

    a. Field dis-assembly and assembly of equipment, instruments and controls where required for access to fixing or adjustment

    b. Clean out of lubrication system including chemical cleaning wherever required.

    c. Circulation of lubricant to check flow.

    d. Clean out and check out of all the service lines.

    e. Check out and commissioning of instruments, equipment and plants, filtering of transformer and other oils so that if deteriorated, they shall attain the required properties/standards, specified tests in this regard must be carried out by approved authorities and their satisfactory reports submitted to the Owner before start-up.

    f. Recharging or make-up filling of lubricant oil up to the desired level in the lubrication system of individual machine.

    g. Operation in empty condition to check general operation details wherever required and wherever possible.

    h. Closed loop dynamic testing with water wherever required.

    i. Operation under load and gradual load increase to attain maximum rated output.

    j. Trouble shooting during the trial period.

    The Supplier shall demonstrate proper working of all mechanical and electrical controls; safety and protective device, in presence of the Owner's engineer and the same should be duly recorded.

- **Commissioning of automation system:**

  The supplier should provide a detailed schedule of testing all automation and control systems.

  All controlled or monitoring devices on the plant should be tested from the relevant control centre and recorded to be operating as designed, including feed back detection.

  A log of these operations is to be maintained, and each completed group of tests to be signed by the supplier's commissioning engineer.
  The purchaser reserves the right to witness as much of these test procedures, as he may feel necessary.

  Testing procedures and commissioning period will be as specified in Section VI.

  After conducting testing, in case a particular equipment is not working properly or not giving rated output the Supplier will furnish a detailed report to the Owner stating therein the detailed account on the performance of the equipment with possible reasons for improper or not working of the same.

  After satisfactory commissioning and start-up, the Supplier shall keep/depute his representatives at the plant in the manner, for the duration and for the performance of such tasks as specified in Section VI.

  The testing, commissioning and start up are considered to be satisfactory only when the cumulative performance meets the designed qualifications.

- **PAINTING**

  All the equipment/machineries like motors, pumps, HT/LT panel, transformer, switch boards, starters, junction boxes, isolators, storage tanks, supporting structures, pipe supports and MS/GI pipes and all exposed and visible iron parts included in the scope of erection/commissioning shall be given double coat of paint of approved shade over a double coat of anti-corrosive primer wherever necessary irrespective of the condition of original paint of equipment/machineries/structures/supports. All surfaces wherever required must be properly cleaned from scale, dirt and grease prior to painting. Spray painting must preferably be used on all the equipment/machineries and wherever practicable. Suitable and necessary cleaning/ wiping of sight/dial glasses, other non-metallic parts, flooring, walls and other surfaces which have been spoiled by paint during painting must also be carried out by the Supplier.

Lettering and other markings, including capacity and flow direction markings, shall also be carried out by the Supplier on the tanks, pipe lines, starters, motors, isolators and wherever else necessary, as directed and as per the standard practice of installation. ISI color codes and color charts as mentioned in Annexure - III must be adhered to.

Supply of all paints and all other materials required is included in the scope of supply of the Supplier under this contract/order.

- **TRAINING OF PERSONNEL**

Necessary staff as may be deputed by the Owner shall be trained by the Supplier for operating the plant. The personnel will be associated for the training during the installation; testing, commissioning and start-up period and the training tenure shall be extended for a minimum period of one month from the date of commissioning and start-up. This training will be a continuous process during commissioning and stand by period and as described in the Tender document.

- **GENERAL TERMS FOR ELECTRICAL INSTALLATION**

1. **SCOPE**
   The intent of this specification is to define the requirements for the installation, testing and commissioning of the electrical system like LT panels and power control centres, distribution boards, power & control cables, motors, etc. The owner shall provide power to the PCC board in the mezzanine floor from where the contractor shall draw the power through for supply into the facility for systems, equipment etc.,

2. **STANDARDS**
   The work shall be carried out in the best workmanlike manner in conformity with this specification, the relevant specification/codes of practice of the Bureau of Indian Standards, approved drawings and the instructions issued by the Engineer in- charge or his authorized representative, from time to time.

3. **EQUIPMENT AND ACCESSORIES - SPECIFICATIONS**
   All materials, fittings and appliances to be supplied by the Supplier shall be of best quality and shall conform to the specification given hereunder. The equipment shall be manufactured in accordance with current Bureau of Indian Standard Specifications wherever they exist or with the BS or NMA specifications, if no such BIS are available. In the absence of any specification, the materials shall be as approved by the Owner or his authorized representative.

All similar materials and removable parts shall be uniform and interchangeable with one another. Makes of bought out items selected by the Supplier must be furnished by him.

4. **Power Cables (LT)**

Power cables for use on 415 V system shall be of 1100 volt grade, aluminium conductor, PVC insulated, PVC sheathed, armoured and overall PVC sheathed, strictly as per IS: 1554 (Part I) - 1976 amended up to date. Conductor of cable shall be solid type for sizes up to 6 sq.mm and stranded for sizes above 6 sq.mm.

Unarmoured cable to be used only if specifically mentioned in schedule of quantities.

The size of these cables shall be as specified in schedule of quantities or as per erection drawings. If neither of these are available, the size of cable shall be as specified in cable selection chart enclosed at Annexure-V. NO CABLE OF SIZE LESS THAN 4 SQ.MM. SHALL BE USED.

5. **Control Cables**

5.1 **Control cables for power**

Control cables for use on 415 V. system shall be of 1100 volts grade, copper conductor, PVC insulated, PVC sheathed, armoured and overall PVC sheathed, strictly as per IS: 1554 (Part I) - 1976 amended up to date. Conductor of cable shall be solid type for sizes up to 2.5 sq.mm and stranded for higher sizes.

Unarmoured cables to be used only if specifically mentioned in schedule of quantities.

The size of these cables shall be as specified in schedule of quantities or as per erection drawing. THE MINIMUM CONDUCTOR DIAMETER SHALL BE 1.5 SQ.MM.

5.2 **Screened control cables for Analogue signals**

These shall be used for carrying out analogue signals. Multi-stranded base annealed copper conductor, PVC insulated, cores colour coded, laid up, screened by braiding with ATC copper wire and finally overall PVC sheathed. Sizes of their cable shall be as specified in schedule of quantities/approved drawings. These cables shall be with armouring unless specified otherwise in Schedule of qualities/approved drawings.

5.3 **Cable Trays**

These shall be perforated type heavy duty, return flange or inward bend shape, manufactured from mild steel conforming to IS 226 and hot dip galvanised as per IS 2629/BS 729. The width of cable tray shall be as per the requirement. Height to be minimum 50mm and

thickness of plate to be 1.5 mm up3to 300mm cable tray width. For cable trays having width more than 300mm height to be 75mm and thickness of plate to be 2mm. Cable trays to be supplied to site in standard lengths of 2.5 M. Necessary accessories of cable trays such as coupler side plates for joining cable trays, bends, outside riser, inside riser, tee etc. Also to be supplied. Plain cable tray covers 1.5mm thick to be supplied if specially required. Sample of cable tray to be got approved from Site In charge before supply

5.4 **Cable Glands**

These shall be provided at both ends of armoured/unarmoured electrical cables. Cable glands to be manufactured as per performance requirements of BS- 6121 amended as on date, with BRAS material accurately machined and NICKEL finish. These shall be of heavy-duty single cumbersome type for cable conductor sizes above 35 sq.mm and weather proof double compression type for cable conductor sizes up to 35 sq.mm. Single compression cable glands to be complete with check nut, gland body, 3 nos. metal washers, and outer seal rubber ring and compression nut. Double compression glands to be complete with check nut, gland body, neoprene outer ring, armour clamping cone, armour-clamping ring, armour clamping nut, neoprene outer ring, skid washer & outer seal nut. Sample of cable gland to be got approved from the Site In charge before supply.

5.5 **Cable Connectors**

Cable connectors, lugs/sockets, shall be of copper/aluminium alloy, suitably tinned solder less, crimping type. These shall be suitable for the cable being connected and type of function (such as power, control or connection to instruments, etc.)

5.6 **Cable Route Markers**

These shall be galvanised Cast Iron plate with marking (LT/HT) diameter 150 mm with 600 mm long 25x25 mm MS. angle riveted/bolted with this plate. Sample to be got approved before use.

5.7 **Cable Indicators**

These shall be self-sticking type and of 2 mm thick lead Strap for overall cable. PVC identification numbers, Ferrule shall be used for each wire.

5.8 **Pipes for Cables**

For laying of cables under floor, G.I. class 'A' pipes shall be used. MS. conduits are not acceptable for this purpose. For laying cable in the air whereas cable trays are not being used, MS `B' class pipe shall be used. Size of pipe shall depend upon the overall outer diameter of cable to be drawn through pipe. NO PIPE LESS THAN 40 MM DIA SHALL BE USED FOR THIS PURPOSE. To determine the size of pipe, assume that 40% area of pipe shall be

free after drawing of cable. In dairy's process area wherever required SS 304 pipe, 1.6mm thick shall be used.

- **Motor Isolators**

These shall be in Aluminium cast housing completely dust, vermin and weather proof (IP-55) suitable for 30/25 A, 415 volts, 50 Hz with rotary type switch and complete with cable gland for incoming and outgoing cables. Final finish of housing to be buffer mirror or powder coated grey. Sample to be got approved before supply.

Motor Junction Box/Control Junction Box These shall be in Aluminium cast housing, completely dust, vermin and weather proof (IP 55), suitable for 25A, 415 volts, 50 Hz, with heavy duty bakelite connector, complete with cable/conduit gland. Sample to be got approved before use.

- **ERECTION OF EQUIPMENT**

The cases containing the equipment (being supplied the Purchaser) shall be handed over to the supplier. The Supplier shall make his own arrangements for safe transportation of all the items to the erection site and also carry out complete loading/unloading during transportation. Equipment shall not be removed from packing cases unless the floor has been made ready for installing them. The cases shall be opened in presence of the Engineer-in-charge or his authorized representative. These empty packing cases shall be returned to the stores and any document if found with the equipment shall be handed over to the Engineer-Incharge. Any damage or shortage noticed shall be reported to the Engineer-Incharge in writing immediately after opening of packing cases.

- **INSTALLATION OF CABLE NETWORK**

General requirements for handling of cables.

1. Before laying cables, these shall be tested for physical damage, continuity absence of cross phasing, insulation resistance to earth and between conductors. Insulation resistance tests shall be carried out with 500/1000 volt Megger.

2. The cables shall be supplied at site, wound on wooden drum as far as possible. For smaller length and sizes, cables in properly coiled form can be accepted. The cables shall be laid by mounting the drum of the cable on drum carriage. Where the carriage is not available, the drum shall be mounted on a properly supported axle, and the cable laid out from the top of the drum. In no case the cable will be rolled on, as it produces kinks, which may damage the conductor.

3. Sharp bending and kinking of cables shall be avoided. The bending radius for PVC insulated and sheath armoured cable

shall not be less than 10 D Where `D' is overall diameter of the cable.

4. While drawing cables through GI pipes, conduits, RCC pipe, ensure that size of pipe is such that, after drawing cables, 40 % area is free. After drawing cable, the end of pipe shall be sealed with cotton/bituminous compound.

5. High voltage (11 KV and above), medium voltage (230 V and above) and other control cables shall be separated from each other by adequate spacing or running through independent pipes/trays.

6. Armoured cables shall never be concealed in walls /floors /roads without GI pipes, conduits RCC pipes.

7. Joints in the cable throughout its length of laying shall be avoided as far as possible and if unavoidable, prior approval of site engineer shall be taken. If allowed, proper straight through epoxy resin type joint shall be made, without any additional cost.

8. A minimum loop of 3 M shall be provided on both ends of the cable, or after every 50 M of un jointed length of cable and on both ends of straight through cable joint. This additional length shall be used for fresh termination in future. Cable for this loop shall be paid for supply and laying.

9. Cable shall be neatly arranged in the trenches/trays in such a manner so that crisscrossing is avoided and final take off to the motor/switch gear is facilitated. Arrangement of cables within the trenches/trays shall be the responsibility of the Supplier.

10. All cable routes shall be carefully measured and cable cut to the required lengths and undue wastage of cables to be avoided. The routes indicated in the drawings is indicative only and the same may be rechecked with the Engineer-in-charge before cutting of cables. While selecting cable routes, interference with structures, foundations, pipeline, future expansion of buildings, etc. should be avoided.

11. All temporary ends of cables must be protected against dirt and moisture to prevent damage to the insulation. For this purpose, ends of all PVC insulated cables shall be taped with an approved PVC or rubber insulating tape. Use of friction type or other fabric type tape is not permitted. Lead sheathed cables shall be plumbed with lead alloy.

12. Wherever cable rises from underground/concrete trenches to motors/switch gears/push buttons, these shall be taken in G.I. Pipes of suitable size, for mechanical protection up to 300 mm distance of concerned cable gland or as instructed by the Engineer-in-charge.

13. Where cables pass through foundation/walls of other underground structures, the necessary ducts or openings will be provided in advance for the same. However, should it become necessary to cut holes in existing foundations or structures the electrical Supplier shall determine their location and obtain approval of the Engineer-in-charge before cutting is done.

- **LAYING OF CABLES IN CABLE TRAYS**

1. Cable trays and supporting steel members such as MS angle/channel/flats etc. shall be provided and fixed by the Supplier.

2. Cables shall be fixed in cable trays in single tier formation and cables shall be clamped with aluminium flat clamps and galvanized bolts/unit.

3. Earthing flat/wire can also be laid in cable tray along with cables. All machines, equipment, Electrical distribution board, motors should be earthed through flat/wire (8 mm copper/GI).

4. After laying of cables minimum 20 % area shall be spare.

- **TERMINATION AND JOINTING OF CABLES**

1. **Use of Glands**

All PVC cable up to 1.1 KV grade, armoured or unarmoured shall be terminated at the equipment/junction box/ isolators/push buttons/control accessories, etc. By means of suitable size compression type cable glands armour of cable shall be connected to earth point. The Supplier shall drill holes for fixing glands wherever necessary. Wherever threaded cable gland is to be screwed into threaded opening of different size, suitable galvanized threaded reducing bushing shall be used for approved type. In case of termination of cables at the bottom of the panel over a cable trench having no access from the bottom, a close fit holes should be drilled in the bottom plate for all the cables in one line, then bottom plate should be split in two parts along the centre line of holes. After installation of bottom plate and cables with glands, it shall be sealed with cold sealing compound.

2. **Use of Lugs/Sockets**
All cable leads shall be terminated at the equipment terminals, by means of crimped type solder less connectors unless the terminals at the equipment ends are suitable for direct jointing without lugs/sockets.

The following is the recommended procedure for crimped joints and the same shall be followed:

a. Strip off the insulation of the cable ends with every precaution not to severe or damage any stand. All insulations to be removed from the stripped portion of the conductor and ends of the insulation should be clean and square.

b. The cable should be kept clean as far as possible before assembling it with the terminal/socket. For preventing the ingress of moisture and possibility of reoxidation after crimping of the aluminium conductors, the socket should be fitted with corrosion inhibiting compound. This compound should also be applied over the stripped portion of the conductor and the palm surface of socket.

c. Correct size and type of socket/ferrule/lug should be selected depending on size of conductor, and type of connection to be made.

d. Make the crimped joint by suitable crimping tool.

e. If after crimping the conductor in socket/lug, some portion of the conductor remains without insulation the same should be covered sufficiently with PVC tape.

- **DRESSING OF CABLE INSIDE THE EQUIPMENT**

After fixing of cable glands, the individual cores of cable shall be dressed and taken along the cable ways (if provided) or shall be fixed to the panels with polyethylene straps. Cable shall be dressed in such a manner that small loop of each core is available inside the panel. For motors of 20 HP and above, terminal box if found not suitable for proper dressing of a aluminium cables, the Supplier shall modify the same without any additional cost.

Cables inside the equipment shall be measured and paid for.

1. **Identification of Cables/Wires/Cores**
Power cables shall be identified with red, yellow & blue PVC tapes for trip circuits identification, additional red ferrules shall be used only in the particular cores of control cable at the

termination points in the switch gear/control panels and control switches.

In case of control cables all cores shall be identified at both ends by their wire numbers by means of PVC ferrules or self-sticking cable markers, wire numbers shall be as per schematic/connection drawing. For power circuit also wire numbers shall be provided if required as per the drawings of switch gear manufacturer.

2. **Cable between Isolators/Junction Box & Motors/Controls.** Wherever possible Copper Conductor Armoured cables with glands shall be used between isolator/junction box (installed near motor/controls) and motors/controls. However, if terminal box of the motor or control switch is not suitable for accepting armored cable or it is difficult to lay, copper conductor, multi-core, unarmored flexible cable in PVC flexible conduit steel (reinforced) with flexible conduit glands shall be used.

- **TESTING OF CABLES**

1. Before energizing, the insulation resistance of every circuit shall be measured from phase to phase and from phase to ground. This requires 3 measurements if one side is grounded and 6 measurements for 3 phase circuits.
2. Where splices or terminations are required in circuits rated above 650 volts, measure insulation resistance of each length of cable before splicing and/or terminating. Report measurements after splices and/or terminations are complete.
3. DC High Voltage test shall be made after installation on the following:
   a. All 1100 Volts grade cables in which straight through joints have been made.
   b. All cables above 1100 V grade. For record purposes test data shall include the measured values of leakage current versus time.

The DC High Voltage test shall be performed as detailed below:
Cables shall be installed in final position with the entire straight through joints complete. Terminations shall be kept unfinished so that motors, switch gear transformer etc. Are not subjected to test voltage.

The test voltage and duration shall be as per relevant codes and practices of Indian Standards Institution.

BUREAU OF INDIAN STANDARDS TO BE FOLLOWED FOR ELECTRICAL ERECTION

1. PVC insulated cables (light duty) for Working voltage up to 1100 volts - 694-1977 Part I & II
2. PVC insulated cables (heavy duty) for Voltage up to 1100 volts - 1554-1976 Part I
3. PVC insulated cables (heavy duty) for voltage 3.3 KV to 11 KV - 1554-1976 Part II
4. Specification for PE insulated PVC Sheathed heavy duty electric cables, <1100 V - 5959-1970 Part I
5. Specification for PE insulated PVC Sheathed heavy duty electric cables, voltage 3.3 KV to 11 KV - 5959-1970 Part II
6. Guide for marking of insulated conductors - 5578-1970
7. Code of practice for installation and Maintenance of paper insulated power cables - 1255-1967
8. Code of practice for earthing - 3043-1966
9. Guide for safety procedures and practices in electrical work - 5216-1969
10. Code of practice for installation and Maintenance of AC induction motor starters - 5214-1969
11. Code of practice for installation and Maintenance of induction motors - 900-1965
12. Code of practice for installation and Maintenance of switch gears - 372-1975
13. Code of practice for installation and Maintenance of transformers- 1886-1967
14. Code of practice for electrical wiring Installation, voltage not exceeding 650 V - 732-1963
15. Code of practice for electrical wiring Installation (system voltage exceeding 650 V)- 2274-1963
16. Guide for testing three-phase induction Motor - 4029-1967
17. IS 3615: glossary of terms used in Refrigeration & Air Conditioning
18. IS 659: Air Conditioning safety code.
19. IS 277: galvanized sheet metal.
20. IS 660: Mechanical refrigeration safety code.
21. IS 325: Three phase induction motor.
22. IS 732: Code of practice for electrical wiring and fittings for the buildings.
23. IS 1554 (Part 1): PVC Insulated heavy duty electrical cables for working voltages and including 1100 V.
24. IS 1367 Technical supply conditions for threaded fasteners.
25. IS 4671: Expanded polystyrene for thermal insulation.
26. IS 7240: Code of practice for industrial application and finishing of thermal insulating material at temperature from -80 ^{0}C to 40 ^{0}C.
27. IS 655: Metal Air ducts.
28. Any other IS codes which is applicable for this work.

Section III: Tender Specifications

1.0 PART A.

Civil structure wall demolition, floor finishing, HVAC, Modular Panels, Clean room equipment, BMS, Cold rooms and ancillaries

1.1 PART A1:

Specifications for Demolition of internal walls, clearance of rubble, bricks and waste, plastering and finishing of internal walls and columns

It is expressly mentioned for all the bidders that the Bill of Quantities mentioned in the tender document are indicative and needs to be reconfirmed by the bidders to ensure adequacy as required. Under no circumstances lack of performance of the total system can be related to either bill of quantities indicated in the tender or insufficiency of tender specifications mentioned in the tender. Bidder shares the entire responsibility for the quotation.

A. GENERAL DESCRIPTION

1	Project Location	:	BIBCOL OPV Plant, Chola village, Bulandshahr, Uttar Pradesh
2	Nearest Railway station	:	Bulandshahr
3	Rubble disposal site	:	A suitable location within the campus will be Provided for disposal of the rubble
4	Time allotted for the project	:	1 month from award of contract

CONDITIONS OF CONTRACT

1. The contractor shall examine the SITE including the scope, nature and magnitude of works he has to execute in accordance with the client requirements

2. There may be change in layout as per site conditions and tenderer shall not be entitled to any claims due to such changes

3. Delay in work execution due to reasons beyond contractor control
   a. Force majeure -
      In case of force majeure the owner may extend the period by the affected period

4. Time Schedule – The successful tenderer shall submit a time schedule for work execution before commencing the work and shall execute the work strictly as per the schedule submitted and approved by the Owner/Consultant

5. Variation in scope of works

a. Variation in quantity –
The consultant/owner has the right to increase or decrease the quantity of work or delete/add certain items of work. However such changes shall not entitle the contractor for any compensation, claims regarding the scope of work

b. Variation in drawings/specification
In case of change of specification the difference of amount (on either plus or minus side) shall be established on unit rate by owner in consultation with consultant and the same shall be acceptable by the contractor

6. Escalation

The rates quoted by the contractor in the contract documents shall be final and shall not be subjected to any change due to increase in labor wages or other price variations during the execution

7. Insurance

The contractor shall at his own expense carry and maintain insurance with reputed insurance companies to the satisfaction of the owner

a. Insurance of on-site employees
b. Workmen compensation

B. DESCRIPTION OF WORK:

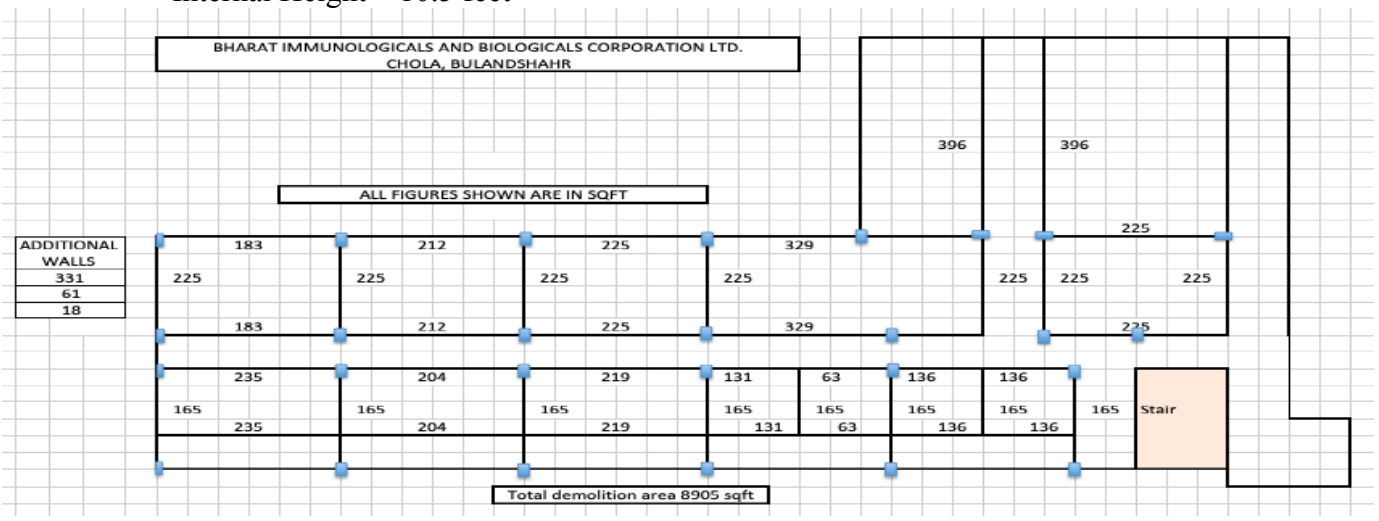
Civil structure wall demolition, rubble clearance and floor finishing with Kota stone

1. DEMOLITION OF INTERNAL WALLS

The total estimated area in sq.ft of walls which require demolition are 8905 sq.ft.

Please refer to the attached drawing for more details , All figures are sq.ft.

The thickness of the walls are 12 inches unless wherever specified
Location of facility – first floor
Internal Height – 10.5 feet



2. REMOVAL OF RUBBLE
The estimated rubble is expected to be approximately 90 trolleys. A suitable location within the campus will be provided for disposal of the rubble.

3. TRANSPORT OF RUBBLE
Since the location of the facility is on the first floor, adequate arrangement of labor and equipment for physically removing the rubble from first floor, collection in the trolleys and disposal at the provided site shall be done

Unit rates for this job should be provided, as the exact quantity of rubble will be available post demolition

Dismantling of RCC including grouting & rendering the surface, including disposal of all material to client dump premises complete as per direction of Engineer in charge. Dismantling of Brickwork including disposal of all material to dump site premises complete as per direction of Engineer in charge.

4. FLOOR FINISHING ON PRODUCTION FLOOR
Cleaning and final preparation of base, sub grade or subfloor by trimming slight undulations etc. including applying beat cement slurry.

Laying floors to required slope in any size and shape of panels made either by wooden side forms or strips of any description.

Use of scaffolding, cradles, etc., dust sheets and other coverings for the protection of fixtures, fittings, furniture, Floors etc.

Cleaning paint splashes, drops or dirt, glasses joinery, electric fittings, wiring etc., including washing the floors and leaving the premises neat and clean.

Cement concrete flooring 1:2:4 (1 cement: 2 Coarse sand: 4 graded stone aggregate) finished with a floating coat of neat cement including cement slurry.

Unit rates for this job should be provided, as the exact surface will be available post demolition.

5. KOTA STONE LAYING ON MEZZANINE FLOOR
Mezzanine floor measuring approx. **540** sqm which is currently PCC flooring needs to be layed with kota stone.

Stones shall be hard, sound, dense and homogeneous in texture free from cracks, decay weathering and flaws and of approved quality, size and uniform thickness (40 mm), edges shall be chisel dressed/ machine cut and the top surfaces shall be machine polished with joints running true and parallel from side to side.

The sides (edges) shall be table rubbed with coarse sand or machine rubbed before paving. Stones should be laid on a bed of cement slurry of @4.4 kg per sqm.

Adequate precautions shall be taken to achieve the required hardness post laying

Polishing:
The floors shall be machine polished using carborundum stone of No. 60, followed by 120, 150 and final coat with 320 Grit stone to the desired finish.

Sufficient quantity of water shall always be used during polishing to prevent scratches. After final polish with No. 320 stone, the surface to be cleaned with water and dried.Oxalic acid shall then be dusted over the surface @ 33 gms sprinkled with water and rubbed hard with Namadah blocks with machine.

Wax polishing shall be carried out as specified in the item specification by applying wax over the cleaned surface and sprinkling dry saw dust when the wax is set and then polish with machine fitted with Namadah or woolen rags block.

The used saw dust shall then be swept to get polished surface. Care should be taken that the saw dust used is free from dust particles or any impurities. The final surface should not show any trace of wax when polished.

The finished floor shall be mopped with water.

The general slope for the area shall be as per the drawing / directions of the Engineer shall be provided in sub base / PCC and or the grade slab as the case may be.

6. EXTRA WORK
All the extra or additional work done or work omitted by the order of the Purchaser shall be valued at the rates and prices set out in the contract. If the contract does not contain any rates or prices applicable to the extra or additional work, then suitable rates or prices shall be agreed upon between the Purchaser and the Supplier. In the event of disagreement the Purchaser shall fix such rates or prices as shall, in his opinion, be reasonable and proper.

7. SPECIAL NOTES
   a. The contractor shall ensure that the engaged labor is adequately trained and well versed with the demolition work.
   b. Under no circumstances, any damage shall be done to the existing structure due to negligence, lack of supervision or inadequate tools. In case of such damage observed, the contractor shall repair the same to client's/consultants satisfaction free of cost

C. Bill of Quantity (BOQ) – (see annexure – I)

1.2 PART A2
TECHNICAL SPECIFICATIONS FOR HVAC AND PRE FABRICATED MODULAR CLEAN ROOM SYSTEM FOR VACCINE PRODUCTION FACILITY

It is expressly mentioned for all the bidders that the Bill of Quantities mentioned in the tender document are indicative and needs to be reconfirmed by the bidders to ensure that the HVAC and Clean Air system works as required under turnkey. Under no circumstances lack of performance of the total system can be related to either bill of quantities indicated in the tender or insufficiency of tender specifications mentioned in the tender. Bidder shares the entire responsibility for the quotation.

A. HEATING, VENTILATION & AIRCONDITIONING SYSTEM:

1 BASIS OF DESIGN:

1.1 FUNCTIONAL REQUIRMENT:

Site is located at BIBCOL, BULANDSHAHR. It lies 204 m above sea level
High temp is 40. Deg.C and low temp is 8 deg.C. Mean temp is 26 deg.C
The HVAC system function is to condition (Heating & cooling), replace (Makeup) Fresh air to pressurize rooms and clean, (Terminal HEPA filtration) the air in the environment to meet the required operational conditions.
The Design conditions in the Production rooms are as follows:

Internal Environmental Design conditions:

Temperature	:	23+/-2 Deg C
Relative humidity	:	55 +/- 5%
Pressure Gradient according to the classification of the rooms	:	as per Data sheet
Filtration	:	Terminal HEPA filtration with efficiency 0f 99.997% down to 0.3 micron, except as classified in Data Sheet
Air change rate per hour	:	As per Data Sheet
Air circulation	:	As per Data sheet
Personal Load	:	As per Data Sheet
Equipment Load	:	As per Data sheet
Standards	:	cGMP, Schedule M & WHO TRS 937

The bidders shall study the basis of design along with the room data sheets provided and calculate the refrigeration loads for Process use and to meet the environmental conditions in the Production Blocks.

Clean air requirements has to be Designed according to the Classification of the Zones and the Equipment should be so selected according to the detailed specifications, such offer will be considered in the appraisal of this tender and may be adopted in the contract subject to fulfilling the condition laid down in the tender specification.

a. An existing Building for OCV manufacturing Facility at BIBCOL is being renovated.
b. The Refrigeration plant already installed shall supply the required chilled water at designated temperature to maintain the Environmental conditions in the main production building and Production requirements as mentioned above.
c. The Bidder should inform the total tonnage requirement for the facility to cater the Total Air Handling units for Bacterial Block at Designed temp of water.
d. The scope of the contract covers complete design, detailed engineering including preparation of drawings, supply, installation and commissioning of the HVAC on turn-key basis including training of operating personnel in operation and maintenance of plant and machineries.
e. The Bidders shall allow 15% for the losses and other unexpected miscellaneous loads while deciding the total heat load. The Bidder shall consider the operation time of the HVAC system particularly compressor for 24 hrs in a day (maximum).
f. Bidder shall also consider the following details of Vaccine Production Facility, given below while designing the system and selecting the major components:

2. BRIEF DESCRIPTION HVAC SYSTEM:

The equipments would be required are

- Chilled water piping supply & return with insulation.
- Air handling unit with cooling coils.

DESIGN PARAMETERS OF THE EQUIPMENTS:

AIR HANDLING UNITS:

Maximum face velocity across pre filters	=	500 ft/min
Maximum face velocity across fine filters	=	500 ft/min
Maximum fan outlet velocity	=	1800 ft/min
Maximum fan speed	=	1450 RPM
Maximum fan motor speed	=	1450 RPM

DESIGN PARAMETERS FOR COOLING COIL DESIGN:

Maximum face velocity across coil	=	500 ft/min
Water Pressure p across coil(Max)	=	10 ft
Water velocity in coil (Max)	=	6 ft/Sec

FILTERATION:

Maximum face velocity across HEPA filters (Max)	=	250-175 ft/min

CHILLED WATER PUMPS:

Maximum Split Pump speed	=	1450 RPM
Maximum mono-block Pump speed	=	2900 RPM

Piping shall be sized for the following design Parameters:

Maximum flow velocity	=	8 ft/sec.
Maximum friction	=	5 ft W C/100 ft.

DUCTING:

Design Parameters for duct design shall be:

Maximum flow velocity for A/c ducts	=	1200 ft/min
Maximum velocity at supply air outlet	=	500 ft/min
Maximum friction in AC ducts per 100 ft length	=	0.15 Inches

See Annexure – I for

a. BOQ for Clean room modular systems
b. BOQ for epoxy flooring
c. BOQ for clean room equipment
d. BOQ for AHU and air distribution systems
e. BOQ for electrical lighting
f. BOQ for MV system
g. BOQ for LV system
h. BOQ for BMS system

PIPING & VALVES

SCOPE

The scope of this section comprises the supply and laying of pipes, pipe fittings and valves, testing and balancing of all water and refrigerant piping required for the complete installation. All piping inclusive of fittings, expansion tank and valves shall follow the applicable Indian Standards.

CHILLED WATER PIPING

All chilled water piping and fittings shall be ERW of MS class " C" (heavy duty) conforming to BIS 1239 for pipe size up to 150 mm dia and for pipe size 200 mm dia and above shall be as per BIS 3589 having minimum 6mm thickness. All the joints in the piping system shall be done by welding unless otherwise mentioned, or as directed at site. All welding shall be done by qualified welders having welding certification with a minimum experience of 5 years and shall strictly confirm to Indian Standards code of procedure for manual metal arc welding of Mild steel as per BIS 823. The condenser water piping shall also be confirming to the specified standards as above but shall be carried out with MS Class "C" with fittings. The piping shall be subsequently paint finished as per code of color as recommended in the standards/guidelines of safety.

All pipes and their steel supports shall be thoroughly cleaned and given one primary coat of red oxide paint before being installed. All chilled water piping will rest on treated teakwood blocks neatly machined to the radius of pipes and seated on MS angles/channel. All welded piping shall be subjected to the approval at site.

Fittings shall be of malleable casting of pressure rating suitable for the chilled/condenser piping system. Fittings used on welded piping shall be of weld-able type.

Tee-off connection shall be through equal or reducing tees. Otherwise ferrules welded to the main pipe shall be used. Drilling and tapping of the main pipe shall not be resorted to.

Ball valve, Butterfly valves, Balancing valve, globe valve, conforming to the following specifications shall be provided :

SIZE	CONSTRUCTION	ENDS
15 TO 40 mm	Gun Metal	Screwed
50 mm and above	Body cast iron spindle and valve seat of Bronze or Gun metal or Nitrile rubber. (in case of butterfly valve)	Flanged

All valves shall be heavy duty conforming to BIS 780, BIS 5152, BIS 5155. Valves shall have non rising spindles unless otherwise specified and shall be suitable for not less than 15 KG per sq.cm gauge working pressure. Butterfly valve shall perform the function of isolating valves, Butterfly valves shall have cast iron body with black Nitrile rubber seat

All Butterfly valves shall be provided with locking devices. Valves above 250 mm dia shall be gear driven.

Flanges shall be of slip on raised face type. The supply of flanges shall also include supply of bolts and nuts and suitable asbestos/fiber rubber insertion gaskets (minimum 3 mm thick).

Non-return (check) valves shall be provided conforming to BIS 778 and IS 5312 (Part I) and in accordance with the following specifications.

SIZE	CONSTRUCTION	ENDS
50 mm and 150	Cast iron/Gun Metal plate	Flanged
200 mm to 450 mm	Body cast iron, plate carbon steel with 13% chrome overlay	Flanged

The spring and hinge/stop pin shall be SS 304 and bearing fine material. Valves shall be suitable for not less than 15 kg per Sq.cm. gauge working pressure.

Non-return valves shall be disc type. Swing check valves shall normally be used in all water services. Lift type valves may be used in horizontal runs. Valves shall be suitable for not less than 15 kg per Sq.cm gauge working pressure.

Strainers shall be of " Y " type or pot strainers, with cast bodies designed for the test pressure specified for the gate valves. Strainers shall have bronze screen with 3mm perforations. Screen shall be removable and replaceable without disturbing of the main pipes. All strainers shall be provided with equal size isolating gate valves with non-rising spindle so that the strainer may be cleaned without draining the system. Strainers shall be provided on the inlet side (at suction) of each pump.

All chilled water piping and fittings shall be pressure tested, then insulated as described under the section "Insulation".

After all chilled/condenser water piping has been installed, the pressure testing run for at least three days of 72 hours. The piping, fittings & supports shall than be painted with one coat of red oxide paint & two finish coats of 30 Microns each of approved color of synthetic enamel paint conforming to IS 2379 (In case the chilled water piping, the paint shall be done after insulation of the pipes). The direction of flow of fluid in the pipes shall be visibly marked with identifying arrows.

Auto Air vent/drain valve of suitable size shall be provided in the chilled/condenser water piping at highest point and at lowest points in the risers respectively.

At the building expansion joints suitable copper bellows should be introduced in the piping system to overcome expansion and tension on piping system.

COLD WATER AND DRAIN PIPING:

All pipes to be used for cold water (makeup) drain and condensate drain shall be MS Class "C" as per BIS Standards.

All joints in the pipe system shall be by screwed fittings using non-hardening lubricant as sealing material and/or by screwed flanges using 3mm 3-ply rubber gaskets. Pipe threads and flanges shall be as per BS 534 and BS 4504.

All pipe supports shall be of mild steel, thoroughly cleaned and given one primary coat of red oxide paint before being installed.

Fittings shall be of Mild steel 'Medium Class', malleable casting of pressure rating suitable for the piping system. Flanges shall be of approved make. Supply of flanges shall include bolts, washers, gaskets as required. Sufficient number of flanges and unions shall be provided for future cleaning and servicing of piping. Tee-off connections shall be through equal or reducing tees. All equipment and valve connections, or connections to any other mating pipe shall be through unions/screwed flanges up to 50 mm dia and through screwed flanges for larger diameters, or as required for the mating connections.

Ball Valves, Butterfly Valves, check valves and strainers shall be similar to those specified for chilled, condensing and hot water piping, except that the smaller valves up to 15mm dia may have screwed female ends.

All condensate drain piping shall be insulated as per the section 'Insulation'. Cold water piping within the building may also be insulated.

After the piping has been installed, tested and run for at least three days of 72 hours, all piping and pipe supports shall be painted with one coat of red oxide paint & two finish coats of 3 mils each of approved color of synthetic enamel paint conforming to IS 2379.

The direction of flow of fluid in the pipes shall be visibly marked with identifying arrow.

MOTORISED MIXING VALVE

Motorized valves shall be two way, straight through for proportional control of the chilled water. These valves shall act as modulating agents. These valves shall be high pressure tested. The valve shall be housed in a bronze body with female, screwed end connection or flanged connection for a cast iron body. It shall have a self rotating, spring loaded packing material with a SS stem and a disc. The valve shall be mounted with modulating actuation motor on the shaft with control junction box for connecting to automation package.

The actuator mounted on the valve shall be actuated either by accepting input signals from variety of sources viz. Resistance controllers, voltage and current inputs. The motor shall have solid state drive circuit, triac switching, electro mechanic travel limits and quick connect wiring terminals.

BALANCING VALVE

The balancing valve shall be fitted in to the pipeline system for balancing, control and shut off. These shall have in-built flow measuring port to measure flow and pressure for proper balancing and control of water. The body shall be made up of Gun metal/ cast iron body, that is corrosion resistant.

BUTTERFLY VALVE

The Butterfly valve shall comprise of a standard one-piece body casted out of graded Cast iron, the disc shall be made out of casted stainless steel, seat made out of Nitrile rubber for proper isolation/ seal. The coating on the body and disc shall be either epoxy or PTFE material.

GLOBE VALVE

The Globe valve shall have a forged casted brass or bronze body, the packing and the seat shall be made out of teflon material for valve seat tightness. The valve shall have a large flow chamber to enable minimum pressure drop and maximum flow. The seals for the body and bonnet shall be of fully retained gasket.

Y – STRAINER

Y strainer shall have a rigid cast iron body of grade CI 260, a bonnet of the same material, a basket made out of GI perforated sheet of 24 swg with 3 mm perforations, the body and bonnet shall have CAF gasket. The strainer shall have a double flanged body and cover, which are bolted by means of hi tensile bolts.

PIPING INSTALLATION:

Tender indicates schematically the size and location of pipes. The contractor on the award of the work, shall prepare detailed working, showing the cross-section, longitudinal sections, details of fittings, locations of isolating and control valves, drain and air auto vent valves and all pipe supports. He must keep in view the specific openings in buildings and other structures through which pipes are designed to pass.

Piping shall be properly supported on or suspended from stands, clamps, hangers as specified and as required. The contractor shall adequately design all the brackets saddles anchors, clamps and hangers, and be responsible for their structural sufficiency.

The pipe supports shall be galvanized / concrete to avoid corrosion and the spacing of pipe supports shall not exceed the following:

Pipe Size	Space between supports
Upto 12 mm	1.5 meter
15 to 25 mm	2.0 meter
30 to 150 mm	2.0 meter
Over 150 mm	2.5 meter

Vertical risers shall be parallel to the wall and column lines and shall be straight and to plumb line. Risers passing from floor to floor shall be supported at each floor by clamps or collars attached to pipe and with a 15 mm thick rubber pad or any resilient material. Where pipes pass through the terrace floor, suitable curbing shall be provided to prevent water leakage. Risers shall have a suitable clean out at the lowest point and air vent at the highest point.

Pipe sleeves, 50 mm larger in diameter than pipes shall be provided wherever pipes pass through walls and slabs and the annular space filled with fiberglass and finished with retainer rings.

Insulated piping shall be supported in such a manner as not to put undue pressure on the insulation. 14 gauge metal sheets shall be provided between the insulation and the clamp saddle or roller, extending at least 15 cm on both sides of the clamp, saddles or roller.

All pipe work shall be carried out in a workman like manner. Causing minimum disturbance to the existing services, buildings, roads, and structure. The entire piping work shall be organised, in consultation with other agencies work, so that laying of pipe supports and pressure testing for each area shall be carried out in one stretch.

Piping layout shall take due care for expansion and contraction in pipes, and shall include expansion loop wherever required.

Auto/Manual air vents shall be provided at all high points in the piping system for venting. All valves shall be of 32mm pipe size and shall be associated with an equal size gate valve. Discharge from the air valves shall be piped through an equal sized mild steel or galvanised steel pipe to the nearest drain or sump. All pipes shall be pitched towards drain points.

TESTING & BALANCING:

All piping shall be tested to hydrostatic test pressure of at least two and half times the maximum operating pressure, but not less than 8 kg per sq.cm gauge for a period of not less than 72 hours. All leaks and defects in joints revealed during the testing shall be rectified and got approved at site.

Piping repaired subsequent to the above pressure test shall be re-tested in the same manner.

System may be tested in sections and such sections shall be securely capped and later re-tested along with the entire system.

The contractor shall give sufficient notice to all other agencies at site, of his intention to test a section or sections of piping and all testing shall be witnessed and recorded by Owner's site representative.

The Contractor shall make sure that proper noiseless circulation of fluid is achieved through all coils and other heat exchange equipment in the system concerned. In case of improper circulation, the contractor shall rectify the defective connections. He shall bear all expenses for carrying out the above rectification, including the clearing up and re-finishing of floors and walls as required.

After completion of the installation, all water system shall be adjusted and balanced to deliver the water quantities as specified, quoted or as directed, to individual air handling units and fan coil units cooling coil.

Complete certified balancing report shall be submitted for evaluation and approval. Upon approval, four copies of the balancing report shall be submitted with complete documents

FLOOR MOUNTED DOUBLE SKIN AIR HANDLING UNITS

The Air Handling units shall be double skin construction of approved make comprising o Fan Section, Chilled water Coil Section, Provision for steam coil section,, stainless steel drain pan, Filter Section with 2 stage filtration of 20 Micron (pre filter) and 5 Micron (fine filter), PVC eliminator, Mixing box along with Return, Supply and fresh air dampers and push through type. The unit shall be of floor mounted design installed on spring/vibration isolators/mountings for eliminating vibration to the civil structures.

CASING

The casing shall be of sandwich panels fixed on modular frame design. The frame shall be made of non corrosive extruded aluminum channels fitted with extruded Aluminum/PVC(Polyamide) corner pieces and insulated with 50 mm PUF injected having density 40 Kg/m^3 insulation. The structure shall be having thermal break for total unit. Panels shall be 44 mm thick sandwich type with injected polyurethane foam insulation for rigid non-vibrating construction. The insulation shall not absorb moisture and should be rot resistant. The panels shall be flush mounted to the casing with no sharp edges/corners. They shall be rapid

access type fitted from inside with Allen screws to have flush finish from outside. The sealing of frame to panel shall be by means of non-hygroscopic seal compressed between the panel and the aluminum frame channels to prevent cold tracking and air leakage between panel & frame. The outer wall shall be of galvanized sheet chemically treated, having scratch free pre plasticized coating and plain GI inner sheet. The AHU shall be provided with electrical power/control junction box on external side of the unit conveniently mounted for cable connections.

FAN SECTION

Fans shall be plug type single width, single inlet multi blade type. Fans shall be back ward curved as required for stable operation. The blades shall be made of heavy gauge of steel treated and painted after manufacturing. The fans shall be statically and dynamically balanced at the factory as complete fan assembly should have AMCA approval. The fans shall be equipped with self-aligning bearings. Fan / motor assembly shall be mounted on a common framework entirely isolated from the unit by spring isolators to avoid transmission of vibration. The fan discharge shall be isolated from the casing by a vibration absorbing connection. The fan section shall be housed in the supply chamber similar to the other sections and shall have outlet dampers as deemed fit for connecting the supply ducts.

FILTER SECTION

The filter section shall be same as that of casing and panels of AHU but with an access door for withdrawal/fixing of filters. A channel/fixing arrangement shall be made of galvanized sheet and be provided for inserting/withdrawing the filters in the unit. The Filter section shall be 2 stage one with 20 Micron and other with 5 Micron Filters.

COOLING COILS

Chilled water / Hot water coils shall have 12.5 to 15 mm dia copper tubes minimum 24 gauge thick, with aluminum fins firmly bonded to copper tubes assembled in zinc coated steel frame. Face and surface areas shall be such as to ensure rated capacity from each unit and such that the air velocity across each coil shall not exceed 150 meters per minute. The coil shall be pitched in the unit casing for proper drainage. Each coil shall be factory tested at 21 Kg / Sq.cm, air pressure while submerged in water. Tubes shall be hydraulically expanded for minimum thermal contact resistance with the fins. Fin spacing shall be 13 fins per inch. (4-5 Fins / CM.).The coil shall be minimum 6 Rows for the Cooling coil.

COIL SECTION

The coil boxes housing cooling / steam coils shall be of the same construction as of the fan casing. The casing shall be of sandwich panels fixed on modular frame design.

The frame shall be made of non corrosive extruded aluminum channels fitted with extruded Aluminum/PVC(Polyamide) corner pieces and insulated with 43mm PUF injected insulation. Panels shall be 43mm thick sandwich type with injected polyurethane foam insulation for rigid non-vibrating construction. The

insulation shall not absorb moisture and should be rot resistant. The panels shall be flush mounted to the casing with no sharp edges/corner. They shall be rapid access type fitted from inside with Allen screws to have flush finish from outside. The sealing of frame to panel shall be by means of non-hygroscopic seal compressed between the panel and the aluminum frame channels to prevent cold tracking and air leakage between panel & frame. The outer wall shall be of galvanized sheet chemically treated, having scratch free pre plasticized coating and plain GI inner sheet.

MIXING BOX SECTION

The construction of this section is same as unit but will have Airfoil blade design opposed blade dampers for Return Air, Fresh Air and Exhaust Air as may be required. The casing shall be of sandwich panels fixed on modular frame design. The frame shall be made of non corrosive extruded aluminum channels fitted with extruded Aluminum/PVC(Polyamide) corner pieces and insulated with 50mm PUF injected insulation. Panels shall be 50mm thick sandwich type with injected polyurethane foam insulation for rigid non-vibrating construction. The insulation shall not absorb moisture and should be rot resistant. The panels shall be flush mounted to the casing with no sharp edges/corner. They shall be rapid access type fitted from inside with Allen screws to have flush finish from outside. The sealing of frame to panel shall be by means of non-hygroscopic seal compressed between the panel and the aluminum frame channels to prevent cold tracking and air leakage between panel & frame. The outer wall shall be of galvanized sheet chemically treated, having scratch free pre plasticized coating and plain GI inner sheet.

DAMPER:

Dampers shall be opposed blade type. Blades shall be made of double skinned aerofoil aluminium sections with integral gasket and assembled within a rigid extruded aluminium alloy frame. All linkages and supporting spindles shall be made of aluminium or nylon, supported in teflon bushes. Spindle shall be provided with a bakelite knob for locking the damper blades in position. Linkages shall be extended wherever specified for motorisation operation. Damper frames shall be sectionalised to minimise blade wrapping. Air leakage through dampers when in the closed position shall not exceed 1.5% of the maximum design air volume flow rate at the maximum design air total pressure.

MOTOR AND DRIVE

Fan motors shall be of flame proof and suitable for 415V $\pm$ 10%, 50 Hz, 3 phase, AC supply. It shall be squirrel cage, totally enclosed fan cooled motors. Motors shall be specially designed for quiet operation and motor speed shall not exceed 1450 RPM. Fan motors shall be mounted inside the AHU on spring mounts with belt drive facility with easy belt tensioning. Drive to fan shall be provided through belt-drive with a standard belt guard housing the bolt and adjustable motor sheave. Belts shall be of the oil-resistant type. The frame for mounting the fan and motor shall be isolated from the double skin casing with spring isolators.

ISOLATOR

AHU shall be floor mounted on cushy foot/spring isolation to avoid transmission of vibration to the floor.

PERFORMANCE DATA

Air handling units shall be selected for the lowest noise level of the equipment. Fan performance rating and power consumption data with operating points clearly indicated shall be submitted with the tender and verified at the time of testing and commissioning.

TESTING

Cooling capacity of various Air handling unit models shall be computed from the measurements of air flow and dry and wet bulb temperatures of air entering and leaving the coil. Flow measurements meters shall be accurately calibrated. The temperature gauges shall be digital thermometers. Computed results shall conform to the specified capacities and quoted ratings.

DUCTING

GENERAL

All ducts shall be fabricated from galvanized steel sheets of the following thickness as indicated in schedule of quantities & as described in the IS: 655 with latest edition. The ducting shall be made out of Lock former machine or factory fabricated to avoid site work to the minimum.

RECTANGULAR DUCT

Dimensions of Ducts(mm)	G.I	Gauge Aluminium	Type of Joints	Type of Bracing's
Up to 600	24	22	G.I Flange at 2.5 Center	Cross bracing's
601 to 750	24	22	25 x 25 x 3 mm angle frame with nuts and bolts	25 x 25 x 3 mm MS angles bracing 6 mm dia at 1500 mm from joints
751 to 1000	22	20	25 x 25 x 3mm angle frame with 6mm dia nuts and bolts	25 x 25 x 3 mm MS angle bracing at 1500mm from joints
1001 to 1500	22	20	40x40x5 mm angle frame with 8mm dia nuts and bolts	40 x 40 x 3mm MS angle bracing at 1500mm from joints

1501 to 2250	20	16	50x50x3mm angle to be cross braced diagonally with 10mmdia nuts & bolts at 125 center.	40 x 40 x 3mm MS angle bracing at 1200mm from joints or 40x 40 x 3mm MS angle diagonal bracing.

Sheet metal ducts shall be fabricated as per BIS/SMACNA Standards out of galvanized steel sheets. Sheets used shall be produced by hot dip process and galvanizing shall be Class VIII - Light Coating of zinc nominal 120 gm / Sq. M.

HANGERS FOR DUCT

Duct Size(mm)	Spacing (Mtr)	Size of MS angle (mm x mm)	Size of rod dia (mm)
Up to 750	2.5	40 x 3	10
751 to 1500	2.0	40 x 3	12
1501 to 2250	2.0	50 x 3	15
2251&above	2.0	50 x 3	15

INSTALLATION

All ducts shall be installed as per the drawings prepared by the Contractor.
The Contractor shall provide and neatly erect all sheet metal work as may be required to carry out the intent of these specifications. The work shall meet with the approval of Owner's site representative in all its parts and details.

All necessary Allowances and Provisions shall be made by the Contractor for beams, pipes, or other obstructions in the building, whether or not the same are shown on the drawing. Where necessary to avoid beams or other structural work, plumbing or other pipes, and/or conduits, the ducts shall be transformed, divided or curved to one side, the required area being maintained, all as per the 'site requirements.'

- If a duct cannot be run as shown on the drawing, the contractor shall install the duct between the required points by any path available, in accordance with other services and as per approval of Owners site representatives.

- All ductwork shall be independently supported from the building structure. All horizontal ducts shall be rigidly and securely supported, in an approved manner with trapeze hangers formed of galvanised MS rods and angle iron under ducts at not greater than 2 meter centers. All vertical

duct work shall be supported by structural members at 2 Meters intervals. Air conditioning contractor shall supply and install all supports made of galvanised steel material and shall be of hi-tech supports only. The supports shall be designed to prevent vibration to be transmitted to the building structure by providing vibration isolation. If duct is passing through in such areas where space between ceiling slab to false ceiling is more than 1500 mm than duct should be supported by wall mounted brackets of 40 x 40 x 3mm angle.

- Where metal ducts or sleeves terminate in woodwork, tight joints shall be made by means of closely fitted heavy flanged collars. Where ducts pass through brick or masonry opening, wooden frame work shall be provided within the opening and crossing ducts provided with heavy flanged collars on each side of wooden frame work, so that duct crossing is made leak-proof.

- All ducts shall be totally free from vibration under all conditions of operation. Whenever duct work is connected to fans, air handling units or blower coil units that may cause vibrations in the ducts, ducts shall be provided of fire retardant rubberized canvas cloth flexible connection. The flexible connections should be located close to the unit, in mutually perpendicular directions. The flexible sleeve should be at least 15cm long securely bonded and bolted on both sides. Sleeve shall be made smooth and the connecting ductwork rigidly held by independent supports on both ends. The flexible connection shall be suitable for pressures at the point of installation.

- All ducts should be free from particles and before erection all ducts should be cleaned to avoid contamination sticking inside the ducts. Silicon sealant to be applied wherever joints are there. And ensure leak test to be carried out at site before doing final connections.

- Air conditioning unit and exhaust fans shall be connected to duct work by inserting at air inlet and air outlet a double canvass sleeve. Each sleeve shall be minimum 150 mm securely bolted to duct and the connecting ductwork rigidly held in line with unit inlet or outlet.

AIR FILTRATION SYSTEM:

Air filters are to be used as part of HVAC Clean Air system.

PREFILTER (EU-4):

The filters are of box type made of Nylon and washable. They should meet the following:

a.	Efficiency	As per EU 4 and / or Average arrestance of 65% - 80% when tested in accordance with BS:6540

b.	Initial pressure drop	Not to exceed 5.0 mm wg at rated flow.
c.	Final pressure drop	Up to 10 mm wg at rated flow

FINE FILTER(EU-9):

The fine filters will be of polypropylene medium in the form of a fabric. The separators shall be of tubular aluminum supports. This casing will of CRCA sheet with expand polyethylene gaskets.

They should meet the following:

a.	Efficiency	99% down to 5 Microns when tested in accordance with BS:6540.
b.	Initial pressure drop	Not to exceed 10 mm wg at rated flow.
c.	Final pressure drop	Up to 30 mm wg at rated flow

HEPA FILTERS

HEPA Filters are made to suit the room wise volumes and construction should be Box type and frame should be Anodised aluminum. The medium of the HEPA filter shall be of 100% micro glass fiber in the form of a sheet of paper of imported origin designed for higher efficiency and longer life. The separator shall be of aluminium foil. The Tenderer shall furnish a test certificate. Provision for measuring the pressure drop across the filters shall be made in the plenum. Test certificates shall be provided for the filters. Wherever specified all the filters shall be tested individually at the factory and consultants/Owners may visualize the testing at factory(FAT)

They should meet the following:

a.	Efficiency	99.97% down to 0.3 Micron.
b.	Initial pressure drop	Not to exceed 25 mm wg at rated flow.
c.	Final pressure drop	Up to 50 mm wg at rated flow

FIRE DAMPERS

All supply / return air ducts of air handling units and return air openings shall be provided with approved fire dampers of at-least 1 1/2 hour fire rating. These shall be

of approved make. The damper shall be fabricated of 16 gauge GSS housing with blades formed out of 1.6 mm sheets. The damper shall be pivoted on both ends using chrome-plated spindles in bronze bushes. The stop seals shall be provided on top and bottom of the damper housing. The damper blades shall be held in horizontal position using spring actuator bimetallic UL certified fusible link.

RETURN AIR GRILLS

Return air grilles shall be of anodized extruded Aluminium construction with adjustable bars. air grills shall be generally double deflection type backed with GI damper. The return air grills being provided with removable key operated volume control dampers. To be provided with pre filter inside the clean room areas.

SUPPLY DIFFUSERS(for GENERAL AREA areas)

The supply air diffuser shall be provided with removable key operative volume control dampers. Aluminium supply and return air diffusers shall be powder coated and should have the color of client's choice or shall be extruded Aluminium. Supply linear diffuser shall be Extruded Aluminium construction, square, rectangular, or round diffusers with flush fixed pattern or adjustable flow pattern. Diffusers for different spaces shall be selected in consultation with the Client/Consultants Prefilters to be provided.

HEPA HOUSINGS (FILTER MODULE):

The Filter module shall be fabricated using CRCA powder coated sheet having a thickness of not less than 1.5 mm. the plenum shall have inlet mouth connection suitable for connecting permanent suitable duct. Housings shall be flushed with ceiling panels without any gaps.

SS perforated grill to be provided at the out let of the filter. Gear damper control to be provided to control from inside the room. DOP, Pressure drop ports to be provided . The filter housing should accommodate to fix box type filter only.

DUCT INSULATION

Scope of this specification comprises supplying, installing testing and commissioning of insulation on duct, pumps, chilled water piping, expansion tank and exposed roof under-deck insulation.

Duct insulation - Nitrile rubber insulation of 13mm thickness for supply air duct and 9mm thickness for return air duct. The Insulation material should have the following properties:
Excellent ozone and weather resistance Self-extinguishing flame proof CFC Free-Product, Should have low toxicity Should have good resistance to oils and chemicals

CHILLED WATER PIPE INSULATION:

The insulation for chilled water and drain piping shall be carried out from using High density Expanded polystyrene pre formed slabs of following thickness as specified below. Density shall be 20Kg/m^3.

Thickness of insulation shall be as follows:

1) up to 80mm dia = 50 mm thk.

2) from 100 to 250mm dia = 75 mm thk.

Application :

All chilled water and drain piping shall be insulated after pressure testing, as follows:

- Brush and clean all piping and fittings to remove all dust, dirt, mortar and oil. Then provide 2 coats of zinc chromate primer
- Apply 2 coats of Black Japan paint.
- Apply pre-formed pipe sections over the pipe before the adhesive dries up and seal all longitudinal and transverse joints. All joints along the circumference of the pipe sections shall be covered with Bitumen tar.
- Cover the pipe sections with vapour barrier of Polythene sheet with minimum overlap of 75 mm near the joints.
- The vapour barrier shall be covered with Tar felt sheets and fixed with G.I wire of 22swg. The felt sheet shall be stuck with Bitumen Grade 85/25 applied at the rate of 1.6 Kg/Sqm.-Finally applying sand cement plaster in ratio 1:3 in two layers each 15 mm thick. Finally painting the insulated cement plastered piping with 2 coats of Painting.

PUMP INSULATION:

All chilled water pumps shall be insulated with Expanded Polystyrene in the manner specified herein. Two sectionalized boxes made of 20 gauge Galvanized steel sheet shall be provided around each horizontally split casing pump. All sheet joints shall be sealed with bitumen from inside, the insulation impaled over pins welded/riveted to GI sheet and secured with spring washers. The insulation shall be finally covered on top with GI sheet cladding for smooth finishing.

AIR BORNE PARTICULATE CLASSIFICATION FOR MANUFACTURE OF STERILE PRODUCTS:

Grade	At rest (b)		In operation	
	Maximum permitted number of particles/m^3			
	≥ 0.5 µm	≥ 5 µm	≥ 0.5 µm	≥ 5 µm
A	3,520	20	3,520	20
B	3,520	29	352,000	2,900
C	352,000	2,900	3,520,000	29,000
D	3,520,000	29,000	Not defined	Not defined

Limits for micro Biological Contamination:

Grade	Air sample (CFU/m^3)	Settle plates Diameter 90 mm (CFU/4 hours)	Contact plates Diameter 55 mm (CFU /plate)	Glove print (5 fingers) (CFU/glove)
A	<1	<1	<1	<1
B	10	5	5	5
C	100	50	25	-
D	200	100	50	-

DOCUMENTATION & VALIDATION:

Bidder shall submit the following Qualification & Validation Documents:

1) Design Qualification
2) Installation Qualification
3) Operational Qualification
4) Performance qualification
5) Calibration test certificates.
6) Sets of Standard operating & maintenance procedures.
7) Required spare parts.

Validation:

The Plant & Clean room equipment as mentioned has to be validated for:
1) Velocity
2) Air volumes
3) Air Flow pattern
4) Particle count
5) PAO leak test
6) Duct leak test

As built
At Rest
At Dynamic condition As per the ISO 14644-1 Standards for One year.

TECHNICAL DATA TO BE FURNISHED BY BIDDER:

CONDENSER:

Manufacturer / Model No.	:
No. of passes (No.)	:
Pressure drop (Ft)	:
No. of condensers (each unit) (No.)	:
No of circuits	:

COOLING COILS

Manufacturer / Model No.	:
No. of water passes (No.):	:
Pressure Drop (Ft)	:
No. of circuits	:

GENERAL:

Over all Dimension (M)	:
Length (mm)	:
Width (mm)	:
Height (mm)	:
Operating Weight (Kg)	:
Service Clearance Required (mm)	:
Noise Level of one Machine (db)	:

PUMPS:(Primary Pumps)

Manufacturer	:
Model	:
Impeller dia (mm)	:
Capacity (USGPM)	:
Head (Mt)	:
Motor Speed (RPM)	:
Motor rating (HP)	:
Type and material of seal	:

DOUBLE SKIN AIR HANDLING UNITS(FLOOR MOUNTED):

Manufacturer	:
Type	:
Air Quantity	:
Capacity (TR)	:
Static Pressure	:
Operating weight (Kg)	:
Overall dimensions (mm)	:
Noise Level (db)	:
Material and thickness of casing (gauge)	:
Material and thickness of drain pan (gauge)	:
Manufacturer of coil	:
Type of coil	:
No. of rows (No.)	:
Water flow rate (USGPM)	:

Water pressure drop (Ft)	:	
Fan section manufacturer	:	
Type of fan	:	
Fan speed (RPM)	:	
Motor rating (HP)	:	
Type of air filters	:	
Size of air filter and Quantity	:	
Velocity at filter face (FPM)	:	
Pressure drop across filter (mm WG)	:	
Heaters capacity & number (KW/No.)	:	
Contractor rating (Amps)	:	
Humidification arrangement if provided (Yes/No)	:	
Spray water rate (USGPM)	:	
Rating of spray pump (kW)	:	
Number of nozzles (No.)	:	
Pressure drop across filter (mm WG)	:	

PIPING INSULATION

Manufacturer	:	
Materials	:	
Density	:	

INSULATION:		Ducting Lining	Acoustic Lining
Manufacturer	:		
Materials	:		
Density	:		

DAMPERS:	(Make, Material & Gauge)
Fire Dampers	:
Volume Control Dampers	:

GRILLES/DIFFUSERS:	(Make, Material & Gauge)
Louvers	:
Grill's	:
Diffusers	:

FILTERS	:	pre Filters	Fine Filters
Manufacturer & Model	:		
Air Quantity (CFM)	:		
Filter material	:		
Filter Area (Sq.Mt.)	:		
No. of pleats (No.)	:		
Flange material & thickness	:		
Filtration level	:		
Initial & Final pressure drop (mm)	:		
Filters dimensions	:		
Efficiency	:		

BASIS OF DESIGN SUPPORTING SYSTEMS

DESIGN, SUPPLY, INSTALLATION, TESTING, COMMISSIONING AND VALIDATION OF SUPPORTING SYSTEMS

Design, Supply, Installation, commissioning and Validation of the following process equipment to meet the production capacities. The design shall meet the cGMP, schedule M standard with ISI specification as applicable. The total requirements of equipment are shown in the General Layout drawing.

Bidder shall study the General layout drawing before submitting the bid

The supporting systems are as follows

WFI DISTRIBUTION, PURE STEAM DISTRIBUTION, CIP SYSTEM PIPING, DI WATER DISTRIBUTION.

Refer Annexure II - Utility Location point Layout

FUNCTIONAL REQUIREMENTS;

WFI DISTRIBUTION: No of user points - Estimated (See annexure drawing)

Piping and components:

All valves used on drain side piping are to be pneumatically controlled ball valves.
Flow control valve is to be manually operated diaphragm valve for feed water and needle valve type for cooling water.
WFI line is to be installed with isolation Diaphragm valve, normally kept fully open.
Pneumatically operated sanitary dumping valve is to be provided for dump impure quality of WFI.
All sensors are to be fitted with sanitary connections.
Automatic Orbital welding techniques are to be utilized for pipeline welding. Each piping section is to be individually pickled and passivized after welding. All inter connecting pipeline fittings are to be with sanitary fittings. The plant steam valves and fittings to be of standard quality
All gaskets in contacts with the feed water, pure steam or distillate are of Pharmaceutical grade PTFE, silicon / viton.

Piping System:

Pure steam and distillate	: AISI 316 L
Feed water	: AISI SS316
Plant steam	: MS

Loop system / distribution system

Water is continuously circulated and maintained at an elevated temperature to the user points and return to storage tank.
Zero dead legs valves to be maintained for all the points.
Slope to be maintained for entire system to the user points, etc.,

Material of construction:
For all the pipes, valves, bends, tanks, Fittings, Sampling point shall be made of SS 316L electro polished for generations and distribution. The welding of all pipe line joints shall be with ORBITAL welding. All welding joints shall be checked with 100% Boroscopy 30% Radiography. Before commissioning of plant passivation to be carried out for all the piping and its tanks etc,.
The pipe lines shall pass through the pendants for WFI, Compressed air etc.,
The total system shall be designed for steam sterilization at 121 deg C. All pressure gauges shall be made of SS 316 material with Triclover joints. Vent filters to be provided where ever necessary. The all pipe line joints shall be Triclover joints with silicone gaskets. The centrifugal pumps shall be sanitary type with mechanical seal and should with stand high temperatures 121 to 125 deg C.
All hot pipe lines should be insulated with SS cladding.
The velocity shall be maintained 1 to 2 meters per second at storage tank return loop and temperature above 80 deg.C.
The Isometric pipe line drawings shall be provided by the bidder with all necessary supports and clamps.

PURE STEAM DISTRIBUTION PIPING

USER POINTS FUNCTIONAL REQUIRMENTS:
The user points and sampling points shall be made of SS 316L electro polished. The welding of all pipe line joints shall be with ORBITAL welding. The joints shall be checked with 100% Boroscopy, 30% Radiography with 0 dead leg valves and all pipe lines should be passivized including the tanks. The pipe lines shall pass through the pendants at user points.
The pipe line joints shall be tri-clover joints. The pipe line shall have slope towards user points. The piping should be insulated and to be Cladding with SS. All Pipe lines from the generation plant through the distribution points up to the equipment shall be done by the bidder according to the approved drawing.

The Isometric pipe line drawing shall be provided by the bidder with all necessary supports and clamps.

Pure stream is required as the user points as per annexure II – Layout for OCV manufacturing facility (Utility location point layout).

COMPRESSED AIR DISTRIBUTION PIPING

SS304 piping shall be used for compressed air distribution.

Joints/ bends shall be done using orbital welding machine.
Boroscopy for at least 10% of the joints shall be done and documented by the vendor

The user points are as per annexure BOQ.

DOCUMENTATON & VALIDATION:
Bidder shall submit the following Qualification & Validation Documents for all above equipment.

1) Design Qualification
2) Installation Qualification
3) Operational Qualification
4) Performance qualification
5) Calibration test certificates.
6) Sets of standard operating & maintenances procedures.
7) Required spare parts.
8) Factory Acceptance tests all equipment.

PIPING & SUPPORTING STRUCTURE:

Design, supply, installation, commissioning and validation of Piping and Supporting structure as mentioned below:
The following services are required from the mezzanine floor to main production building.

1	Plant steam piping including insulation	-	IBR seamless pipes and fittings
2	Soft water piping	-	B class GI pipe &fittings
3	Cooling water piping supply & return	-	B class GI pipe& fittings and for process use from the main ring SS 316
4	Chilled water piping supply & return	-	ERW ‘C’ class MS pipes& fittings
5	Compressed air supply pipe line	-	Up to filters MS ‘C’ class seamless pipes and after Filters SS 316
6	Potable water pipe line	-	GI ‘B’ Class pipe and fittings
7	Waste water pipe line to kill tanks	-	MS ‘C’ Class pipes & fittings
8	LT cables from the PCC panel to MCC panels which shall be kept on mezzanine floor of main production block.		

Note:
For all above pipe lines the bidder shall prepare common supporting structure drawings with all necessary hard ware with pipe color code as per ISI specification along with technical bid.
The drawings shall be prepared by bidder.

B. PRE FABRICATED MODULAR PANELS FOR CLEAN ROOM FACILITY

Design, Supply, Installation & Validation of the following items to meet Class B, C, D & GENERAL AREA specifications & factory made drawings to be provided by the bidder

1 BASIS OF DESIGN:

1.1 FUNCTIONAL REQUIRMENT:

A Bacterial Vaccine manufacturing Facility at BIBCOL is being created to meet the WHO cGMP & Schedule M standards.
To meet the standards it is proposed to install Pre-Fabricated Modular Partitions, Ceiling, Coving, Flushed Doors, View Panels, Flooring - Epoxy & PVC as per the classification of the rooms.
The Floor is to be made of IPS flooring with top layer as self leveling Epoxy.
The Internal Lighting Fixtures, Sockets, Return risers & Filter Modules Grill should be flushed with the Ceiling & Wall partitions as per cGMP & Schedule M standards.

CGMP standards:
The Following points to be followed during progress of work by contractor.

a. Walls, floors and ceiling should be impervious, Non shedding, Non-Flaking and Non Cracking, Flooring should be unbroken and provided with a cove both at the junction between the wall and the floor as wall and the ceiling. Wall & ceiling should have smooth& polish finish and

b. Walls shall be flat, and ledges and recesses shall be avoided. Wherever other surface joins the wall (E.g. sterilizers, electrical sockets, gas points etc.,). These shall flush the walls. Walls shall be provided with a cove at the joint between the ceiling and floor.

c. Ceiling shall be solid and joints shall be sealed. Light fittings and air grills shall be flush with the walls and not hanging from the ceiling, so as to prevent contamination.

d. There shall be no sinks and drains in Grade A & B areas.

e. Doors shall be made of non shedding material. These may be made preferably of aluminium or steel material. Doors shall open towards the higher pressure area so that they close automatically due to air pressures.

f. Windows shall be made of similar material as the doors, preferably with double panel and shall flush with walls. If fire escapes are to be provided, these shall be suitable fastened to the walls without any gaps.

Fabrication, Supply, Installation & Validation of following items:

WALL PANELS:

Supply & fixing of Modular **Wall panels** of powder coated GSS sheet of 0.8 mm thick on both side, bonded to PUF of density 44-40 kg/m3 in between both the sheets Sealing the edges with RTV sealant . Electrical conduit to be provide to run cables and after completing fixing of the cables panel area to be sealed with Silicon sealant. And extra panels required for taking return ducts to be considered in the panel area.

RETURN RISERS:
Return raisers to be provided inside the panel.

DOORS
Doors shall be made of non shedding material. These may be made preferably of aluminium or steel material. Doors shall open towards the higher pressure area so that they close automatically due to air pressures.

Metal swing type 50 mm thick door leaves and frame should be flushed with wall panels and door leaves filled with paper honeycomb material, vision float glass 5 mm thick having minimum size of 300mm X 600mm with matching clean room door PU paint with panels.
SS Handles, door closures, SS hinges &locks, Kick plates, 100% air tight arrangement to be provided.
Quantity should be as per the drawing.

Coving
Extruded Aluminium powder coated coving connecting Wall to floor, all Corners and wall to ceiling Including corner bush. R70 or equivalent

Flooring
Self level Epoxy flooring of 3 mm thick on IPS flooring after chemical etching and grinding should have mirror finish for all areas.

VIEW PANELS:
Windows shall be made of similar material as the doors, preferably with double panel and shall flush with walls. If fire escapes are to be provided, these shall be suitable fastened to the walls without any gaps.
Double glazed view panels of size 1000 mm x 1000 mm in the wall partitions with 5 mm thick float glass on both sides fully glued fit along with desiccant adhesives to avoid condensate. Frame to be flushed with walls.

TUBE LIGHT FIXTURES
Clean room compatible air tight light fixtures of top access made of GI suitable to fix in the RCC Slab. 2 X36 W luminaries, electronic chokes, glass/vinyl including wiring. Switches of ANCHOR, ROMA make with SS plates and same to be flushed with walls / Partitions. All the cable connections should be sealed with silicon sealant & labeled with ferule.

Factory/site made cutouts for All the Required Equipment (Pass box etc), Electrical Fixtures as per the drawing to be provided.

STERILE DRAINS:
It is necessary to use sterile drains in Class C/D areas for Waste water Flow. Necessary Sterile drains to be used as Air Break.

DOCUMENTATION & VALIDATION:

Contractor would be required to submit the following Qualification& Validation Documentation:

1) Design Qualification
2) Installation Qualification
3) Operational Qualification
4) Performance qualification
5) Calibration test certificates.
6) Sets of Standard operating & maintenance procedures.
7) Required spare parts.
8) Validation.

C. CLEAN ROOM EQUIPMENT

Design, supply, Installation & validation of the Clean room Equipment to meet specifications & factory made drawings to be provided.

1 BASIS OF DESIGN:

1.1 FUNCTIONAL REQUIRMENT:

Dynamic pass box

The Pass boxes would be required to transfer the material from one classification of the room to the higher classification rooms to reduce man movement. This is made of double skin SS 316 material with mirror finish sandwiched with PUF . Double Door Completely Automatic DC solenoid valves interlocking facility should be provided. And lighting shall be with Fluorescent lamp & UV lamp should be provided. And there should be any gaps between hinges and doors& Doors and frames. With built-in HEPA air barrier and magnahelic gauges to be provided. To meet Class 100 specifications.

Ceiling suspended LAF

Ceiling suspended LAF is required above filling machines to maintain Class A conditions. The material of construction should be SS 316 material with mirror finish .All the sides should be covered with PVC curtain. Lighting in the working area should be with Fluorescent lamp. Magnahellic gauges to be provided. And the Required HEPA filters, Prefilters, Blowers& Motors to be provided and should meet Class 100 classification.

Sterile Garment cubicle

Sterile Garment cubicle is required to keep sterile dresses under dynamic conditions. And material of construction should be of SS316 with Class 100 and can keep maximum 15 clean room garments, sliding doors, glazing , UV light, pre filter, HEPA filter and blower for recirculation of air, complete ready to use.

Sampling /Dispensing Booth

Sampling/Dispense Booth is required to dispense bulk raw material in clean room to avoid contamination and to operator safety. And should be made of SS316 material and should be of mirror finish. For raw material testing of size 6'X4' of SS make. The box shall have internal finishing with smooth curved surface with working table of 2'X2'. Magnahellic gauges to be provided.

DOCUMENTATION & VALIDATION:

Bidder shall submit the following Qualification & Validation Documents:

1) Design Qualification
2) Installation Qualification
3) Operational Qualification
4) Performance qualification
5) Calibration test certificates.
6) Sets of Standard operating & maintenance procedures.
7) Required spare parts.

Validation: The Plant & Clean room equipments as mentioned has to be validated For

1) Velocity
2) Air Flow pattern
3) Particle count
4) PAO leak test

D. Bill of Quantity (BOQ) – (see annexure – I)

E. Layouts for OCV manufacturing facility – (see annexure – II)

F. Room data sheet – (see annexure – III)

1.3 Estimated budget for Part A1 & Part A2

Part A1

Estimated budget estimate for the identified scope of work in:

INR: 1100000/- (Eleven lakhs only)
(Above budget estimate is excluding GST)

Part A2

Estimated budget estimate for the identified scope of work in:

INR: 4,93,00,000 (Four crore ninety three lakhs only)
(Above budget estimate is excluding GST)

Estimated budget estimate for Part A1 + Part A2 :

INR: 5,04,00,000 (Five crore four lakhs only)
(Above budget estimate is excluding GST)

ANNEXURE Form for Technical Bid Submittal

General Submittals

The vendor must provide the following details, along with any other documents considered relevant to the proposal, with the cover letter of the bid:

S.no.	Details	Remarks (Yes/No)
1.	Audited financial statements of the balance sheet, profit/loss account for previous three financial years (2016-17, 2017-18 and 2018-19) duly attested by Chartered Accountant.	
2.	Latest Income Tax Clearance Certificate	
3.	A client list along with the contact details for the successfully completed projects as well as any project(s) being done presently.	
4.	Experience certificate/ work order /completion report in support of satisfaction of eligibility criterion, along with client references (contact person and address, email/ contact number)	
5.	List of the following personnel in support of satisfaction of eligibility criterion, including the Designation, Name of the Person and Total Years of Experience at the current firm: • Head, Execution • Head, Design -Technical • Project manager -Technical • Manager, Quality • Project Engineers - Execution • Safety Engineer • Site Supervisor & Technicians • Validation Engineers • Documentation Engineer • Service Engineer	
6.	Details of sub-contractors/service providers, if any, as mentioned in Sections above	

Technical Submittals

The vendor must provide the following documents/drawings/information along with the technical bid:

S.no.	Details	Remarks (Yes/No)
1.	Cleanroom material specifications, e.g. filters, flooring, panels, ceiling grids etc.	
2.	Process and allied Equipment specifications	
3.	An item-wise compliance statement indicating clearly any deviations against specifications, make etc.	
4.	Copy of Un-Priced commercial bid.	
5.	PERT chart.	

*Other Technical Submittals**:***

The bidders shall furnish two (2) copies of the proposal containing following documents/drawings/information along with the Technical bid and any other information as required in the Tender document or any other Document/information considered relevant to this project by the Contractor/vendor, but not limited to, the following information:

S.no.	Details	Remarks (Yes/No)
1.	Schematic drawings showing installation arrangement(s), Construction details, interconnections, material of construction for all systems/items covered under the tender.	
2.	Cleanroom material specifications of critical Components like FFUs, perforated access flooring, Wall panels, doors, Ceiling grid, ceiling panels, tear drop light fixtures, accessories etc.	
3.	Power Requirements of the Proposal.	
4.	Technical write up on installation / erection / commissioning	

S.no.	Details	Remarks (Yes/No)
	procedures, quality check procedures etc.	
5.	Project schedule incorporating PERT & CPM Chart clearly indicating the sequence of different activities in conjunction with time of the Activity.	
6.	An item wise compliance statement indicating clearly any deviations against specifications & makes etc. mentioned in the tender.	
7.	Any other technical detail needed for evaluation of the bid.	

Annexures

Annexure

Annexure I : Bill of Quantity (BOQ)

S.no.	Details
PART A1 :	Civil structure wall demolition, rubble clearance, wall/column finishing, floor finishing and kota stone laying
1	Chapter- 1: BOQ – Civil work
PART A2 :	HVAC, Modular Panels, Clean room equipment, BMS, Cold rooms and ancillaries
2	Chapter-1: Project Summary
3	Chapter-2: Cleanroom modular partition panel
4	Chapter-3: Flooring
5	Chapter-4: Cleanroom equipment
6	Chapter-5: Heat Ventilation & Air Conditioning System HVAC
7	Chapter-6: Electrical lighting fixture
8	Chapter-7: Electrification of MV system
9	Chapter-8: Electrification of LV system
10	Chapter-9: Building Management System (BMS)
11	Chapter-10: Process Drain System
12	Chapter-11: Di-Ionized Water Distribution
13	Chapter-12: Water for Injection Distribution
14	Chapter-13: Compressed Air System
15	Chapter-14: Plant Steam Distribution
16	Chapter-15: Pure Steam Distribution
17	Chapter-16: Soft Water Distribution
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Annexure II : Layouts for OCV manufacturing facility

S.no.	Details
1	Basic Layout
2	Area Classification Zoning Layout
3	AHU Zoning Layout
4	Pressure Zoning Layout
5	Product Flow (DS) Layout
6	Product Flow (DP) Layout
7	Man Flow Layout
8	Clean Material Flow Layout
9	Sterile Material Flow Layout
10	Washing Material Flow Layout
11	Waste Material Flow Layout
12	Clean Garment Flow Layout
13	Dirty Garment Flow Layout
14	Clean Room Equipment Layout
15	Drain Location Layout
16	Utility Location point Layout

Annexure III : Room Data Sheet

1	Room Data sheet for OCV Manufacturing facility

Annexure IV : List of preferred vendor

1	List of preferred vendor / suppliers

Annexure I : Bill of Quantity (BOQ)

PART A1 : Civil structure wall demolition, rubble clearance, wall/column finishing, floor finishing and kota stone laying

CHAPTER-1: BOQ – CIVIL WORK

S.NO.	DESCRIPTION	UNIT	QUANTITY	SUPPLY UNIT RATE (INR)	SUPPLY AMOUNT (INR)	INST. UNIT RATE (INR)	INST. AMOUNT (INR)
1	Area estimated for internal walls to be demolished	sq.ft	8905				
2	Additional walls apart from internal walls	sq.ft	410				
	Thickness of walls to be demolished (12 inches)						
	Internal room height from floor to ceiling (10.5 ft)						
3	No of trolley trips expected for transport of rubble from demolition site to dumping site	trips	90				
4	Area estimated for finishing of production floor with Cement concrete flooring 1:2:4 (1 cement: 2 Coarse sand: 4 graded stone aggregate) finished with a floating coat of neat cement including cement slurry.	sqm	600				
5	Area estimated for finishing of mezzanine floor with Cement concrete flooring 1:2:4 (1 cement: 2 Coarse sand: 4 graded stone aggregate) finished with a floating coat of neat cement including cement slurry.	sqm	540				
6	Coving estimated in running ft Wall to Wall and Wall to slab / beam Covings is 75 mm x 75 mm radial Coving with cement plaster.	ft	150				
7	Estimated no of man-days for labor	days	60				
8	Area estimated for plaster repairing of roof, pillars/columns	sqm	650				
9	Area estimated for kota stone laying on mezzanine floor	sqm	540				

PART A2 : HVAC, Modular Panels, Clean room equipment, BMS, Cold rooms and ancillaries

CHAPTER-1: PROJECT SUMMARY

S.NO	DESCRIPTION	SUPPLY AMOUNT	INSTAL. AMOUNT	TOTAL AMOUNT
1	MODULAR PARTITION PANEL			
2	FLOORING			
3	CLEANROOM EQUIPMENTS			
4	HEAT VENTILATION & AIR CONDITIONING SYSTEM			
5	ELECTRICAL LIGHTING FIXTURE			
6	ELECTRIFICATION OF MV SYSTEM			
7	ELECTRIFICATION OF LV SYSTEM			
8	BUILDING MANAGEMENT SYSTEM (BMS)			
9	PROCESS DRAIN SYSTEM			
10	DE-IONIZED WATER DISTRIBUTION			
11	WATER FOR INJECTION DISTRIBUTION			
12	COMPRESSED AIR DISTRIBUTION			
13	PLANT STEAM DISTRIBUTION			
14	PURE STEAM DISTRIBUTION			
15	SOFT WATER DISTRIBUTION			
16	COLD WATER DISTRIBUTION			
17	COLD ROOM			
	GRAND TOTAL IN INR	**0**		

CHAPTER-2: CLEANROOM MODULAR PARTITION PANEL

S.NO.	DESCRIPTION	UNIT	QUANTITY	SUPPLY UNIT RATE (INR)	SUPPLY AMOUNT (INR)	INST. UNIT RATE (INR)	INST. AMOUNT (INR)
1	**MODULAR WALL PARTITIONS**						
A	**PPGI/PPGI**						
	Standard wall partitions are a composite construction of two skins of **PPGI/PPGI** over an frame work with a sealed and insulated interior. Standard panel dimensions are 1200x2500mm. Standard panels have an overall thickness of 50 / 80 / 100 mm. Additional wall heights can be achieved using a stacking technique. The self supporting internal walls are constructed with an interior frame work. Partition to Partition connections are maintained with precision with profiles that create uniform seams. The Partition seams are sealed by silicone with a perfectly flush finishing. puf insulation material is sandwiched between the two skin layers and sealed from the exterior by the frame work.						
	Self supporting wall provided in modular units consisting of external skin in **PPGI/ PPGI** which will be **0.6mm** thick ,with protective film to prevent surface damage during shipping and installation.						
1.1	**Panel Thickness: 80mm**	**Sq. Mt.**	**1247**				
1.2	**Panel Thickness: 30mm**	**Sq. Mt.**	**426**				
	Movable wall includes:						
	a) **PUF** insulation 40 Kg/m^3						
	GI frame work, Silicon sealant (Clear, White, Winsil Gray) & Bottom Track						
2	**MODULAR FALSE CEILING**						
A	**PPGI/PPGI**						
	False ceiling panels are designed to fit within each other and suspended by threaded tension bars with adjustable turnbuckles fastened to the overhead support at fixed intervals , Standard Ceiling Panels are 50 mm thick and have a composit construction of two skins of **PPGI / PPGI** over an frame work with a sealed and insulated interior.						
	Type :- Walkable (Load 150Kg/m^2)						
2.1	**Panel Thickness: 50mm**	**Sq. Mt.**	**595**				
	Ceiling includes						
	a) **PUF** insulation 40 Kg/m^3						
	b) Sheet Thickness **0.6mm**						
	GI frame work						
	Special load bearing Aluminium connecting profile between ceiling panels at provide the precision 3-4 mm seal gap to bottom and inbuilt hanging arrangement at top.						

S.NO.	DESCRIPTION	UNIT	QUANTITY	SUPPLY UNIT RATE (INR)	SUPPLY AMOUNT (INR)	INST. UNIT RATE (INR)	INST. AMOUNT (INR)
	Silicon sealant(Clear, White, Winsil Gray)						
3	**COVINGS & CORNERS**						
3.1	Extruded Aluminium Powder Coated/ Anodised clip on type covings for panel to panel connections.	**R. Mt.**	**1582**				
3.2	3D Corners	**Nos.**	**308**				
3.3	2D Corners for 80mm panel	**Nos.**	**58**				
3.4	Wall Corners for 80mm panel	**R. Mt.**	**175**				
4	**CLEAN ROOM DOORS**						
A	**PCGI/PCGI**						
	Doors are designed to fit flush into wall panel system on both sides and are supplied in different dimensions. Doors are fabricated from galvanised iron sheets duly powder coated. Shutter has sheet thickness of 0.8 mm and the frame of 1.2 mm. Standard 50 mm panel has frame width of 50 mm and shutter thickness of 46 mm. Doors available in various sizes as per the requirement of the client. The following accessories are a part of the door.						
a)	Shutter Thickness: 46mm						
b)	Stainless steel hinges						
c)	Stainless steel 'D' type of handles on pull & push side						
d)	standard arm door closure						
e)	View glass along with self adhesive tape and silicon sealant						
f)	Filler material **PUF/HONEYCOMB**						
g)	Both side operating locking arrangement						
h)	Automatic door bottom seal at the bottom						
i)	Stainless steel kick plates						
j)	Tower bolt for Double door						
k)	Panic bar for Emergency door						
	Sizes						
4.1	**750 mm X 2100 mm**	**Nos.**	**49**				
4.2	**900 mm X 2100 mm**	**Nos.**	**21**				
4.4	**1200 mm X 2100 mm**	**Nos.**	**2**				
4.4	**1200 mm X 2100 mm (Emergency Doors)**	**Nos.**	**5**				
5	**VIEW GLASS**						
	Flush view/ Glazing panels on wall designed to fit flush into wall panel with 6 mm thick Toughned glasses						
5.1	**Size: 900 mm X 1000 mm**	**Nos.**	**50**				
6	**RETURN AIR RISER**		**.**				

S.NO.	DESCRIPTION	UNIT	QUANTITY	SUPPLY UNIT RATE (INR)	SUPPLY AMOUNT (INR)	INST. UNIT RATE (INR)	INST. AMOUNT (INR)
6.1	**Inbuilt Return air Risers** made of G.I. sheet in 80 mm thick wall panels with coving and 150 mm projection at the top of the ceiling with necessary flanges to connect to HVAC duct. Riser includes Damper, SS perforated Grill & Filters(for Critical areas)	**Sq. Mt.**	**300**				
7	**CUTOUT IN PANELS**						
7.1	Cutout in panel for Switch box, Air Terminals, Pass box, Light fixture	**Nos.**	**300**				
8	**MISCELLANEOUS ITEMS**						
8.1	Conduit 25mm	**Nos.**	**250**				
8.2	Fire Extinguisher Cabinet (suitable for 4.5 Kg DCP type Fire Extinguisher) on parttion wall with SS304 Door, Hinges, Lock & Flush Glass	**Nos.**	**6**				

CHAPTER-3: FLOORING

S.NO.	DESCRIPTION	UNIT	QUANTITY	SUPPLY UNIT RATE (INR)	SUPPLY AMOUNT (INR)	INST. UNIT RATE (INR)	INST. AMOUNT (INR)
1	**EPOXY FLOORING**						
1	**EPOXYFLOORING:- 2 mm SCREED + 1 mm THICK FLOOR**	**Sq. Mt.**	**575**				
	Preparing the surface by grinding/ scarification. Laying 2 mm Screed as applicable, all the feather points shall be properly anchored. Further as per the shades approved. The total Thickness of Floor shall be 3 mm.						
2	**EPOXY COVINGS: 75 mm x 75 mm**	**R. Mt.**	**760**				
	They are readily adaptable to the 90 junctions Wall - Floor.They are constructed with solvent less epoxy incorporating very high abrasion resistant aggregates. They are merged with wall leveling on one end & floor on the other.						

CHAPTER-4: CLEANROOM EQUIPMENTS

S.NO.	DESCRIPTION	UNIT	QUANTITY	SUPPLY UNIT RATE (INR)	SUPPLY AMOUNT (INR)	INST. UNIT RATE (INR)	INST. AMOUNT (INR)
1	**DYNAMIC PASSBOX**						
	Basic Data						
	Model : Dynamic Pass Box						
	Material of Construction : SS 304 (1 mm Thick)						
	Finish : Matt Finish						
	Blower / Fan						
	Type : AC Centrifugal, Backward curve						
	Casing MOC : Aluminium						
	Filters						
	Minipleat HEPA Filters						
	Grade : EU-13						
	Type : Gasket Type/Box Type						
	Efficiency : 99.997% down to 0.3 Micron						
	Pre-Filters						
	Grade : EU-5						
	Type : Flange Type						
	Efficiency: 95% down to 5 Micron						
	Fresh Air Filter						
	Grade : EU-5						
	Type : Box Type						
	Efficiency : 95% down to 5 Micron						
	Instrumentation						
	Differential Pressure Gauge Range : 0-25mm of Wg : Pressure Gauge Across Supply HEPA Filter						
	Mechanical						
	DOP / PAO Test Port : SS 304						
	Magnehelic Pressure Port : SS 304						

S.NO.	DESCRIPTION	UNIT	QUANTITY	SUPPLY UNIT RATE (INR)	SUPPLY AMOUNT (INR)	INST. UNIT RATE (INR)	INST. AMOUNT (INR)
	Door Handle: SS 304						
	Door Drop Down Seal : With Rubber Seal						
	View Glass: 5mm Thick						
	Electrical						
	Motor Status Indication: Green						
	Push Button with Indicator: At both side door						
	U.V Light: 1 No.						
	Utilities Required						
	Electrical Power Consumption: @ 230 V X 50Hz						
1.1	**1000 mm X 1000 mm X 1000 mm (ID)**	**NO.**	**12**				
2	**STATIC PASS BOX**						
	Basic Data						
	Model : Static Pass Box						
	Material of Construction : SS 304 (1 mm Thick)						
	Finish : Matt Finish						
	Mechanical						
	Door Handle: SS 304						
	View Glass: 4mm Thick						
	Electrical						
	Push Button with Indicator : At both side door on Display						
	Electromagnetic Interlocking : At both side door						
	U.V Light: 1 No.						
	Hour Meter : On Display						
	Utilities Required						
	Electrical Power Consumption: @ 230 V X 50Hz						
2.1	**600 mm X 600 mm X 600 mm (ID)**	**NO.**	**1**				
3	**DISPENSING BOOTH**						
	Purpose & Function						

S.NO.	DESCRIPTION	UNIT	QUANTITY	SUPPLY UNIT RATE (INR)	SUPPLY AMOUNT (INR)	INST. UNIT RATE (INR)	INST. AMOUNT (INR)
	The equipment is meant to provide a laminar Air Flow over the work level with ISO-5 (Class100) conditions						
	Velocity 90±20 FPM						
	Noise Level Less than 65 dB at 1 Mtr. from Equipment						
	Main Equipment						
	Material of Construction : SS 304 (1mm thick)						
	Finish : Matt						
	HEPA Filter						
	Grade EU-13						
	Minipleat, Gasket Type						
	Efficiency 99.997% down to 0.3 Micron						
	Pre Filter						
	Grade EU-5						
	Flange type						
	Efficiency 95% down to 5 Micron						
	Intermediate Filter						
	Grade EU-7						
	Flange type						
	Efficiency 97% down to 3 Micron						
	Bleed air Filter						
	Grade EU-13						
	Minipleat, Gasket Type						
	Efficiency 99.997% down to 0.3 Micron						
	Motor & Blower						
	Type AC Centrifugal, Backward curve						
	Casing MOC Aluminum						
	Instrumentation						

S.NO.	DESCRIPTION	UNIT	QUANTITY	SUPPLY UNIT RATE (INR)	SUPPLY AMOUNT (INR)	INST. UNIT RATE (INR)	INST. AMOUNT (INR)
	Differential Pressure Gauge , Range : 0-25 of Wg - Pressure Gauge Across Supply HEPA Filter, Range : 0-10 of Wg - Pressure Gauge Across Intermediate Pre Filter						
	Mechanical						
	DOP Port S S 304						
	Electrical						
	Fluorescent Light						
	Switches & Speed Controller						
	Socket with Switch 5/15 Amps Socket for External Equipment						
	Utilities Required						
	Electrical Power Consumption: @ 230 V X 50Hz						
3.1	**1200 mm X 900 mm x 2400mm (OD)**	**NO.**	**1**				
4	**VERTICAL LAMINAR AIR FLOW - CEILING SUSPENDED**						
	Purpose & Function						
	ISO 5 (Class 100), As per ISO 14644-1 Guidelines						
	Velocity 90±20 FPM						
	Noise Level Less than 65 dB at 1 Mtr. from Equipment						
	Main Equipment						
	Material of Construction : SS 304 (1mm thick)						
	Finish : Matt						
	HEPA Filter						
	Grade EU-13						
	Minipleat, Gasket Type						
	Efficiency 99.997% down to 0.3 Micron						
	Pre Filter						
	Grade EU-5						
	Flange type						
	Efficiency 95% down to 5 Micron						

S.NO.	DESCRIPTION	UNIT	QUANTITY	SUPPLY UNIT RATE (INR)	SUPPLY AMOUNT (INR)	INST. UNIT RATE (INR)	INST. AMOUNT (INR)
	Motor & Blower						
	Type AC Centrifugal, Backward curve						
	Casing MOC Aluminum						
	Instrumentation						
	Differential Pressure Gauge , Range : 0-25 of Wg - Pressure Gauge Across Supply HEPA Filter						
	Mechanical						
	DOP/PAO Port S S 304						
	Magnehelic Pressure Port SS 304						
	Electrical						
	Main Switch Board- 1 No.						
	Power Supply Socket - 1 No.						
	White Light - 1 No.						
	Utilities Required						
	Electrical Power Consumption: @ 230 V X 50Hz						
4.1	**3250 mm X 2100 mm X 600mm (OD)**	**NO.**	**1**				
4.2	**2700 mm X 2100 mm X 600mm (OD)**	**NO.**	**1**				
4.3	**1500 mm X 1000 mm X 600mm (OD)**	**NO.**	**1**				
4.4	**2100 mm X 950 mm X 600mm (OD)**	**NO.**	**1**				
5	**STERILE GARMENT CABINET**						
	Purpose & Function						
	ISO 5 (Class 100), As per ISO 14644-1 Guidelines						
	Velocity 90±20 FPM						
	Noise Level Less than 68±3 dBs on A scale						
	Technical details						
	MOC: 19 Gauge, Full Stainless Steel Mat Finishing (SS 304)						
	Finish : MATT						
	Internal Dimensions : 750mm W x 600mm D x 1750mm H						
	Overall Dimensions : 850mm W x 620mm D x 2215mm H						
	Fresh Air Filter-EU 7 Grade (Efficiency 97 % Down to 3 Micron)						
	Pre Filter - EU-5 rating (Efficiency 95 % Down to 5 Micron)						

S.NO.	DESCRIPTION	UNIT	QUANTITY	SUPPLY UNIT RATE (INR)	SUPPLY AMOUNT (INR)	INST. UNIT RATE (INR)	INST. AMOUNT (INR)
	Minipleat HEPA Filter - Efficiency of 99.999% up to H 14 down to 0.3Micron						
	Magnehelic gauge -0.25mmWC						
	Air blower - Centrifugal Backward Curved Motor Blower						
	LED Panel with Diffuser						
	UV light						
	Door interlocking, IR lamp, Hour metre on Both sides						
	Sandwiched type Double Skin View Panel Door, SS Handles & Proper Gasketing.						
	Leveling legs						
	Electrical Power : @ 230 V X 50Hz						
5.1	**850 mm X 650 mm 2200 mm (OD)**	**NO.**	**1**				

CHAPTER-5: HVAC

S.NO.	DESCRIPTION	QUANTITY	UNIT	SUPPLY UNIT RATE (INR)	SUPPLY AMOUNT (INR)	INST. UNIT RATE (INR)	INST. AMOUNT (INR)
A	**AIR HANDLING SYSTEM**						
1	**AIR HANDLING UNIT**						
	Sheet metal sectionalised cabinet type Air Handling unit in Double skin construction fabricated from Al extruded section frame structure.						
	The inner skin is of 0.6mm & outer skin of pre-cotaed 0.6mm GI constrution with 43 ± 2 mm thick PUF insulation of density 38kg/cm³ panel complete with following sections.						
	Mixing Chamber with Return Air / Fresh Air dampers in Aluminium /GI construction						
	Prefilter section with Pre filter of Grade E-4 (10 Micron)						
	Fresh air filter of Grade E-4 (10 Micron)						
	Coil section with Chill water Cooling coil						
	Steam Coil section for RH control						
	Blower (DIDW BACKWARD CURVED FAN) for 125 mmwc Static Pressure, section with Blower and motor, both Motor and Blower are mounted on common base frame						
	Purge air filter of Grade E-4 (10 Micron)						
	Fine Filter section with Grade E-7 (3 Micron) Filter						
	sandwich type insulated drain pan ,drain pan should be 18 G SS construction						
	There should be access door across every section of AHU						
	Necessary openings for electrical connections						
	Port for magnahelic gauges across filters						
	Vibration Rubber pads for Mounting						

	AHU.NO	CLASS	COOLING CAPACITY (TR)	AIRFLOW (CFM)	HEATING (KW)	STATIC PRESSURE (MM)						
	AHU-1	CLASS B	11.0	7000	3.9	150	1	NO.				
	AHU-2	CLASS C	5.5	3500	1.4	135	1	NO.				
	AHU-3	CLASS C	5.5	3500	1.7	135	1	NO.				
	AHU-4	CLASS C	5.5	2500	1.1	135	1	NO.				
	AHU-5	CLASS C	14.0	8000	5.7	135	1	NO.				

S.NO.	DESCRIPTION						QUANTITY	UNIT	SUPPLY UNIT RATE (INR)	SUPPLY AMOUNT (INR)	INST. UNIT RATE (INR)	INST. AMOUNT (INR)
	AHU-6	CLASS D	8.5	3500	2.8	125	1	NO.				
	AHU-7	CLASS D	8.5	4500	4.3	125	1	NO.				
2	**FORCED DRAFT VENTILATION UNIT (SUPPLY)**											
	Sheet metal sectionalised cabinet type FDV unit in Double skin construction fabricated from Al extruded section frame structure.											
	The inner skin is of 0.6mm & outer skin pre-cotaed 0.6mm GI constrution with 25 ± 2 mm thick PUF insulation of density 38kg/cm³ panel complete with following section.											
	Prefilter section with Pre filter of Grade G-4 (10 Micron)											
	Blower (DIDW FORWARD CURVED FAN) section with motor ,both Motor and Blower are mounted on common base frame											
	Fine Filter section with Grade E-5 (5 Micron) Filter											
	Blower section length should be as per standared dimension of the blower required to install the blower in housing.											
	There should be access door across every section of FDV											
	Necessary openings for electrical connections											
	Port for magnahelic guage across the filters											
	Vibration Rubber pads for Mounting											
	FDV.NO	**CLASS**	**COOLING CAPACITY (TR)**	**AIRFLOW (CFM)**	**HEATING (KW)**	**STATIC PRESSURE (MM)**						
	FDV-01-S	UNC	NA	9500	NA	50	1	NO.				
3	**FORCED DRAFT VENTILATION UNIT (EXHAUST)**											
	Sheet metal sectionalised cabinet type FDV unit in Double skin construction fabricated from Al extruded section frame structure.											
	The inner skin is of 0.6mm & outer skin pre-cotaed 0.6mm GI constrution with 25 ± 2 mm thick PUF insulation of density 38kg/cm³ panel complete with following section.											
	Prefilter section with Pre filter of Grade G-4 (10 Micron)											
	Blower (DIDW FORWARD CURVED FAN) section with motor ,both Motor and Blower are mounted on common base frame											
	Blower section length should be as per standared dimension of the blower required to install the blower in housing.											
	There should be access door across every section of FDV											

S.NO.	DESCRIPTION						QUANTITY	UNIT	SUPPLY UNIT RATE (INR)	SUPPLY AMOUNT (INR)	INST. UNIT RATE (INR)	INST. AMOUNT (INR)
	Necessary openings for electrical connections											
	Port for magnahelic guage across the filters											
	Vibration Rubber pads for Mounting											
	FDV.NO	**CLASS**	**COOLING CAPACITY (TR)**	**AIRFLOW (CFM)**	**HEATING (KW)**	**STATIC PRESSURE (MM)**						
	FDV-01-E	UNC	NA	9500	NA	40	1	NO.				
B	**PIPINGS & VALVES**											
1	**AHU MANIFOLD (CHILLED WATER)**											
	Chilled water Manifold with piping of M.S. Class `C' pipe complete with fittings like Valves (5no Butterfly Valve for 50mm Dia & Above / 5 no ball Valve below 50mm Dia) , Y-Strainer, (2 No. Pressure Gauges with isolation ball valve ,100mm Dial Size & 2 no. Temperature Gauges 100 mm dial size with Thermowell etc as required), Automatic Air Purge Valve 1 no, 20mm Dia Drain Valve, elbows, tees, reducers,Flanges Gasket, Nut-Bolts etc. Insulated with Aluminum foil faced closed cell fire rated (FM Approved) Nitrile Rubber insulation of suitable density (40-60kg/m3), Class O insulation of 25mm Thick. All joints and corners should be finished with 50mm wide cross linked Oven type aluminim self adhesive Tape. The adhesive cost and Taping cost should be inclusive in the insulation rate. 3-Way Motorized Modulating (compatable for BMS operation) Control Valve with actuator operating voltage 24V AC & feed back signal output & Balancing Valve etc. as required											
	40NB						3	NO.				
	50NB						3	NO.				
	65NB						1	NO.				
2	**STEAM MANIFOLD (Boiler Steam)**											
	Steam Manifold with piping of M.S. Class `C' pipe complete with fittings like Valves 8no. Globe Valve of 25mmDia , 1 No. Pressure Gauges with isolation ball valve ,100mm Dial Size & 1 no. Temperature Gauges 100 mm dial size with Thermowell etc as required, 25mm PID Valve with actuator 1 no, Float steam trap15mm, elbows, tees, reducers,Flanges Gasket, Nut-Bolts etc. Insulated with Aluminum cladded Rockwool insulation of suitable density (95kg/m3) of 25mm Thick.											

S.NO.	DESCRIPTION	QUANTITY	UNIT	SUPPLY UNIT RATE (INR)	SUPPLY AMOUNT (INR)	INST. UNIT RATE (INR)	INST. AMOUNT (INR)
	15NB	7	NO.				
3	**PIPINGS & FITTINGS**						
3.1	**Chilled water piping** of M.S. Class `C' pipe complete with fittings like elbows, tees, reducers,Flanges Gasket, Nut-Bolts etc. Insulated with Aluminum foil faced closed cell fire rated (FM Approved) Nitrile Rubber insulation of suitable density (40-60kg/m3), Class O insulation of 25mm Thick. All joints and corners should be finished with 50mm wide cross linked Oven type aluminim self adhesive Tape. The adhesive cost and Taping cost should be inclusive in the insulation rate.						
	40NB	30	RMT				
	50NB	30	RMT				
	65NB	12	RMT				
	100NB	30	RMT				
3.2	**Steam piping** of M.S. Class `C' pipe complete with fittings like elbows, tees, reducers,Flanges Gasket, Nut-Bolts etc. Insulated with Aluminum cladded Rockwool insulation of suitable density (95kg/m3) of 25mm Thick.						
	15NB	84	RMT				
	25NB	18	RMT				
C	**AIR DISTRIBUTION SYSTEM**						
1	**G.I DUCTING**						
	Sheet metal work comprising of G.I ducting with all accessories like Bends, Tees, Reducer,expander, with silicon sealant, gasket, hanging supports & connection accessories, including duct leak test						
	24 G (120GSM) (Till duct size of 750mm)	19936	FT²				
	22 G (120GSM) (Duct size of 751 - 1500mm)	4992	FT²				
	20 G (120GSM) (Duct size of 1501 - 2500mm)	RO	FT²				
2	**THERMAL INSULATION**						
	19 mm Thick polyethylene insulation material (with Alu. Foil (Class O) including Adhesive & Aluminium tape	4095	FT²				
	13 mm Thick polyethylene insulation material with (40-60kg/m3) Alu. Foil (Class O) including Adhesive & Aluminium tape	9410	FT²				

S.NO.	DESCRIPTION	QUANTITY	UNIT	SUPPLY UNIT RATE (INR)	SUPPLY AMOUNT (INR)	INST. UNIT RATE (INR)	INST. AMOUNT (INR)
	6 mm Thick polyethylene insulation material With Alu. Foil (Class O) including Adhesive & Aluminium tape	1350	FT²				
3	**TERMINAL BOX WITH FILTER**						
	Gel Seal Hepa Filter box type, Grade H 14, Filter media: Glass Fiber with hot Melt seperator of efficiency 99.999% down to 0.3 micron. Terminal box flange type with Aluminium powder coated extrusion with air distribution perforated diffuser plate, DOP port, pressure measurement port, SS perforation sheet (capsule design), worm gear operated damper at external to the housing						
	FILTER SIZE:						
	Flange Size: 710 x 710 mm, Plenum Box Size: 640 x 640 x 220 mm, Filter Size: 610 x 610 x 149 mm CFM: 1000	26	NOS.				
	Flange Size: 710 x 710 mm, Plenum Box Size: 640 x 640 x 152 mm, Filter Size: 610 x 610 x 81 mm CFM: 500	14	NOS.				
	Flange Size: 405 x 405 mm, Plenum Box Size: 335 x 335 x 220 mm, Filter Size: 305 x 305 x 149 mm CFM: 250	20	NOS.				
	Flange Size: 405 x 405 mm, Plenum Box Size: 335 x 335 x 152 mm, Filter Size: 305 x 305 x 81 mm CFM: 150	7	NOS.				
4	**DAMPER, DIFFUSER & GRILL**						
	Aluminium powder coated square Diffuser with Volume control Damper	10	FT²				
	Aluminium powder coated Grill with Volume control Damper	10	FT²				
	GSS fabricated opposed blade volume control dampers	55	FT²				
5	**FIRE / SMOKE DAMPER**						
	UL listed curtain type static fire damper operated by UL listed fusible link rated for 73.8 deg c (165 deg f) with 20 g sleeves of 432 mm length for 1.5 hours fire rating without flange and reataining angle.	50	FT²				
	Curtain type fusible link for fire damper	7	NOS.				
	Limit switch	7	NOS.				
D	**ELECTRICAL**						
1	**AHU CONTROL PANEL**						

S.NO.	DESCRIPTION	QUANTITY	UNIT	SUPPLY UNIT RATE (INR)	SUPPLY AMOUNT (INR)	INST. UNIT RATE (INR)	INST. AMOUNT (INR)
	Supply ,installation, testing & commissioning of AHU Starter cum Controller Panel along with following features (Individual / combined panel will be decided as per site condions)						
	Fan Motor Starter with RYB & ON/Off/Trip Push Bottons with Inbuilts LED lamps, as required.						
	AHU 1 - 15 KW	1	NO.				
	AHU 2 - 9.3 KW	1	NO.				
	AHU 3 - 9.3 KW	1	NO.				
	AHU 4 - 7.5 KW	1	NO.				
	AHU 5 - 15 KW	1	NO.				
	AHU 6 - 11 KW	1	NO.				
	AHU 7 - 11 KW	1	NO.				
	FDV-1-S - 9.3 KW	1	NO.				
	FDV-1-E - 9.3 KW	1	NO.				
2	**CABLES**						
	Supply & Laying of cables including ring /pin type lugs & DC gland.						
	4C X 4 Cu Armoured	400	RFT				
	4C X 6 Cu Armoured	285	RFT				
	2C X 2.5 Cu Armoured	270	RFT				
	2C X 1.5 Cu Armoured	300	RFT				
	3C X 1.5 Cu Armoured	300	RFT				
	4C X 1.5 Cu Armoured	300	RFT				
	6C X 1(Shelded Cable)	300	RFT				
3	**CABLE TRAYS**						
	Hot Dip galvanized Cable tray of 25mm depth perforated type with neccesary supports						
	100 mm wide	600	RFT				
	200 mm wide	250	RFT				
	Supply of supporting cable tray.	1	LOT				

S.NO.	DESCRIPTION	QUANTITY	UNIT	SUPPLY UNIT RATE (INR)	SUPPLY AMOUNT (INR)	INST. UNIT RATE (INR)	INST. AMOUNT (INR)
4	**EARTHING**						
	Earthing GI 25mmx3mm	435	RFT				
5	**DIFFERENTIAL PRESSURE TRANSMITTER**	7	NOS.				
6	**TEMPERATURE & RH SENSOR**	7	NOS.				
E	**MISCELLANEOUS ITEMS**						
1	**MAGNAHELIC GAUGE**						
	Magnahelic Gauge with SS box for core areas and its accessories (silicon tube, screw etc.)						
	Magnahelic Gauge in core areas (0 - 60 pascal)	67	NOS.				
	Magnahelic Gauge in AHU (0 -25mm WC)	9	NOS.				
	Magnahelic Gauge in AHU (0 -50mm WC)	8	NOS.				
2	**AHU DRAIN PIPING**						
	25 mm UPVC pipe with accessories	450	RFT				
	32 mm UPVC pipe with accessories	250	RFT				
	50 mm UPVC pipe with accessories	150	RFT				
3	**M.S ANGLE**	950	KG				
4	**DOCUMENTATION, TESTING, COMMISSIONING & VALIDATION**	1	SET				
	DQ/IQ/OQ/PQ documents, Test certificate for equipment						
	System Validation including of following test:						
	Air balancing						
	Pressure balancing						
	Filter integrity test						
	Non viable Partical Count						
	Air flow pattern						
	Temperature & RH with digital thermo hygrometers						
	Recovery test						
	Light Intensity Test						
	Sound Level Test						

HAPTER-6: ELECTRICAL LIGHTING FIXTURE

	ELECTRICAL LIGHTING FIXTURE	UOM	QTY	SUPPLY UNIT RATE (INR)	SUPPLY AMOUNT (INR)	INST. UNIT RATE (INR)	INST. AMOUNT (INR)
1	**CLEANROOM & NON CLEAN ROOM LIGHTING FIXTURES**						
	Supply, Installation ,testing & commissioning of lighting fixtures. All fixtures should be complete with all accessories such as lamps, starters, Driver , power factor improvement capacitors etc						
	SURFACE / FALSE CEILING / SLAB MOUNTED LUMINAIRES						
	Recess Mounted LED lighting Fixture complete with reflectors, Driver, HPF capacitors for walkable/non-walkable cealing						
	Cleanroom LED Lighting Fixture						
1.1	40WATT LED Recess Mounted **Bottom Openable Fitting SS-304 Bottom Frame.**	No's	55				
1.2	40WATT LED Recess Mounted **Bottom Openable Fitting SS-304 Bottom Frame.**	No's	40				
1.3	24WATT LED Recess Mounted **Bottom Openable Fitting SS-304 Bottom Frame**	No's	35				
1.5	36WATT LED Recess Mounted **Surface Fitting .**	No's	20				
2	**MODULR SWITCH FOR LIGHT POINT**						
	(CONCEALED /EXPOSED)						
	Supply, Installation ,testing & commissioning of complete modular switch board with required accessories for modular plate. All the modular plate has consist of SS-304 front plate & MS/PVC backbox .						
1.1	1Nos. 6A 1Way Switch with 1 module SS cover plate for Light Operate	No's	30				
1.2	2Nos. 6A 1Way Switch with 2 module SS cover plate for Light Operate	No's	11				
1.3	3Nos. 6A 1Way Switch with 3 module SS cover plate for Light Operate	No's	6				
1.4	4Nos. 6A 1Way Switch with 4 module SS cover plate for Light Operate	No's	5				
1.5	6Nos. 6A 1Way Switch with 6 module SS cover plate for Light Operate	No's	7				
1.6	8Nos. 6A 1Way Switch with 8 module SS cover plate for Light Operate	No's	2				

	ELECTRICAL LIGHTING FIXTURE	UOM	QTY	SUPPLY UNIT RATE (INR)	SUPPLY AMOUNT (INR)	INST. UNIT RATE (INR)	INST. AMOUNT (INR)
3	**CIRCUIT WIRING & LOOPING WIRING FOR LIGHT**						
	CONCEALED/EXPOSED						
	Supply, Installation & commissioning for Circuit Wiring from LDB to SB/PB, SB/PB to SB/PB using Cu. flexible cable in Conduit/Bare/Cable tray with all accessories like , connectors, pull boxes, with covers etc. The work scope cover work on wall, trusses, in racks, or concealed including wall chiseling in wall with GI staples/ saddles etc.All conduit accessoriess (like bend & JB) will be PVC type, and tools consumables required for this installation shall be arranged by contractor. The conduit shall be provided with GI saddles at every 450mm distance. Complete work has to be executed strictly as per drawing & specifications to ensure work as per standard aesthetics.						
1.1	3CX2.5 sqmm Cu flexible Cable (For Circuit Wiring)	Mtr	1500				
1.2	3CX1.5 Sqmm Cu. Flexible Cable (For Looping Wiring)	Mtr	1250				
1.3	25MM Conduit with all accessories.(For Cleanroom Light Fittings)	Mtr	1000				
4	**LIGHTING DIST. BOARD**						
4.1	12 WAY TPN Distribution Boards.	No's	1				
5	**UPS DIST. BOARD**						
5.1	12 WAY SPN Distribution Boards.	No's	1				
6	**CABLE GLANDS FOR LIGHTING DB**						
	3CX2.5SQMM DOUBLE COMPRESSION PVC GLAND FOR DB	No's	48				

CHAPTER-7: ELECTRIFICATION OF MV SYSTEM

S.NO.	DESCRIPTION	UNIT	QTY	SUPPLY UNIT RATE (INR)	SUPPLY AMOUNT (INR)	INST. UNIT RATE (INR)	INST. AMOUNT (INR)
A	**LT PANELS & DIST. BOARD**						
1	**POWER DISTRIBUTION BOARDS.**						
	Supply and Installation & commissioning of free standing, floor/wall mounting, vermin proof compartmentalized, extensible at both ends, suitable for 3-Ph ,415V ,50Hz TPN power supply. The switchgears to be mounted in a sheet metal enclosure of 14/16 CRCA sheet with suitabely rated Aluminium busbars (As per detailed drawings). All the panels are 7 tank process powder coating with RAL-7032.For floor mounted panel 100mm/75mm base frame shall be provided for mounted. Necessary support shall be provided for panel shifting .Panel Shifting & placing at approved location is in client scope.						
	All Incommer & outgoing feeders to be provided as detailed in single line diagram (As per detailed SLD drawings).						
1.1	Process Panel -Location Electrical Room Mezeenine Floor	No.	1				
1.2	HVAC Panel -Location Electrical Room Mezeenine Floor	No.	1				
1.3	Utility panel - Location Near the Mezeenine Floor	No.	1				
1.4	Power DB (12WAY TPN DB)	No.	1				
B	**CABLE ,SOCKETS & EARTHING**						
1	**CABLING**						
1.1	3.5CX95SQMM AL XLPE ARM CABLE	MTR	100				
1.2	4CX70SQMM AL XLPE ARM CABLE	MTR	100				
1.3	4CX50SQMM AL XLPE ARM CABLE	MTR	50				
1.4	4CX35 SQMM AL XLPE ARM CABLE	MTR	50				
1.5	4CX25SQMM CU XLPE ARM CABLE	MTR	100				
1.6	4CX16SQMM CU XLPE ARM CABLE	MTR	100				
1.7	4CX10 SQMM CU ARM CABLE	MTR	100				
1.8	4CX6SQMM CU ARM CABLE	MTR	100				
1.9	4CX4SQMM CU ARM CABLE	MTR	100				
2	3CX6SQMM CU ARMOURED CABLE	MTR	50				
2.1	3CX4SQMM CU ARMOURED CABLE	MTR	100				
2.2	3CX2.5SQMM CU ARMOURED CABLE	MTR	1500				
2.3	3CX1.5SQMM CU FLEXIBLE CABLE	MTR	1000				
2.4	5CX2.5SQMM CU FLEXIBLE CABLE	MTR	500				
2.5	2 C X 1.5 SQMM CU FLEXIBLE CABLE	MTR	100				
2.6	1CX1 SQMM CU WIRE	MTR	900				
2.7	1CX6 SQMM CU FLEXIBLE CABLE	MTR	500				
2.8	1CX10 SQMM CU FLEXIBLE CABLE	MTR	100				

S.NO.	DESCRIPTION	UNIT	QTY	SUPPLY UNIT RATE (INR)	SUPPLY AMOUNT (INR)	INST. UNIT RATE (INR)	INST. AMOUNT (INR)
2.9	1CX16 SQMM CU FLEXIBLE CABLE	MTR	200				
3	1CX25 SQMM CU FLEXIBLE CABLE	MTR	400				
2	**CABLE GLANDS**						
2.1	4CX95SQMM DOUBLE COMPRESSION GLAND	No's	2				
2.2	4CX70SQMM DOUBLE COMPRESSION GLAND	No's	2				
2.3	4CX50SQMM DOUBLE COMPRESSION GLAND	No's	2				
2.4	4CX35 SQMM DOUBLE COMPRESSION GLAND	No's	2				
2.5	4CX25 SQMM DOUBLE COMPRESSION GLAND	No's	6				
2.6	4CX16SQMM DOUBLE COMPRESSION GLAND	No's	6				
2.7	4CX10 SQMM DOUBLE COMPRESSION GLAND	No's	10				
2.8	4CX6SQMM DOUBLE COMPRESSION GLAND	No's	10				
2.9	4CX4SQMM DOUBLE COMPRESSION GLAND	No's	10				
3	3CX6SQMM DOUBLE COMPRESSION GLAND	No's	6				
3.1	3CX4SQMM DOUBLE COMPRESSION GLAND	No's	4				
3.2	3CX2.5SQMM DOUBLE COMPRESSION GLAND	No's	50				
3.3	5CX2.5SQMM DOUBLE COMPRESSION GLAND	No's	50				
3.4	3CX2.5SQMM DOUBLE COMPRESSION PVC GLAND	No's	50				
3	**CABLE TRAY**						
3.1	Fabrication /erection of cable tray supports/ clamps from M.S. equal angle and strips as per drawing and specifications. Work also includes arranging consumables, grinding/ filling of all welded joints, painting with one coat of anticorrosive paint & 2 coat of approved colour Synthetic enamel paint.	Kgs.	200				
3.2	Supply and Installation of good quality, approved make, pre fabricated perforated type 14SWG thick Hot Dipped G.I. Cable trays of following sizes.						
3.3	100x25mm	Mtr	20				
3.4	150X25mm	Mtr	20				
3.5	300X50mm	Mtr	20				
3.6	400X25mm	Mtr	20				
3.7	600x50mm	Mtr	10				
3.8	Cable Tray Accessories (Coupler,Cable Tie,Cable Tag, Ferruel,Insulation Tap etc)	Kgs.	7				
3.9	PVC conduit for socket point cabling	Mtr	200				
4	**POWER OUTLETS AND ACCESSORIES.**						

S.NO.	DESCRIPTION	UNIT	QTY	SUPPLY UNIT RATE (INR)	SUPPLY AMOUNT (INR)	INST. UNIT RATE (INR)	INST. AMOUNT (INR)
4.1	Domestic nature- modular switch plate consisting of 1 No's 16A Socket Outlets with 1No. 16A Switch. The board shall consist of all items being modular plate type. (With Normal Top Cover)	No.'s	40				
4.2	Single phase Industrial Plug boards consisting of 20A/10A DP ELCB & 20A/10A 3 pin Industrial Socket. (With SS Top Cover)	No.'s	10				
4.3	Three phase Industrial type Plug boards consisting of 10/16/20/25/32A TP ELCB with 20/32A TPN& E 5 PIN Industrial Plug Socket. .- (With SS Top Cover)	No.'s	15				
5	**EARTHING**						
	EARTH STATIONS						
	Supply, Installation & commissioning of earthing pit & earthing strip for equipment earthing & panle earthing etc.						
5.1	GI CHEMICAL EARTHING (Panel Body,Cable tray)	No.'s	4				
5.2	CU CHEMICAL EARTHING (DG ,Transformer,UPS)	No.'s	6				
5.3	25x3mm GI Strip (On cable trays)	Mtr.	500				
5.4	8 SWG Bare GI Wire	Mtr.	100				
5.5	17x3mm Cu Strip (For Electronic Earthing & lighting arrester)	Mtr.	100				
6	**UPS ,BATTERY & DIST. BOARD**						
6.1	10KVA ONLINE UPS with 3 phase input & 1 phase output.	Set	1				
6.2	12V/18AH SMF Battery for 30Minis Backup with Full Load (16Nos Battery)						
6.3	MS battery openrack & interlink						
6.4	12 WAY SPN Distribution Boards.	No's	1				
7	**LIGHTNING ARRESTER**						
7.1	Supply of Level 2 type Early Streamer Emission (ESE) type Lightning Protection, complete with the Lightning Air Terminal including all accessories like MAST of 5 Mtr height & and also Lightning Strike Recoder. (Protection radius = 76 mtrs @ Level II / Medium Protection)	Set	1				
7.2	1CX50SQMM CU FLEXIBLE CABLE (For lighting arrester)	Mtr.	100				
7.3	CU CHEMICAL EARTHING	No.'s	4				

CHAPTER-8: ELECTRIFICATION OF LV SYSTEM

S.NO.	DESCRIPTION	UNIT	QTY	SUPPLY UNIT RATE (INR)	SUPPLY AMOUNT (INR)	INST. UNIT RATE (INR)	INST. AMOUNT (INR)
1	**DOOR INTERLOCKING SYSTEM**						
1.1	2 Door Microcontroller Based Single Leaf DIS with din rail based power supply with Metal Enclosure included Emergency switch to be given with DIS controller with Single Front Facia Plate consisting of Push Buttons (Door Release) & indicator LED to show the door staus, Electromagnetic Lock – 600LBS with Feedback	**Sets**	4				
1.2	3 Door Microcontroller Based Single Leaf DIS with din rail based power supply with Metal Enclosure included Emergency switch to be given with DIS controller with Single Front Facia Plate consisting of Push Buttons (Door Release) & indicator LED to show the door staus, Electromagnetic Lock – 600LBS with Feedback	**Sets**	5				
1.3	CAT-4 4 Pair Cable For Controller to All Accessories Item	**Mtrs**	900				
1.4	25 mm dia Conduit	**Mtrs**	300				
1.5	Testing & commissioing of above door interlock	**Sets**	9				
1.6	Domestic nature- modular switch plate consisting of 1 No's 16A Socket Outlets with 1No. 16A Switch. The board shall consist of all items being modular plate type. (With Normal Top Cover)	No.'s	9				
2	**TELEPHONE SYSTEM & LAN SYSTEM**						
	Following Telephone & Data System considered only point at approved drawing location. System Configuration is in client scope.						
2.1	Wiring for Data point 4 pair Cat-6 data cable in Existing PVC conduit complete as required	**Mtrs**	500				
2.2	Wiring for Telephone point 4 pair Cat-6 data cable in Existing PVC conduit complete as required	**Mtrs**	500				
2.3	Supply & fixing the following sizes of PVC conduit in recessed or on surface of wall . False ceiling including cutting the wall and making good the same as required.						
2.4	25 mm dia Conduit	**Mtrs**	500				
2.5	Supply and fixing of RJ45 connector for connect computer and the other networking elements .	**Nos.**	10				
2.6	Supply and fixing of RJ11 moduler Telephone outlet in Zinc chromate passivated M.S. Box and Modular Plate including cost of M.S.box, modular plate and connections etc as required.	**Nos.**	10				
2.7	10PORT SWITCH MODULE WITH RACK	**Nos.**	1				
2.8	10 PORT MDF	**Nos.**	1				

S.NO.	DESCRIPTION	UNIT	QTY	SUPPLY UNIT RATE (INR)	SUPPLY AMOUNT (INR)	INST. UNIT RATE (INR)	INST. AMOUNT (INR)
2.9	100MM Bus Trunk	Mtr	50				
3	**CONEVENTIONAL FIRE ALARM SYSTEM**						
	CONEVENTIONAL FIRE ALARM SYSTEM						
3.1	Supply & installation of conventional Fire zone panel including battery at suitable place/sucurity room to control & monitoring the fire inside the building.	No	1				
3.2	Supply and installation of following sizes of the PVC insulated and PVC overall sheathed, copper conductor, FRLS Flexible wire of 600/1100 Volt grade in existing M.S.conduit pipe as required.						
	2 x 1.5 Sq mm (hooter looping)	RM	100				
	4 x 1.5 Sq mm (Smoke detector & MCP looping)	RM	300				
3.3	Supply, installation testing and commissioning of dust tight simense type smoke detector .	Nos	30				
3.4	Supply, installation, testing and commissioning of conventional hooter in wall for alert alarm system complete as required.	Nos	10				
3.5	Supply, installation, testing and commissioning of conventional manual call point in wall for alert alarm system complete as required.	Nos	10				
4	**NON IP BASED CCTV CAMERA**						
4.1	IR Dome camera with 1 MEGAPIXEL resolution ,20m IR distance,ICR,0.1 LUX/F1.2,3.6mm/F1.8 Lens,720P	Nos	6				
4.2	IR BULLET camera with 1 MEGAPIXEL resolution ,20m IR distance,ICR,0.1 LUX/F1.2,3.6mm/F1.8 Lens,720P	Nos	10				
4.3	16-CH Video ,16 audio 1 DATA interface ,HDMI output,1920x1080 VGA resolution ,720p ,1MP recording	Nos	1				
4.4	1Tb seagate (storage)	Nos	1				
4.5	12v-5amp smps with surge protector	Nos	1				
4.6	BNC Connectors	Nos	40				
4.7	power pins	Nos	20				
4.8	pvc Base Box	Nos	16				
4.9	DVR Rack	Nos	1				
4.10	32" Monitor for Camera Display	Nos	1				
4.11	Setting of DVR & camera at Sutable location & monitoring the area	Sets	1				
4.12	3+1 CCTV Cable	Mtr	450				

CHAPTER-9: BUILDING MANAGEMENT SYSTEM (BMS)

S.NO.	DESCRIPTION	UOM	QTY	SUPPLY UNIT RATE (INR)	SUPPLY AMOUNT (INR)	INST. RATE (INR)	INST. AMOUNT (INR)
1	**GENERAL**						
a	Engineering station. Vendor/product supplier to advise the requirements as per BMS software.(Dell/HP)	NO	1				
b	22 inch Led screen monitor for BMS engineering station. Vendor/product supplier to advise the requirements.	NO	1				
c	Industrial Grade with minimum 8-Port Managed Redundant Ethernet Switch + SFP With (shielded).	SET	1				
2	**BMS Software along with PC & Jet printer for A4 size**						
	21 CFR Part 11 Compliant Software & Hardware	Set	1				
3	**32 bit DDC Controller with real time clock , CE Approved with I/O modules etc as per I/O summary housed in a sheet metal enclosure & shall be capable of networked operations to exchange data with other controllers and workstations as per specifications;**						
a	DDC Controller with control panel for AHU (Schnider)	Nos	7				
4	**Field Devices**						
a	Temperature & humidity transmitter, duct mounted. Sensor ranges : -20 to 50 °C/ 0 ...100% RH. Power input 24VDC and 4 to 20 mA signal output. Accuracy +/- 2% FS. For quantity refer to document A180109-AU-LST-BMS-001, row 8 in each worksheet.	Nos	7				
b	Pressure Transmitter duct mounted. Calibrated Accuracy full scale; less than +/- 1%, supply; 24 VDC, Overpressure range; 0.97 bar; Cal range; 0-1500 Pa, Thermal effects; .03% Deg C (4.4 Deg C to 37.8 Drg C)	Nos	7				
c	Actuators for Dampers for ahus duct mounted ,Calibrated Accuracy full scale.	Nos	21				
d	Air Velocity Sensor, adjustable probe depth, IP 65 housing, 4 - 20 mA output signal, response time 0.2 s or 2 s (selectable), good accuracy at low velocity (0 to 10/15 m/s +/- 0.3% + 3% of value), low angular dependance, insensitive to dust	Nos	7				

S.NO.	DESCRIPTION	UOM	QTY	SUPPLY UNIT RATE (INR)	SUPPLY AMOUNT (INR)	INST. RATE (INR)	INST. AMOUNT (INR)
5	**Cabling**						
a	2 core , 1 Sq. mm shilded armoured	Mtr	200				
b	4 core , 1 Sq. mm shilded armoured	Mtr	200				
c	2 core , 1 Sq. mm shilded armoured for Communication Cable	Mtr	200				
d	CAT6 wire for BMS controller	Mtr	1500				
6	**Cable tray**						
	Supply and Instalation of 14 SWG GI Perforated Cable Trays along with Coupler plate and nut bolt						
a	150 mm X 25 mm	Mtr	500				
7	**Site Commissioning for 1 Engineer per day 8 Hour (Travel ,Lodging and Boarding , To & Fro to Site & Taxes are excluded)**	Lot	15				
8	**Documentataion Charges (Optional)**	Lot	1				
9	**Site Calibration Charge (optional)**	Lot	1				

CHAPTER-10: PROCESS DRAIN SYSTEM

S.NO.	DESCRIPTION	UNIT	QUANTITY	SUPPLY UNIT RATE (INR)	SUPPLY AMOUNT (INR)	INST. UNIT RATE (INR)	INST. AMOUNT (INR)
1	**DRAIN TRAP**						
1.1	S.S.304 Drain Trap With Bottom Side Verticle Outlet (Double Seal) (Standard Type) Size : - 8" x 8" x Total 9"(Ht) {110mm Ø Cylinder & 60mmØ Outlet Pipe} # Drain Trap Top Made Radius - Embossing Type with Top Side Lid. # Inside Drain Trap Provide S.S.304,14Swg Perforated Plate(For Jali Purpose) & Drainage Bucket # Top Seal :- Inside Drainage Bucket Fixing "Y" Shape S.S. Cup, with Surrounding "U" Shape Silicon Gasket. # Bottom Seal : Inside Provide Bottom Side "U" Type Bucket With Silicon " O " Ring # Bottom Side Vertical Out Let Provide In 60mm(Dia) S.S.304 Pipe # Finish In (Outside Matt Polish & Inside Mirror Polish)	**Nos.**	**21**				
2	**PIPES & FITTINGS**						
2.1	GI pipe with necessary fittings						
	80NB pipe	**Mtrs.**	**450**				
	80NB Elbow	**Nos.**	**35**				
	TEE 80x80	**Nos.**	**12**				
	TEE 80x65	**Nos.**	**8**				
	Pipe Holding clamp with supports 80NB	**Nos.**	**65**				
	65NB pipe	**Mtrs.**	**120**				
	65NB Elbow	**Nos.**	**25**				
	TEE 65x65	**Nos.**	**11**				
	Pipe Holding clamp with supports 65NB	**Nos.**	**24**				
3	**OTHERS**						
3.1	FITTING & ERECTION	**R. Mt.**	**570**				

CHAPTER-11: DE-IONIZED WATER DISTRIBUTION

S.NO.	DESCRIPTION	UNIT	QUANTITY	SUPPLY UNIT RATE (INR)	SUPPLY AMOUNT (INR)	INST. UNIT RATE (INR)	INST. AMOUNT (INR)
A	**PIPINGS & FITTING**						
1	Tube make SS316 L, 1.5", Bead Remove Tube with EP, Make : Rath Gibson/Equ.	**Meter**	**260**				
2	Bend 316L, 1.5"x 90 PL EP, Make : Alfa Laval/Equ.	**Meter**	**60**				
3	TC liner, SS 316L. - 1.5" Make : CCPPL/Equ.	**Nos**	**90**				
4	TC Clamp 1.5", (Investment Casting) - SS 304. Make : CCPPL/Equ.	**Nos**	**55**				
5	Silicon Gaskets 1.5", Make : Western Rubber/Equ.	**Nos**	**55**				
6	Sanitary Sampling Valve 8 mm at Supply & Return Line, Make : Crane / Equ.	**Nos**	**4**				
7	Pipe Support assembly SS 304, BSP at service floor with Barrel Nipple & Base plate, Make : CCPPL/Equ.	**Nos**	**175**				
8	Pipe support assembly SS304 in clean room area at user point, Make : CCPPL/Equ.	**Nos.**	**24**				
9	Manual operated Zero Dead Leg Valves for Loop, U type, SS 316L with EPDM Diaphragm with TC end - Size - 1.5", Make : Crane/Equ.	**Nos**	**12**				
10	Orifice Plate at user point, Make : CCPPL/Equ.	**Nos**	**12**				
11	Hose Nipple at user Points. Make : CCPPL/Equ.	**Nos**	**12**				
12	SS 304 Round Plate in side the clean room at User Point pipe cover Falcelling Panel, Size : 200 X200 MM.	**Nos**	**48**				
B	**ERECTION**						
1	Piping Erection & Fixing Charges-1.5"	**Mtrs.**	**260**				
2	Orbital Welding Joint Preparation Charges	**Nos**	**220**				
3	Commissioning & Documentation Charges with DQ, IQ,OQ,SOP, Orbital Test certificate & Manuals.	**Set**	**1**				
4	Boroscopy Charges For 10%.	**Nos**	**1**				

CHAPTER-12: WATER FOR INJECTION DISTRIBUTION

S.NO.	DESCRIPTION	UNIT	QUANTITY	SUPPLY UNIT RATE (INR)	SUPPLY AMOUNT (INR)	INST. UNIT RATE (INR)	INST. AMOUNT (INR)
I	**PIPINGS & FITTING**						
1	Tube make SS316 L, 1"x 16 SWG EP. Make : Rath Gibson/Equ.	**Meter**	**265**				
2	Insulation with Aluminum Cladding for WFI Line - 1". Make : Armacell/Equ.	**Meter**	**226**				
3	Pipe In Pipe Out at user point - 1". Make : CCPL/Equ.	**Meter**	**39**				
4	Bend 316L, 1"x 90 PL EP. Make : Alfa Laval/Equ.	**Nos**	**60**				
5	1" TC liner, SS 316. Make : CCPPL	**Nos**	**90**				
6	TC Clamp 1", (Investment Casting) - SS 304, Make : CCPPL	**Nos**	**55**				
7	PTFE Gaskets 1". Make : Western Rubber	**Nos**	**55**				
8	Sanitary Sampling Valve 8 mm. Make : Crane / Equ.	**Nos**	**4**				
9	Pipe Support assembly 304 1" BSP at service floor area. Make : CCPPL	**Nos**	**175**				
10	Manual operated Zero Dead Leg Valves for Loop, U type, SS 316L with EPDM Diaphragm with TC end - Size - 1.0", Make : Crane/Equ.	**Nos**	**13**				
11	Pipe support assembly in clean room at user point. Make : CCPPL	**Nos**	**52**				
12	Orifice Plate at user point, PTFE. Make : CCPPL	**Nos**	**13**				
13	Hose Nipple at user Points, Make : CCPPL	**Nos**	**13**				
B	**ERECTION**						
1	Piping Erection & Fixing Charges-1"	**Mtrs.**	**265**				
2	Orbital Welding Joint Preparation Charges.	**Nos**	**220**				
3	Commissioning & Documentation Charges with DQ, IQ,OQ,SOP, Orbital Test certificate & Manuals.	**1**	**Set**				
4	Boroscopy Charges For 20%.	**1**	**Nos**				

CHAPTER-13: COMPRESSED AIR DISTRIBUTION SYSTEM

S.NO.	DESCRIPTION	UNIT	QUANTITY	SUPPLY UNIT RATE (INR)	SUPPLY AMOUNT (INR)	INST. UNIT RATE (INR)	INST. AMOUNT (INR)
A	**PIPINGS & FITTINGS**						
	ERW SS 304 Piping of following sizes. The cleaning of weld joints for Following sizes (For Internal Header), TIG Welded and Back purged. SCH-40. Make : Jindal/Rensa/Tata/Equ.						
1.1	50 NB	**Mtrs.**	**150**				
1.2	40 NB	**Mtrs.**	**0**				
2	**PIPE/FITTINGS ACCESSORIES.**						
	Elbow, R=1.5D, SS 304, 90 deg.						
2.1	50 NB	**Nos**	**15**				
2.2	40 NB	**Nos**	**0**				
3	**Flanges raised face, serrated finish. Dimensions as per ANSI B 16.5, MOC : SS 304.**						
3.1	50 NB	**Nos**	**100**				
3.2	40 NB	**Nos**	**0**				
4	**Blind flanges raised face, serrated finish. Dimensions as per ANSI B 16.5, MOC : SS 304**						
4.1	50 NB	**Nos**	**2**				
4.2	40 NB	**Nos**	**0**				
5	**Gaskets PTFE for 3 mm thick, CSF Gaskets suitable for 150#**						
5.1	50 NB	**Nos**	**55**				
5.1	40 NB	**Nos**	**0**				
6	**SS304 STUDS /2 Nuts/2 Washers (Suitable for Normal -150# Flange Pair)**						
6.1	M16xL85(50 NB)	**Nos**	**450**				
6.1	M16xL85(40 NB)	**Nos**	**0**				
7	**Two piece Ball Valves as per following Sizes.(flanged end-150#), MOC : SS 304.**						
7.1	50 NB	**Nos**	**4**				

S.NO.	DESCRIPTION	UNIT	QUANTITY	SUPPLY UNIT RATE (INR)	SUPPLY AMOUNT (INR)	INST. UNIT RATE (INR)	INST. AMOUNT (INR)
7.2	40 NB	**Nos**	**0**				
8	**NRV 150# MS Sandwich type swing type, (flanged end)**						
8.1	50 NB	**Nos**	**1**				
8.1	40 NB	**Nos**	**0**				
9	**Pressure Gauge, Range 0-10 Kg/cm2, Dial Size 100mm, Dial Type.**						
9.1	25NB	**Nos**	**5**				
10	**Plain TEE, SS 304**						
10.1	(50NB X 50NB)	**Nos**	**5**				
10.2	(40NB X 40NB)	**Nos**	**0**				
10.3	(50NB X 20NB)	**Nos**	**36**				
10.4	(20NB X 15NB)	**Nos**	**15**				
11	**REDUCER, SS 304.**						
11.1	(50NB X 20NB)	**Nos**	**5**				
11.2	(40NB X 20NB)	**Nos**	**0**				
12	**PIPE HOLDING ASSEMBLY**						
12.1	50 NB	**Nos**	**75**				
12.2	40 NB	**Nos**	**0**				
13	**PIPES INSIDE ROOM** **SS 304 Electro Polish Pipe.** **Make : Rensa/Jindal/Equ.**						
	Pipe						
13.1	20 NB	**Mtrs.**	**144**				
13.2	15 NB	**Mtrs.**	**10**				
14	**Bend**						
14.1	20 NB	**Nos**	**75**				
14.2	15 NB	**Nos**	**15**				
15	**Triclover liner**						
15.1	20 NB	**Nos**	**75**				
15.2	15 NB	**Nos**	**30**				

S.NO.	DESCRIPTION	UNIT	QUANTITY	SUPPLY UNIT RATE (INR)	SUPPLY AMOUNT (INR)	INST. UNIT RATE (INR)	INST. AMOUNT (INR)
16	**Triclover Clamps**						
16.1	20 NB	**Nos**	**40**				
16.2	15 NB	**Nos**	**15**				
17	**Silicon Gasket**						
17.1	20 NB	**Nos**	**40**				
17.2	15 NB	**Nos**	**15**				
18	**General Purpose Pre-Filter For Main Supply Line.**	**Set**	**2**				
19	**High Effeciency Coalesing After Filter For Main Supply Line**	**Set**	**2**				
20	**VALVES, SS 304 Ball valve polished, tc end.** **Make : Linet / Valve.**						
20.1	Instrument Air - 20 NB	**Nos**	**20**				
20.2	Process Air - 15 NB	**Nos**	**16**				
21	**PIPE HOLDING ASSEMBLY**						
21.1	20 NB	**Nos**	**100**				
22	Pressure reducing valve 10 bar to 2 Bar. MOC : SS 304. Make : Forbes Marshall/Equ.	**Nos**	**2**				
23	Air filter for PTFE 0.2u for Instrument Air with housing & All Accessories at user point, For Process Area Room.	**Nos**	**16**				

CHAPTER-14: PLANT STEAM DISTRIBUTION SYSTEM

S.NO.	DESCRIPTION	UNIT	QUANTITY	SUPPLY UNIT RATE (INR)	SUPPLY AMOUNT (INR)	INST. UNIT RATE (INR)	INST. AMOUNT (INR)
A	**PIPINGS & FITTINGS**						
1	**PIPE**						
	Steam Piping Moc : CS Seamless SCH- 40. Make : Jindal/Rensa/Equ.						
	25 NB	**Mtrs.**	**60**				
	32 NB	**Mtrs.**	**50**				
	40 NB	**Mtrs.**	**70**				
	50 NB	**Mtrs.**	**100**				
	65 NB	**Mtrs.**	**0**				
2	**PIPE/FITTINGS ACCESSORIES.**						
	CS Elbow, 90 deg, Sch 40, Seamless						
	25 NB	**Nos**	**20**				
	32 NB	**Nos**	**10**				
	40 NB	**Nos**	**22**				
	50 NB	**Nos**	**30**				
	65 NB	**Nos**	**0**				
3	**CS flanges slip on 150# raised face, serrated finish. Dimensions as per ANSI B 16.5.**						
	25 NB	**Nos**	**12**				
	32 NB	**Nos**	**8**				
	40 NB	**Nos**	**15**				
	50 NB	**Nos**	**20**				
	65 NB	**Nos**	**0**				
4	**CS Blind flanges raised face, serrated finish. Dimensions as per ANSI B 16.5 150#**						
	50 NB	**Nos.**	**5**				
5	**Gasket for 3 mm Thk Style 20 Gaskets Wire Embeded Suitable for High Pressure Steam Service 150#**						
	25 NB	**Nos**	**6**				
	32 NB	**Nos**	**6**				
	40 NB	**Nos**	**8**				
	50 NB	**Nos**	**12**				

S.NO.	DESCRIPTION	UNIT	QUANTITY	SUPPLY UNIT RATE (INR)	SUPPLY AMOUNT (INR)	INST. UNIT RATE (INR)	INST. AMOUNT (INR)
	65 NB	**Nos**	**0**				
6	**GI Plated Nut Bolts and 2 Nos washers (for 150 # Flanges)**						
	M14 x L75	**Nos.**	**250**				
	M16 x L90	**Nos.**	**200**				
7	**INSULATION**						
	Supply, Installation of Resin Bonded ready made Mattress for Hot Insulation of the below mentioned Piping sizes including Cleaning of Pipes.Insulation Material is conform to IS 8183 (Part 3), Density 100 Kg/m3.Complete Insulated pipe line shall be cladded with 24 SWG aluminium sheet with self tapping 15 mm screws at regular intervals, all as per manufacturers / detailed specification. Make : Armacell/Equ.						
	HIGH PRESSURE STEAM. TEMP 186DEG C						
	(40mm thk)25 NB	**Mtrs.**	**35**				
	(40mm thk)32 NB	**Mtrs.**	**32**				
	(40mm thk)40 NB	**Mtrs.**	**80**				
	(60mm thk)50 NB	**Mtrs.**	**60**				
	(60mm thk)65 NB	**Mtrs.**	**0**				
8	**Shoe Support (Roller Chair) for following pipe sizes**						
	25 NB	**Nos**	**40**				
	32 NB	**Nos**	**34**				
	40 NB	**Nos**	**47**				
	50 NB	**Nos**	**67**				
	65 NB	**Nos**	**0**				
9	**Piston Valve, MOC: SS304, Flanged End ASA 150#, NIBR Make : Forbes Marshall/Equ.**						
	25 NB	**Nos**	**5**				
	32 NB	**Nos**	**5**				
	40 NB	**Nos**	**4**				
	50 NB	**Nos**	**4**				
10	**CS Piston Valves With Flanged End. Make : Forbes Marshall/Equ.**						
	25 NB	**Nos**	**5**				
	32 NB	**Nos**	**5**				

S.NO.	DESCRIPTION	UNIT	QUANTITY	SUPPLY UNIT RATE (INR)	SUPPLY AMOUNT (INR)	INST. UNIT RATE (INR)	INST. AMOUNT (INR)
	40 NB	**Nos**	**4**				
	50 NB	**Nos**	**4**				
11	Compact Thermodynamic Steam Trap Module, Socket Weld, Make : Forbes Marshall/Equ.						
	15 NB	**Nos.**	**10**				
12	Air Vent with Isolation Valve & connection kit						
	15 NB	**Nos.**	**10**				
13	Pressure Gauge with valve, Dial Size 150 (0 TO 21 bar)						
	15 NB	**SET**	**10**				
14	SS 304, PN 16 Expansion Bellow for Steam Application along with matching flanges & fittings.						
	50 NB	**No**	**2**				
15	SS 304 Pendent						
	Pipe in pipe insulation(pendent) for clean room piping, 4.5 mtr elevation, Actual Size will be provide after detail engineering.						
	25 NB	**Nos**	**5**				
	32 NB	**Nos**	**5**				
	40 NB	**Nos**	**4**				
	50 NB	**Nos**	**4**				
16	Supply and installation of pipe holding assembly for clean room piping with 2nos screw for each assembly.						
	25 NB	**Nos**	**5**				
	32 NB	**Nos**	**5**				
	40 NB	**Nos**	**4**				
	50 NB	**Nos**	**4**				

CHAPTER-15: PURE STEAM DISTRIBUTION

S.NO.	DESCRIPTION	UNIT	QUANTITY	SUPPLY UNIT RATE (INR)	SUPPLY AMOUNT (INR)	INST. UNIT RATE (INR)	INST. AMOUNT (INR)
A	**PIPINGS & FITTING**						
1.1	**PSG PIPING VARIABLE - HEADER - (2.5")**						
	2.5"OD x 16 G Bead Removed Tube, Make : Rath Gibson/Equ	**Mtrs**	**80**				
	Insulation of PSG Loop with Aluminum Cladding in service floor area. Make : Armacell/CCPPL.	**Mtrs**	**80**				
	2.5"OD x 16 swg 316 L Stainless Steel EP Bends, Make : Alfa Laval	**Nos.**	**9**				
	2.5" TC liner, SS 316, Make : CCPPL	**Nos.**	**26**				
	TC Clamp 2.5", SS 304, Make : CCPPL	**Nos.**	**13**				
	Viton Gaskets 2.5", Make : Western Rubber	**Nos.**	**13**				
	SS 304 Adjustable Pipe Holding Clamp , Barrel Nipple and Base Plate with Anchor Bolts : 2.5" SIZE, Make : CCPPL	**Nos.**	**70**				
	Unequal tee (2.5" X 3/4"), Make : CCPPL/Equ.	**Nos.**	**8**				
	Equal Tee 2.5", Make : CCPPL/Equ	**Nos.**	**2**				
	Bliend Flange, Make : CCPPL/Equ	**Nos.**	**3**				
	Pressuge gauge, SS , Range :- 0 - 10 Kg/Cm2, TC end, At header line. Make : Baumer/Equ	**Nos.**	**1**				
	Sanitary Steam Trap at condensate drain, 0.5" SS 316L, Make : Forbes/Steriflow	**Nos.**	**3**				
	Sanitory Safety Valve at PS heater line-0.5" Make : Forbes / Equ	**No.**	**1**				
	TC Blind, SS 316L - In Header line 2.5", Make : CCPPL	**No.**	**2**				

S.NO.	DESCRIPTION	UNIT	QUANTITY	SUPPLY UNIT RATE (INR)	SUPPLY AMOUNT (INR)	INST. UNIT RATE (INR)	INST. AMOUNT (INR)
	Manual Diaphragm Valve with PTFE lined EPDM, Invest cast body, SS 316L, Plastic Handwheel, Size-0.5" - For Condensate Drain assembly & Pressure gauge, Safety Valve, Make : Crane/Equ.	**Nos.**	**7**				
1.2	**DROP PIPING 3/4"**						
	3/4" OD x 16 swg 316 L Stainless Steel EP Tubings, Make : Rath Gibson/Equ	**Mtrs**	**80**				
	3/4" Pipe In / Pipe Out for Clean room - At User Point, Make : CCPPL/Equ.	**Nos.**	**26**				
	3/4" OD x 16 swg 316 L Stainless Steel EP Bends, Make : Alfa Laval	**Nos.**	**54**				
	3/4" TC liner, SS 316, Make : CCPPL	**Nos.**	**65**				
	TC Clamp 3/4", SS 304, Make : CCPPL	**Nos.**	**35**				
	PTFE Gaskets 3/4", Make : Western Rubber	**Nos.**	**35**				
	SS 304 Adjustable Pipe Holding Clamp , Barrel Nipple and Base Plate with Anchor Bolts : 3/4", Make : CCPPL	**Nos.**	**40**				
	Manual Diaphragm Valve with PTFE lined EPDM Size: 3/4" at user Point, Make : Crane/Equ.	**Nos.**	**18**				
	Equal tee 3/4", Make : CCPPL	**Nos.**	**18**				
	Diaphragm Valve with PTFE lined EPDM Size: 0.5" for steam trap. Make : Crane/Equ.	**Nos.**	**18**				
	Sanitary Steam Trap Assembly, Make : Spirax/Equ.	**Nos.**	**18**				
1.3	PS PIPING VARIABLE - 1/2" CONDENSATE DRAIN LINE						
	Tube, SS316 L, 1/2"x 16 SWG EP,Make : Rath Gibson/Equ	**Nos.**	**20**				
	1/2" OD x 16 swg 316 L Stainless Steel EP Bends, Make : Alfa Laval	**Nos.**	**5**				
	1/2" TC liner, SS 316L, Make : CCPPL	**Nos.**	**20**				
	TC Clamp 1/2" , SS 304, Make : CCPPL	**Nos.**	**10**				
	PTFE Gaskets 1/2", Make : CCPPL	**Nos.**	**10**				

CHAPTER-16: SOFT WATER DISTRIBUTION

S.NO.	DESCRIPTION	UNIT	QUANTITY	SUPPLY UNIT RATE (INR)	SUPPLY AMOUNT (INR)	INST. UNIT RATE (INR)	INST. AMOUNT (INR)
A	**PIPINGS & FITTINGS**						
1.1	**Header - 1"**						
	Pipe, SS304, 1" OD. Make : Rensa/Equ.	**Meter**	**130**				
	Bend, 304, 1" OD x 90°	**Nos**	**15**				
	1" TC liner, SS 304	**Nos**	**50**				
	TC Clamp 1", SS 304	**Nos**	**25**				
	Silicon Gaskets 1"	**Nos**	**20**				
	Pipe Support assembly 304 1" BSP	**Nos**	**90**				
	Equal Tee 1", SS 304	**Nos.**	**4**				
	Bliend Flange	**Nos.**	**2**				
1.2	**Drop Piping - 3/4"**						
	Pipe, SS 304, 3/4"OD, Make : Rensa/Equ.	**Meter**	**80**				
	Bend, SS 304, 3/4"ODx 90°	**Nos**	**40**				
	3/4" TC liner, SS 304	**Nos**	**60**				
	TC Clamp 3/4", (Investment Casting) - SS 304	**Nos**	**35**				
	Silicon Gaskets 3/4"	**Nos**	**35**				
	Pipe Support assembly SS316L 3/4" BSP	**Nos**	**55**				
	Manual Ball Valve, SS 304 at user Point - 3/4". With TC end. Make : Linet/Equ.	**Nos**	**18**				
B	**ERECTION**						
1	Piping Erection & Fixing Charges-1.0"	**Mtrs**	**130**				
2	Piping Erection & Fixing Charges-3/4"	**Mtrs**	**80**				
3	Orbital Welding Joint Preparation Charges - 1.0"	**Nos**	**100**				
4	Orbital Welding Joint Preparation Charges - 3/4"	**Nos**	**50**				
5	Commissioning & Documentation Charges with DQ, IQ,OQ,SOP, Orbital Test certificate & Manuals.	**Set**	**1**				

CHAPTER-17: COLD WATER DISTRIBUTION SYSTEM

S.NO.	DESCRIPTION	UNIT	QUANTITY	SUPPLY UNIT RATE (INR)	SUPPLY AMOUNT (INR)	INST. UNIT RATE (INR)	INST. AMOUNT (INR)
A	**PIPINGS & FITTINGS**						
1	**PIPE**						
	Steam Piping Moc : CS Seamless SCH- 40. Make : Jindal/Rensa/Equ.						
	25 NB	**Mtrs.**	**60**				
	32 NB	**Mtrs.**	**40**				
	40 NB	**Mtrs.**	**50**				
	50 NB	**Mtrs.**	**100**				
	65 NB	**Mtrs.**	**0**				
2	**PIPE/FITTINGS ACCESSORIES.**						
	CS Elbow, 90 deg, Sch 40, Seamless						
	25 NB	**Nos**	**15**				
	32 NB	**Nos**	**10**				
	40 NB	**Nos**	**20**				
	50 NB	**Nos**	**30**				
	65 NB	**Nos**	**0**				
3	**CS flanges slip on 150# raised face, serrated finish. Dimensions as per ANSI B 16.5.**						
	25 NB	**Nos**	**10**				
	32 NB	**Nos**	**8**				
	40 NB	**Nos**	**15**				
	50 NB	**Nos**	**20**				
	65 NB	**Nos**	**0**				
4	**CS Blind flanges raised face, serrated finish. Dimensions as per ANSI B 16.5 150#**						
	50 NB	**Nos.**	**5**				
5	**Gasket for 3 mm Thk Style 20 Gaskets Wire Embeded Suitable for High Pressure Steam Service 150#**						
	25 NB	**Nos**	**6**				
	32 NB	**Nos**	**6**				
	40 NB	**Nos**	**8**				

S.NO.	DESCRIPTION	UNIT	QUANTITY	SUPPLY UNIT RATE (INR)	SUPPLY AMOUNT (INR)	INST. UNIT RATE (INR)	INST. AMOUNT (INR)
	50 NB	**Nos**	**12**				
	65 NB	**Nos**	**0**				
6	**GI Plated Nut Bolts and 2 Nos washers (for 150 # Flanges)**						
	M14 x L75	**Nos.**	**250**				
	M16 x L90	**Nos.**	**200**				
7	**INSULATION**						
	Supply, Installation of Resin Bonded ready made Mattress for Hot Insulation of the below mentioned Piping sizes including Cleaning of Pipes.Insulation Material is conform to IS 8183 (Part 3), Density 100 Kg/m3.Complete Insulated pipe line shall be cladded with 24 SWG aluminium sheet with self tapping 15 mm screws at regular intervals, all as per manufacturers/detailed specification. Make : Armacell/Equ.						
	(25mm thk)25 NB	**Mtrs.**	**35**				
	(25mm thk)32 NB	**Mtrs.**	**32**				
	(25mm thk)40 NB	**Mtrs.**	**80**				
	(25mm thk)50 NB	**Mtrs.**	**60**				
	(25mm thk)65 NB	**Mtrs.**	**0**				
8	**Shoe Support (Roller Chair) for following pipe sizes**						
	25 NB	**Nos**	**40**				
	32 NB	**Nos**	**27**				
	40 NB	**Nos**	**34**				
	50 NB	**Nos**	**67**				
	65 NB	**Nos**	**0**				
9	**Ball Valve, MOC: SS304, Flanged End ASA 150#, NIBR Make : Linet/Equ.**						
	25 NB	**Nos**	**6**				
	32 NB	**Nos**	**6**				
	40 NB	**Nos**	**4**				
	50 NB	**Nos**	**0**				
10	**SS 304 Pendent Flange End**						
	Pipe in pipe insulation(pendent) for clean room piping, 4.5 mtr elevation, Actual Size to be decided at detail engineering.						

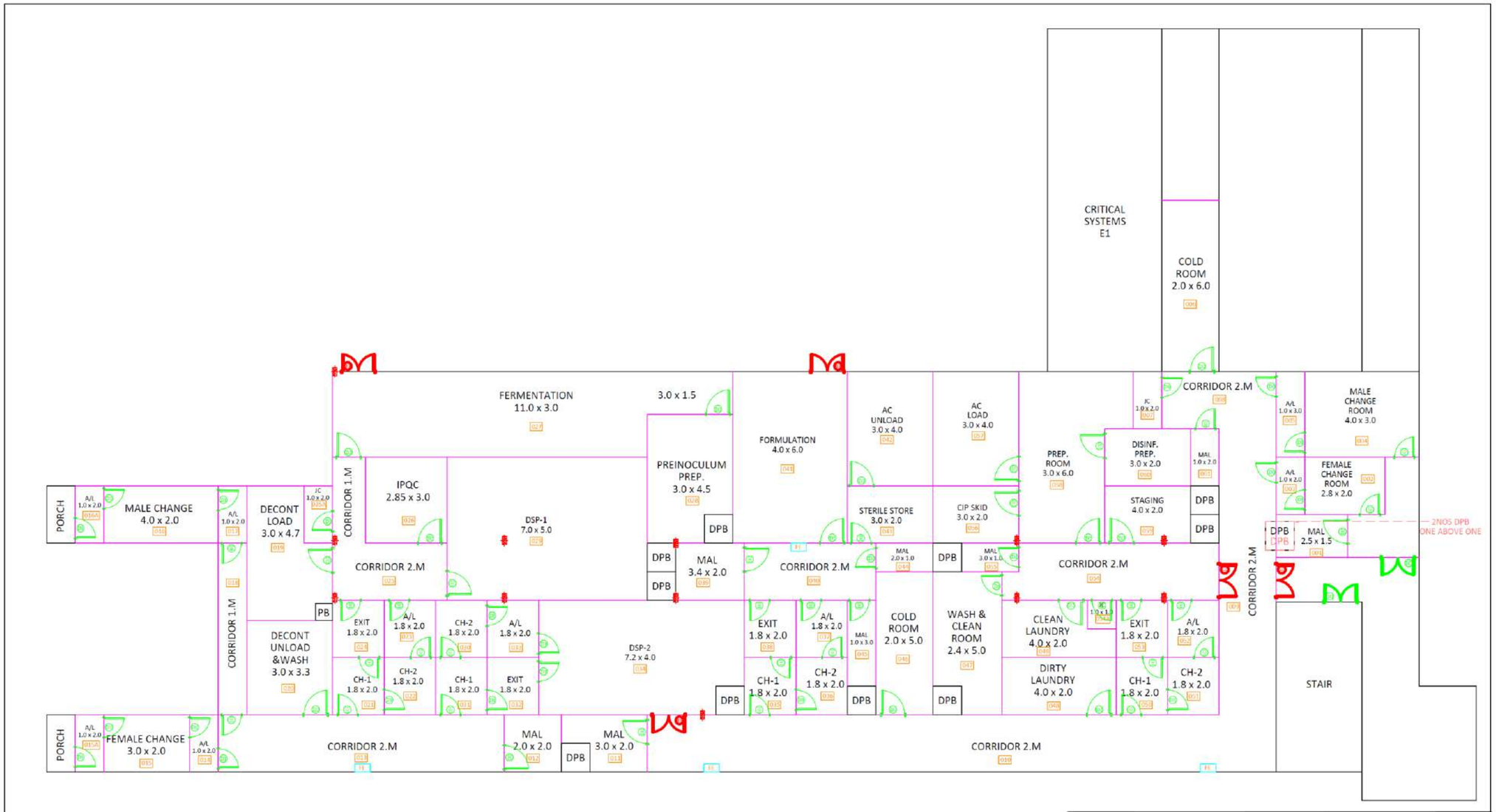
S.NO.	DESCRIPTION	UNIT	QUANTITY	SUPPLY UNIT RATE (INR)	SUPPLY AMOUNT (INR)	INST. UNIT RATE (INR)	INST. AMOUNT (INR)
	25 NB	**Nos**	**6**				
	32 NB	**Nos**	**6**				
	40 NB	**Nos**	**4**				
11	**M.S SUPPORT FOR ALL UTILITY PIPING**						
1	L Type Channel	**Set**	**1**				
2	U Type Channel	**Set**	**1**				

CHAPTER-18: COLD ROOM

S.NO.	DESCRIPTION	UNIT	QUANTITY	SUPPLY UNIT RATE (INR)	SUPPLY AMOUNT (INR)	INST. UNIT RATE (INR)	INST. AMOUNT (INR)
1	**COLD ROOM (2 TO 8°C)**						
1.1	**Room Size: 2m x 5m x 2.5m(h)**						
	50 mm PUF Panel 0.5mm TCT GIPP inside & GIPP outside skin with average density of 40kg/m³ for Walls and Ceilings. Complete with Camlocks.	**SQM**	**45**				
	50 mm PUF panels with 0.5 mm TCT GIPP skin outside and 12 mm marine ply with 1.2mm thick aluminium chequered plate inside for flooring.	**SQM**	**10**				
	50 mm Swing Door size (900 x 2000 mm) GIPP/GIPP FRP - Door section	**NOS.**	**1**				
	Installation Accessories such as angles, flashers, rivets and silicon sealants etc.	**SQM**	**55**				
	Supply of Refrigeration systems of following Air cooled condensing unit Evaporating unit control system & panels Copper Pipings with insulation & accessories	**LOT**	**1**				
1.2	**Room Size: 2m x 6m x 2.5m(h)**						
	50 mm PUF Panel 0.5mm TCT GIPP inside & GIPP outside skin with average density of 40kg/m³ for Walls and Ceilings. Complete with Camlocks.	**SQM**	**55**				
	50 mm PUF panels with 0.5 mm TCT GIPP skin outside and 12 mm marine ply with 1.2mm thick aluminium chequered plate inside for flooring.	**SQM**	**12**				
	50 mm Swing Door size (900 x 2000 mm) GIPP/GIPP FRP - Door section	**NOS.**	**1**				
	Installation Accessories such as angles, flashers, rivets and silicon sealants etc.	**SQM**	**67**				
	Supply of Refrigeration systems of following Air cooled condensing unit Evaporating unit control system & panels Copper Pipings with insulation & accessories	**LOT**	**1**				

Annexure II : Layouts for OCV manufacturing facility

1. Basic Layout



LEGEND

	80MM PPGI/PPGI WALL PANEL		DPB	ID-1000Lx1000Dx1000H	
D1	DOOR 750 X 2100		DPB	ID-1000Lx1000Dx1000H	
D2	DOOR 900 X 2100		PB	ID-600Lx600Dx600H	
DD	DOOR 1200 X 2100		FE	FIRE EXTINGUISHER	
DE	DOOR 1200 X 2100			CIVIL WALL	

Prepared By,

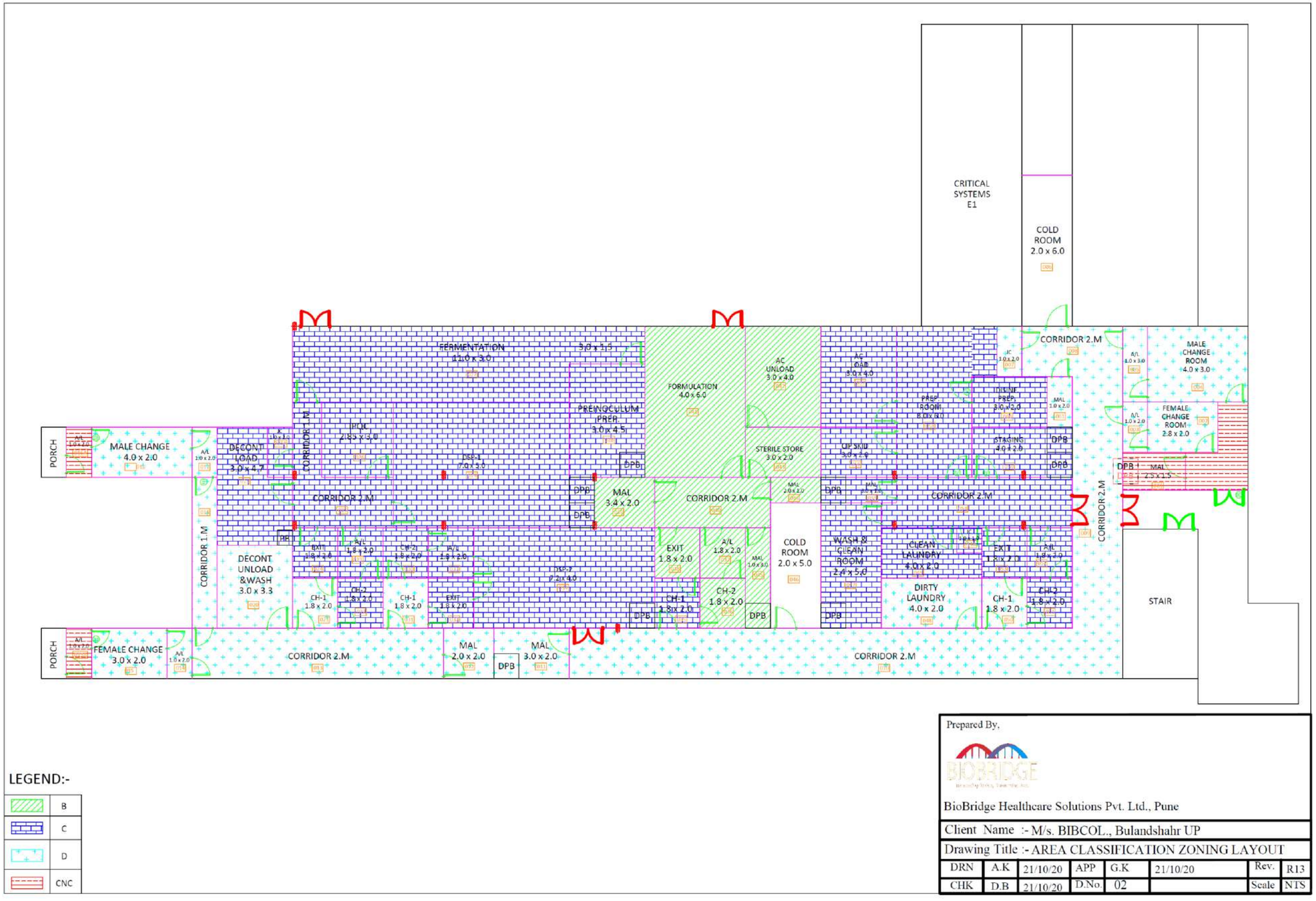
BioBridge Healthcare Solutions Pvt. Ltd., Pune

Client Name :- M/s. BIBCOL., Bulandshahr UP

Drawing Title :- Basic layout

DRN	A.K	21/10/20	APP	G.K	21/10/20	Rev.	R13
CHK	D.B	21/10/20	D.No.	01		Scale	NTS

2. Area Classification Zoning Layout

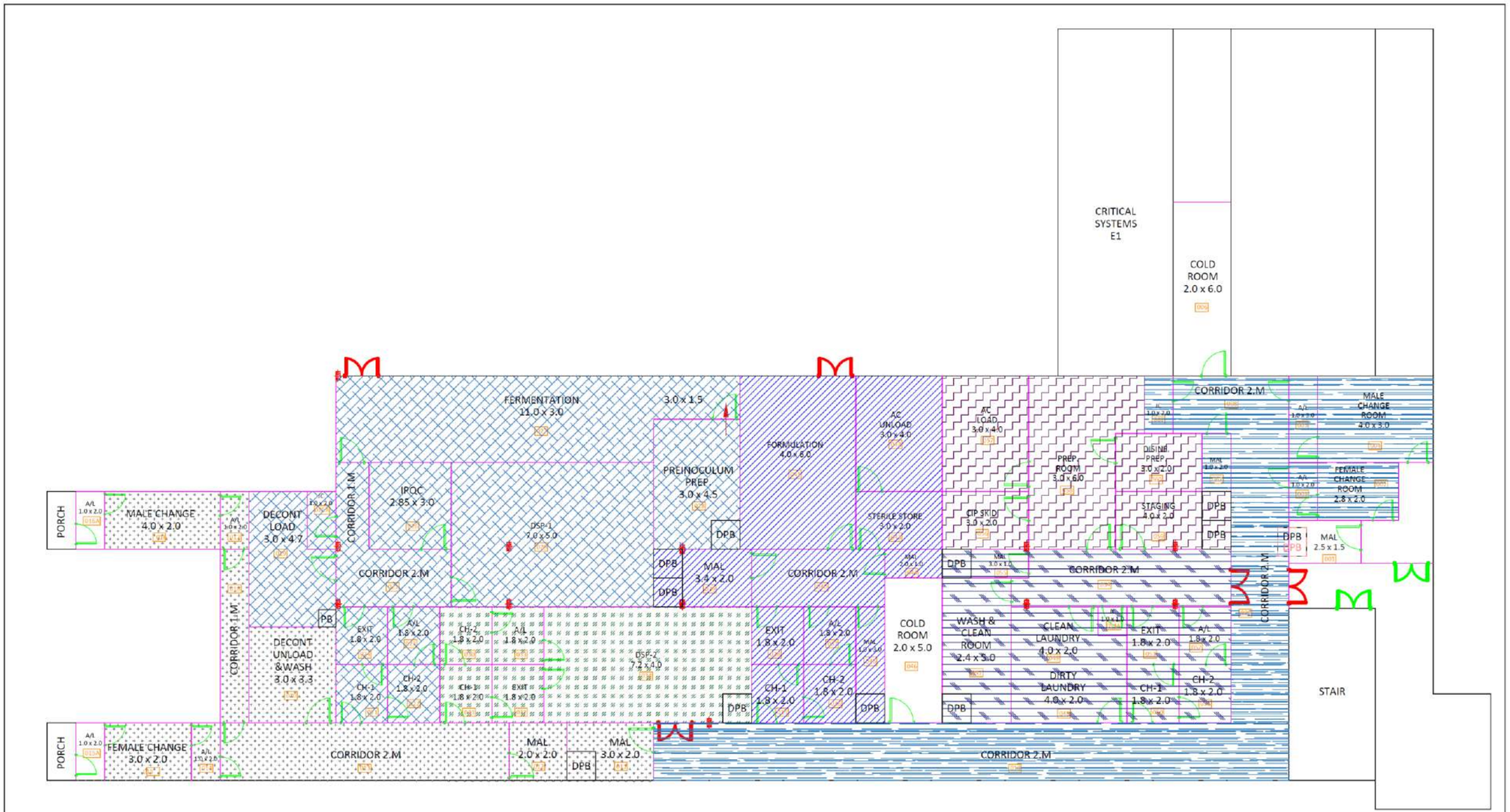


Prepared By,

BioBridge Healthcare Solutions Pvt. Ltd., Pune

Client Name :- M/s. BIBCOL., Bulandshahr UP							
Drawing Title :- AREA CLASSIFICATION ZONING LAYOUT							
DRN	A.K	21/10/20	APP	G.K	21/10/20	Rev.	R13
CHK	D.B	21/10/20	D.No.	02		Scale	NTS

3. AHU Zoning Layout



LEGEND:-

	AHU No.	TEMP.	RH
	AHU - 1	23±2°C	55±5%
	AHU - 2	23±2°C	55±5%
	AHU - 3	23±2°C	55±5%
	AHU - 4	23±2°C	55±5%
	AHU - 5	23±2°C	55±5%
	AHU - 6	23±2°C	55±5%
	AHU - 7	23±2°C	55±5%

Prepared By,

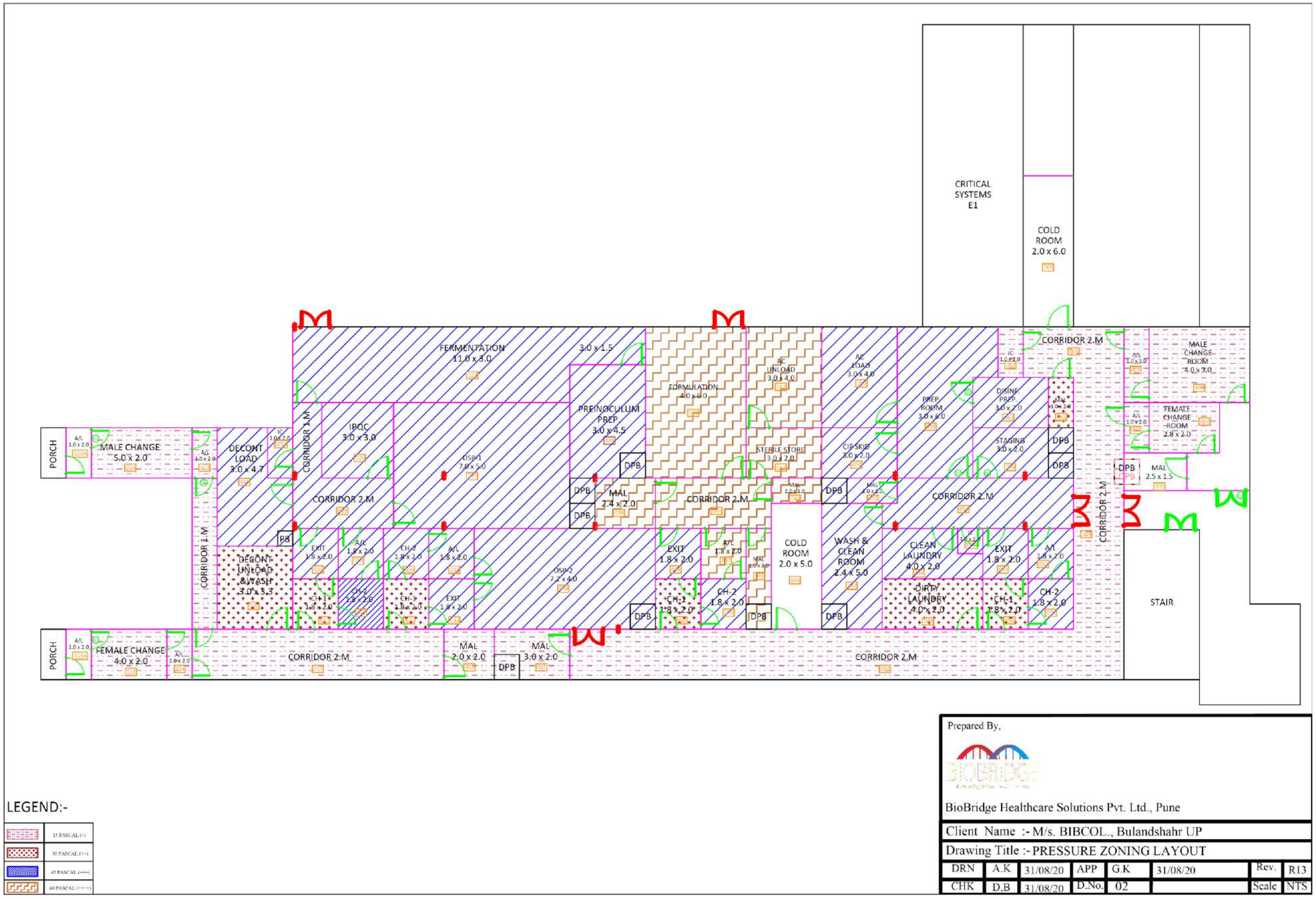
BioBridge Healthcare Solutions Pvt. Ltd., Pune

Client Name :- M/s. BIBCOL., Bulandshahr UP

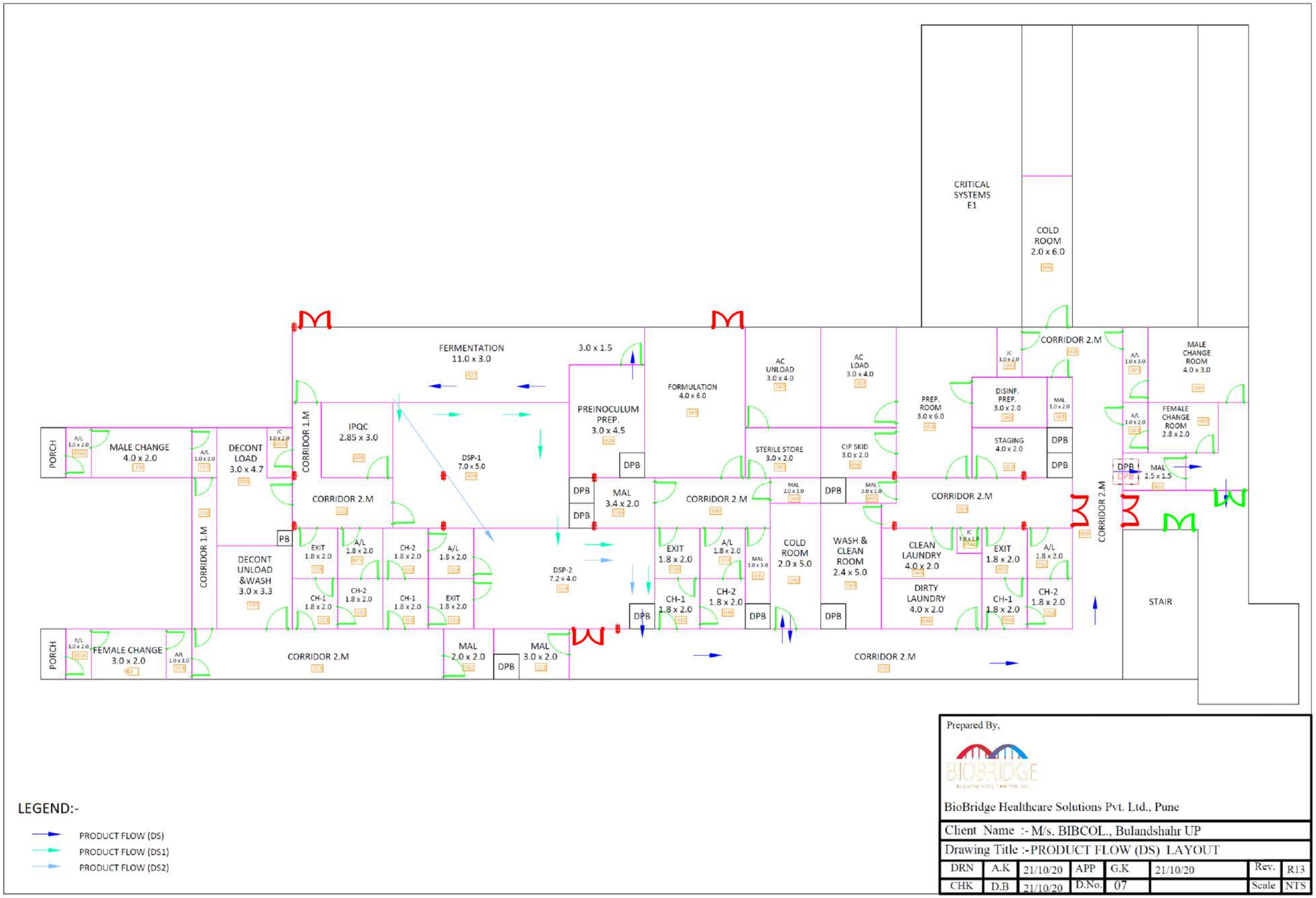
Drawing Title :- AHU ZONING LAYOUT

DRN	A.K	21/10/20	APP	G.K	21/10/20	Rev.	R13
CHK	D.B	21/10/20	D.No.	12		Scale	NTS

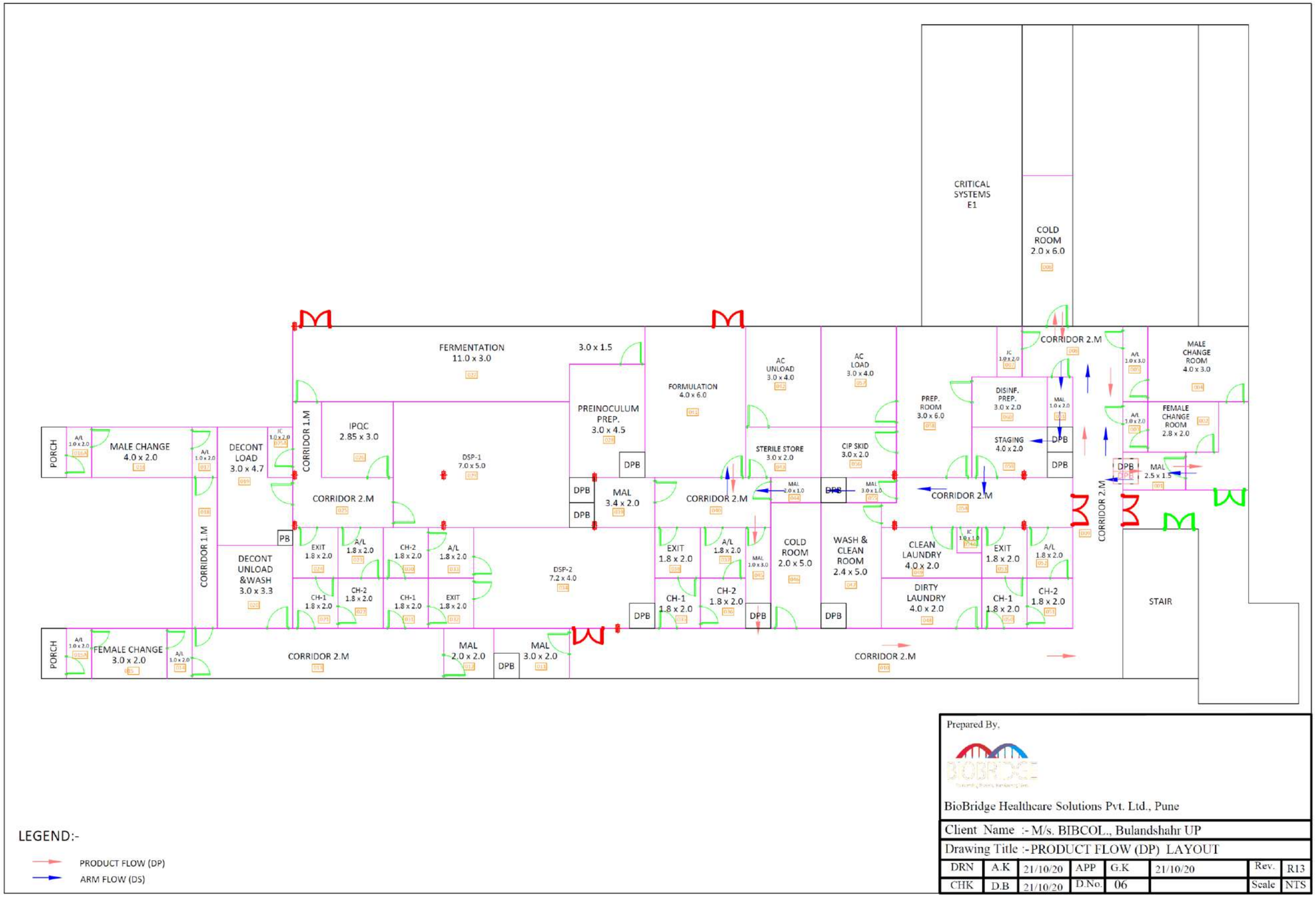
4. Pressure Zoning Layout



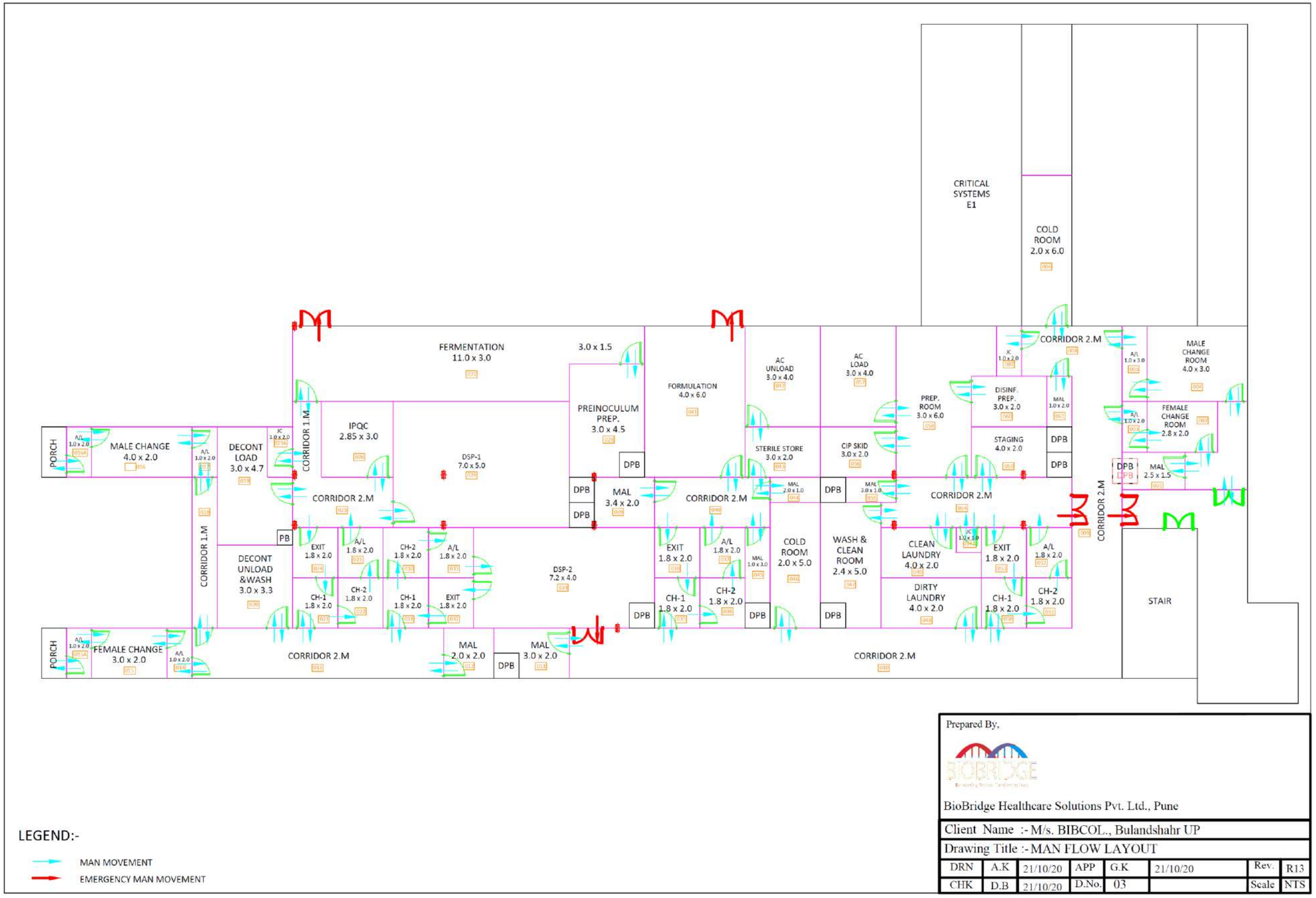
5. Product Flow (DS) Layout



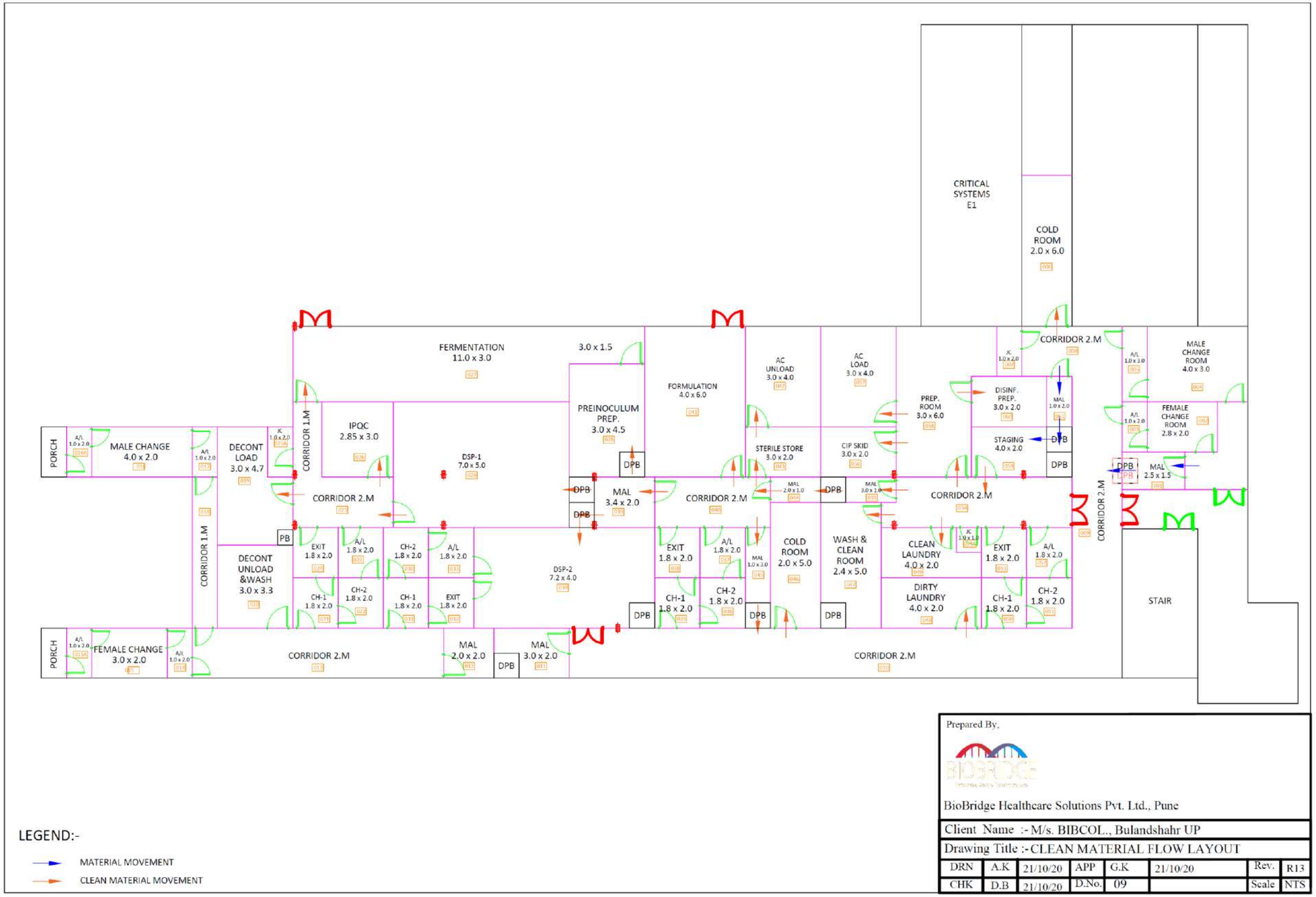
6. Product Flow (DP) Layout



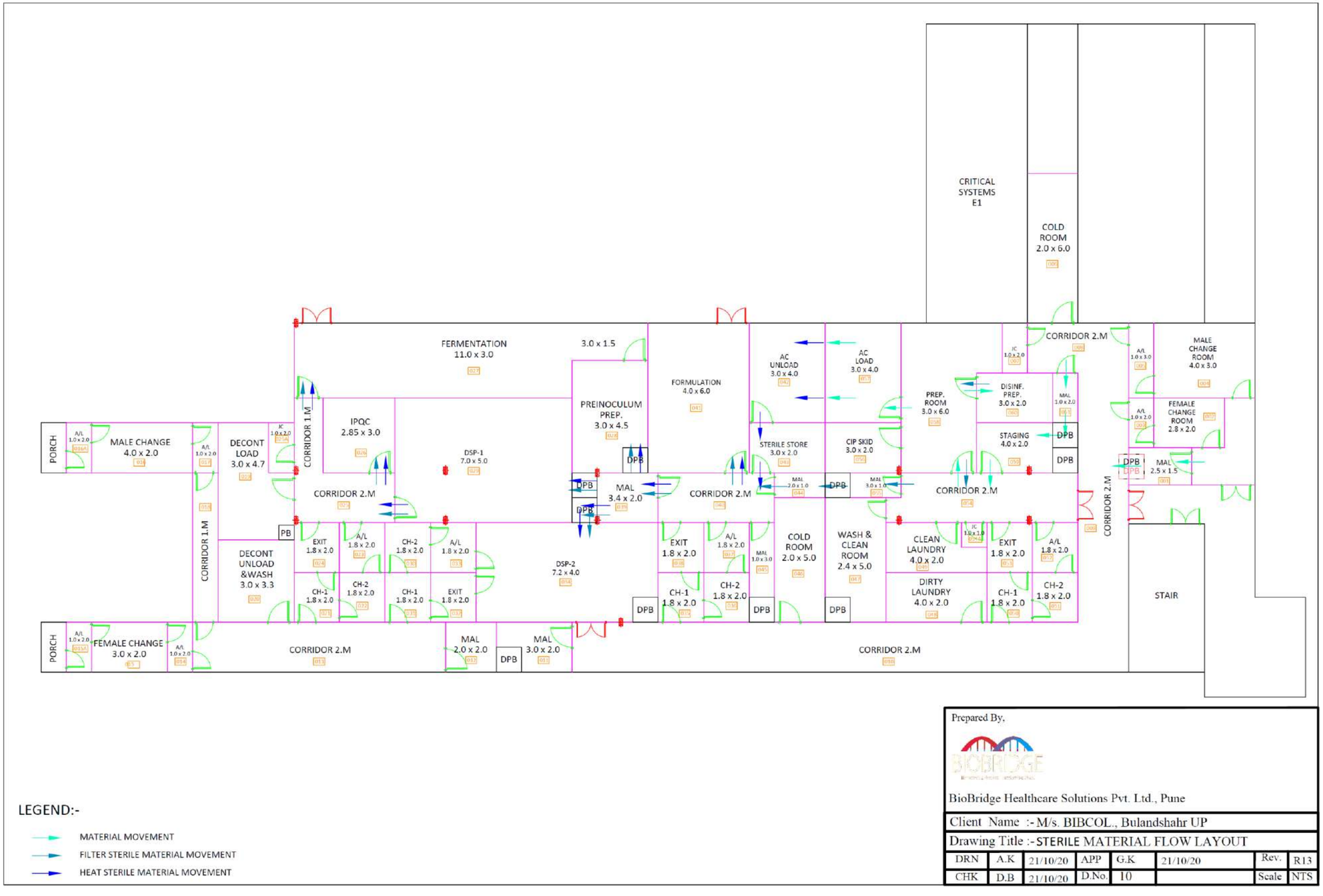
7. Man Flow Layout



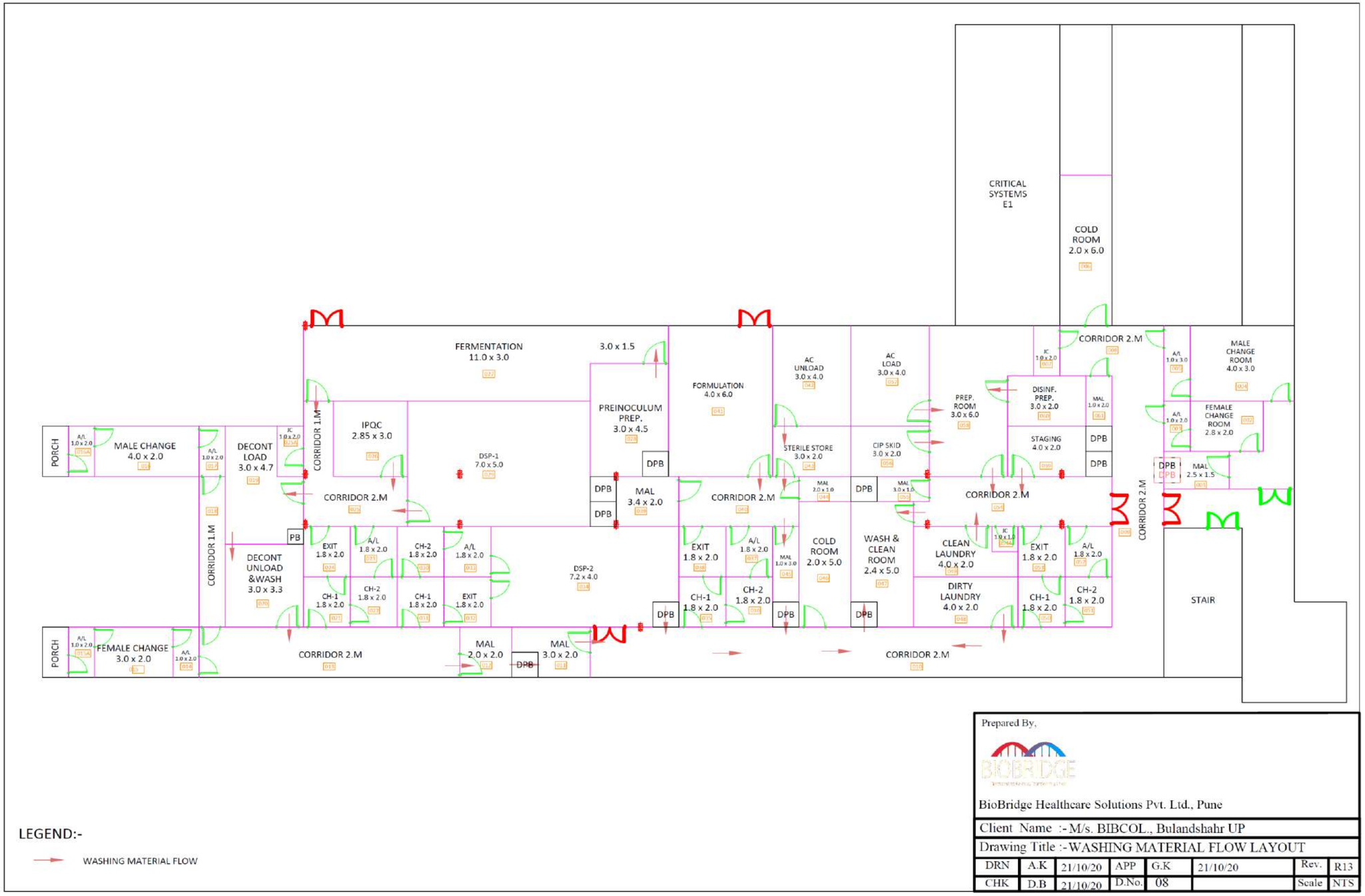
8. Clean Material Flow Layout



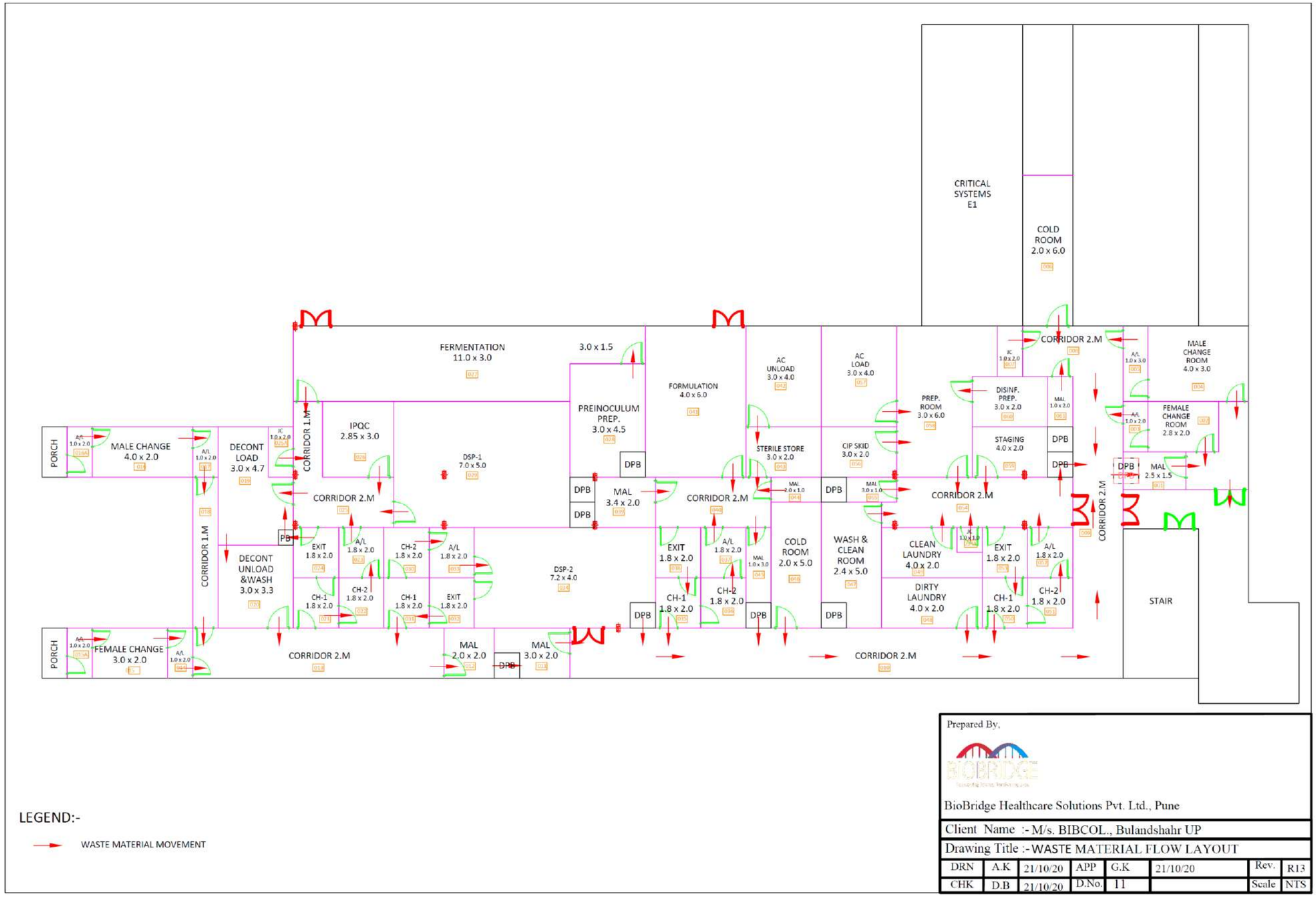
9. Sterile Material Flow Layout



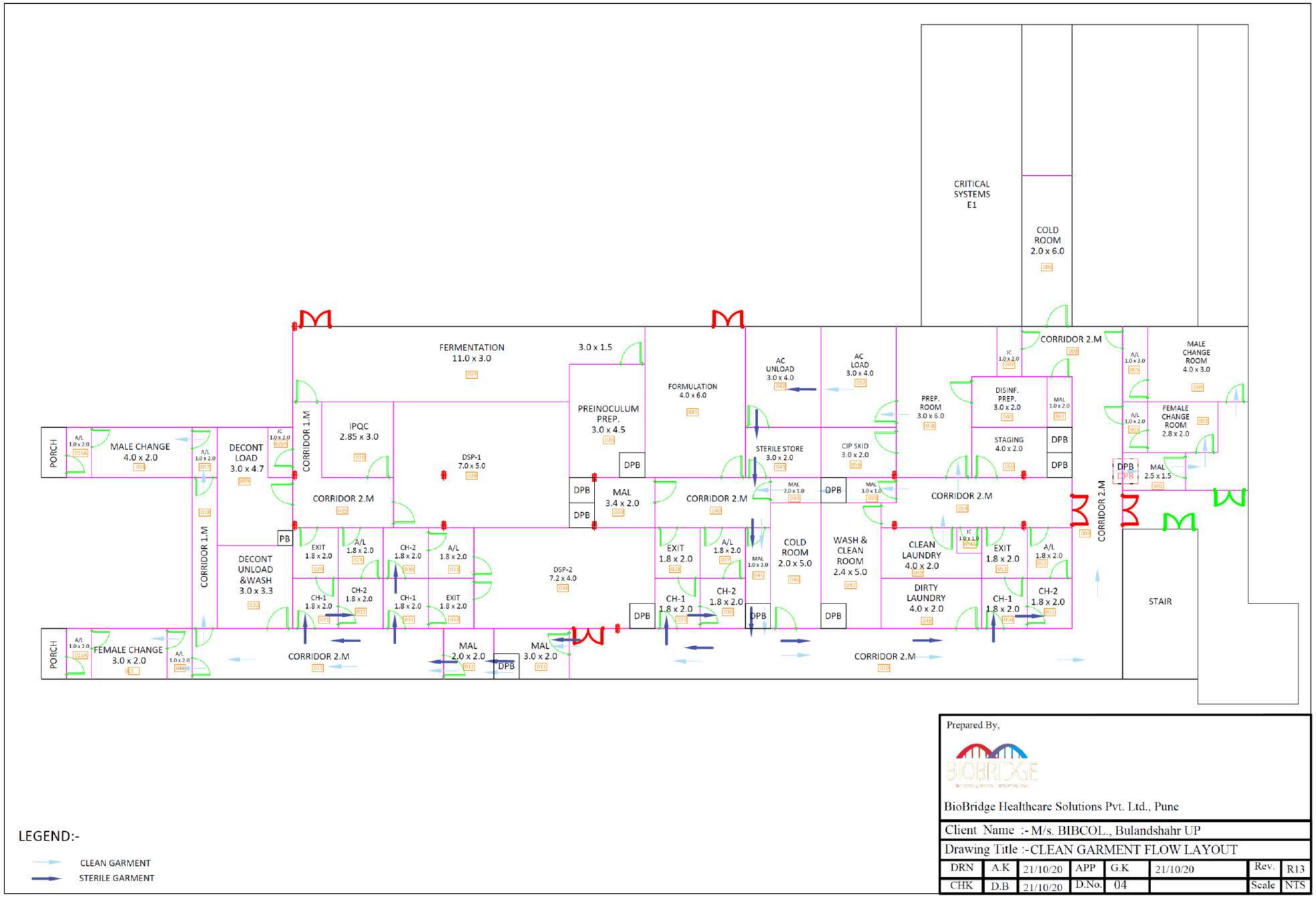
10. Washing Material Flow Layout



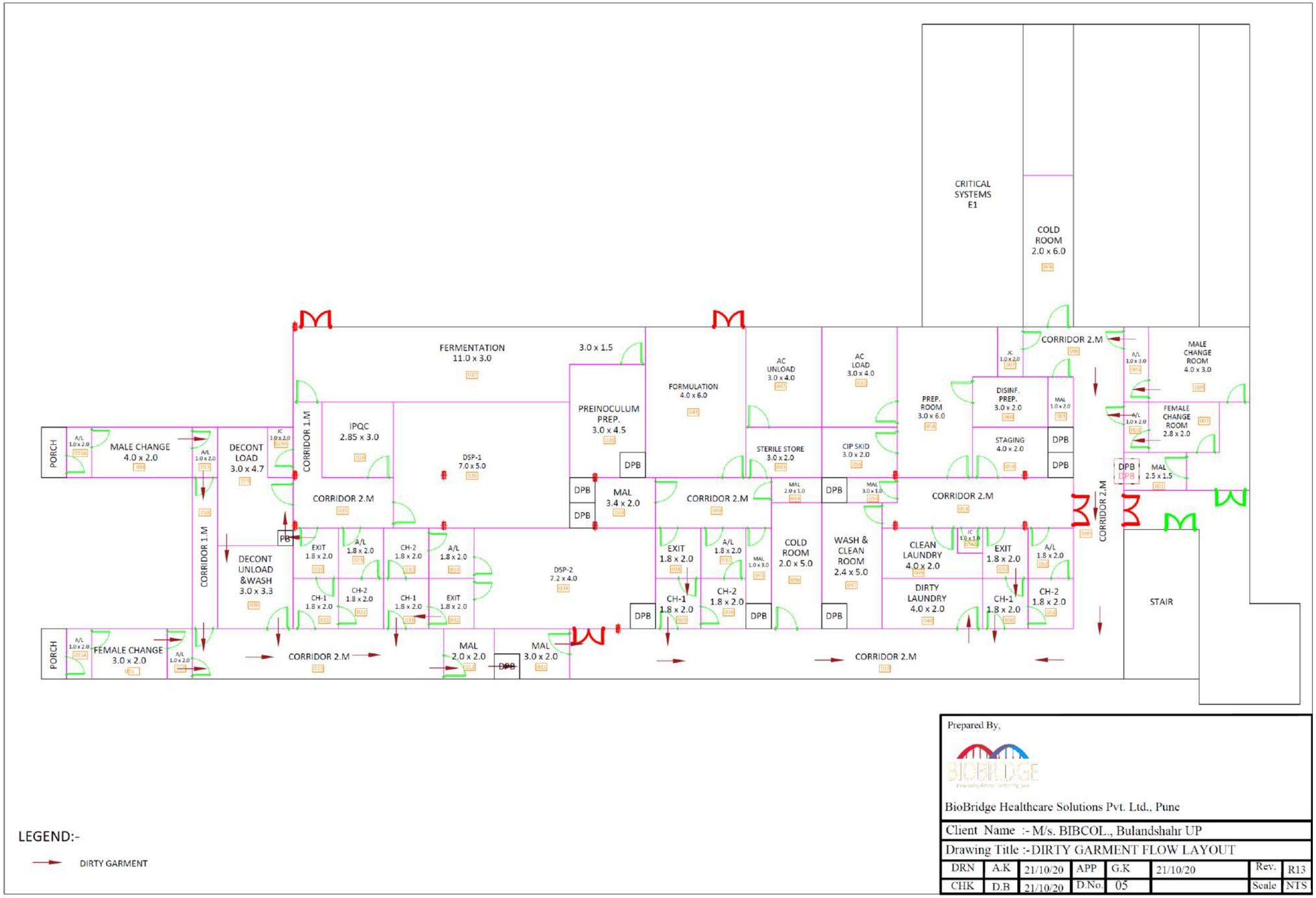
11. Waste Material Flow Layout



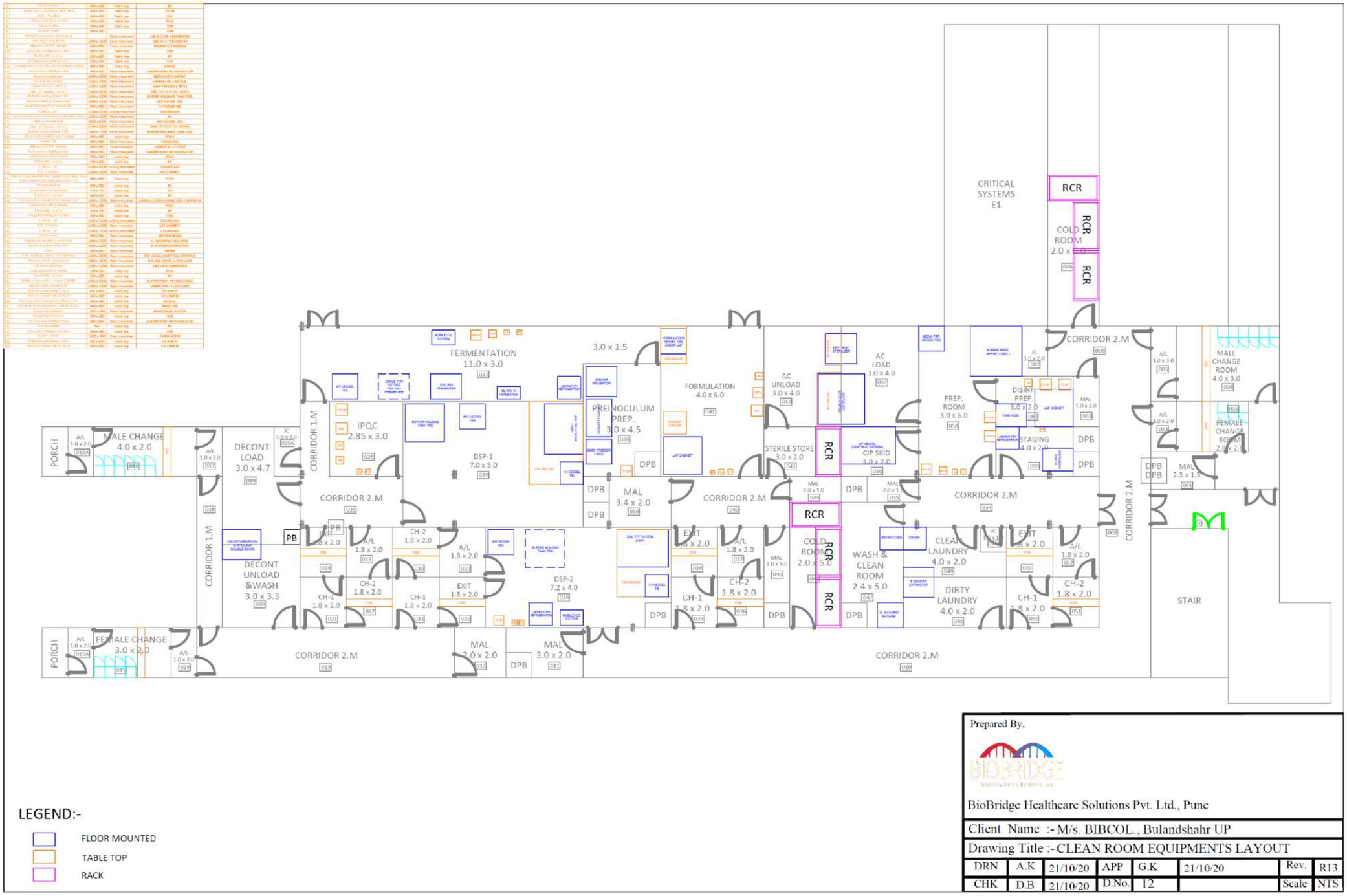
12. Clean Garment Flow Layout



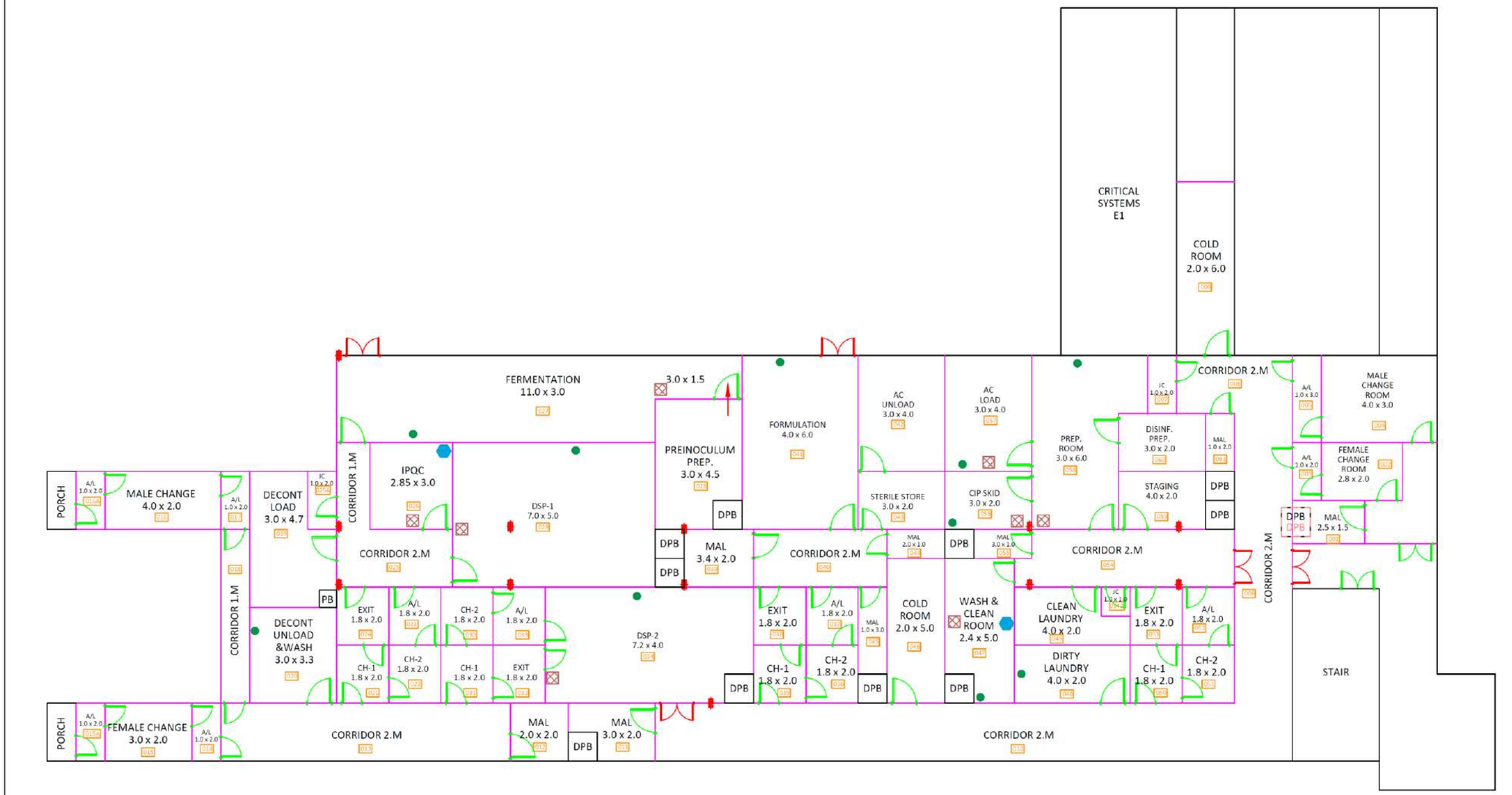
13. Dirty Garment Flow Layout



14. Clean Room Equipment Layout



15.Drain Location Layout



LEGEND

⊠	DRAIN	08 NOS.
●	EQUIPMENT DRAIN	10 NOS.
⬢	SINK DRAIN	02 NOS.

Prepared By,

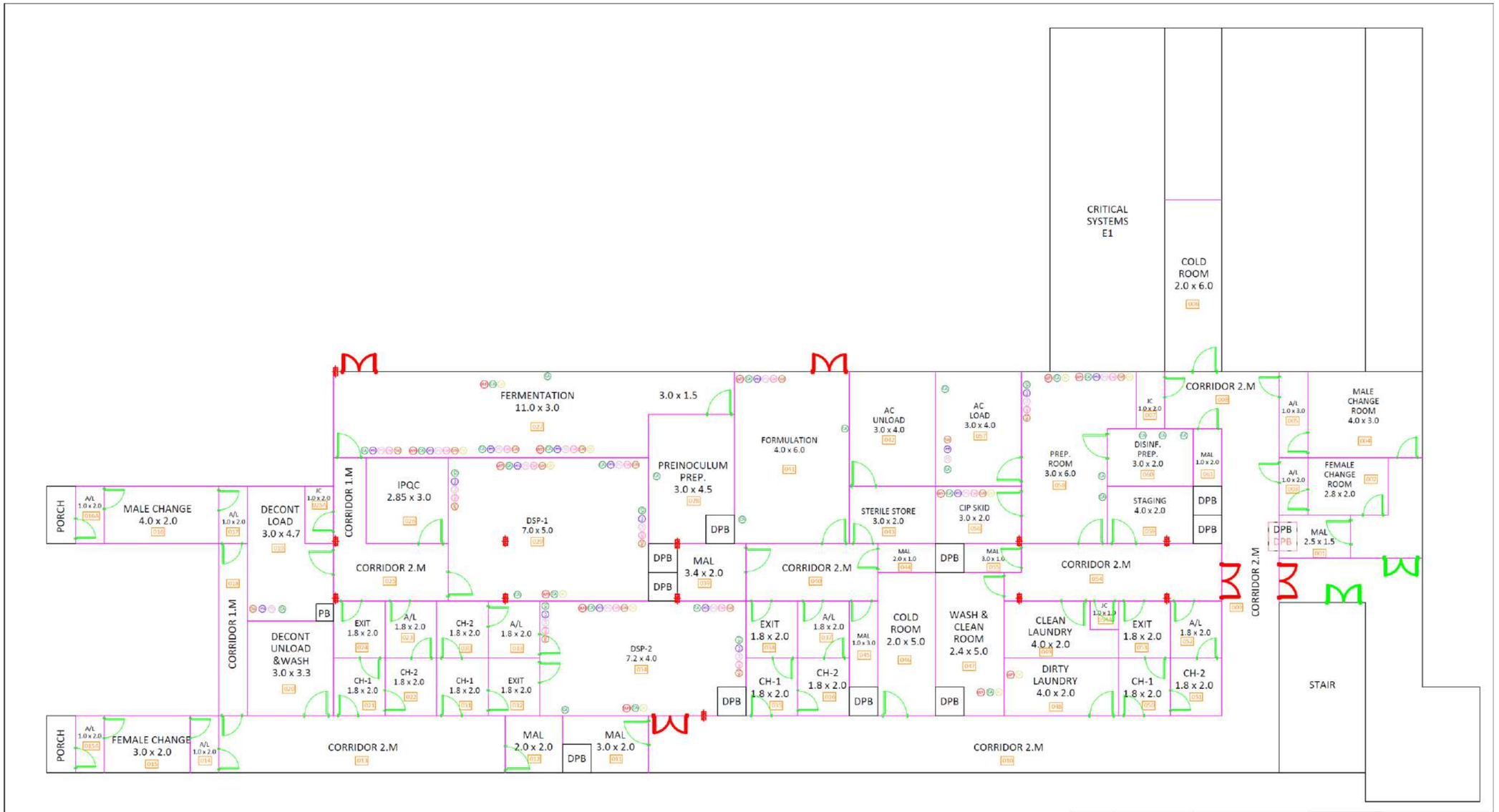
BioBridge Healthcare Solutions Pvt. Ltd., Pune

Client Name :- M/s. BIBCOL., Bulandshahr UP

Drawing Title :-DRAIN POINT LOCATION LAYOUT

DRN	A.K	26/11/20	APP	G.K	26/11/20	Rev.	R14
CHK	D.B	26/11/20	D.No.	13		Scale	NTS

16. Utility Location Point Layout



DI	DE-IONIZED WATER	12 NOS.
PS	PURE STEAM	18 NOS.
CA	COMPRESSED AIR	35 NOS.
WFI	WATER FOR INJECTION	13 NOS.
SW	SOFT WATER	18 NOS.
PTS	PLANT STEAM	18 NOS.
CW	COOL WATER	16 NOS.

Prepared By,

BioBridge Healthcare Solutions Pvt. Ltd., Pune

Client Name :- M/s. BIBCOL., Bulandshahr UP							
Drawing Title :- UTILITY POINT LOCATION LAYOUT							
DRN	A.K	21/10/20	APP	G.K	21/10/20	Rev.	R13
CHK	D.B	21/10/20	D.No.	14		Scale	NTS

Annexure III : Room Data Sheet

Room Data sheet for OCV Manufacturing facility

ROOM.NO.	AHU NO.	ROOM NAME	LENGTH (M)	WIDTH (M)	AREA (M^2)	AREA (FT^2)	HEIGHT (M)	VOLUME (M^3)	VOLUME (FT^3)	CLASS	TEMP. (°C)	RH %	FILTERATION			ROOM PRESSURE	LIGHTING LOAD (W/ft^2)	EQUIP. LOAD (HP)	AREA OCCUPANCY	ACPH	ROOM SUPPLY CFM AS PER AIR CHANGE	DEHUMIDIFIED CFM AS PER HEAT LOAD	FRESH AIR CFM	SELECTED CFM	COOLING LOAD AS PER HEAT LOAD (TR)	SELECTED (TR)	HEATER KW
035	AHU-1	CHANGE ROOM-1	1.80	2.00	3.60	38.75	2.40	8.64	305.12	CLASS C	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER	30	1666.3	3.0	4	40	203	3315	630	**7000**	9.59	**11.0**	2.63
036		CHANGE ROOM-2	1.80	2.00	3.60	38.75	2.40	8.64	305.12	CLASS B	23 ± 2° C	55 ± 5%	10µ/3µ/0.3µ	0.3µ	RISER	45				60	305						
037		AIR LOCK	1.80	2.00	3.60	38.75	2.40	8.64	305.12	CLASS B	23 ± 2° C	55 ± 5%	10µ/3µ/0.3µ	0.3µ	RISER	60				60	305						
038		EXIT	1.80	2.00	3.60	38.75	2.40	8.64	305.12	CLASS B	23 ± 2° C	55 ± 5%	10µ/3µ/0.3µ	0.3µ	RISER	45				60	305						
039		MAL	3.40	2.00	6.80	73.19	2.40	16.32	576.34	CLASS B	23 ± 2° C	55 ± 5%	10µ/3µ/0.3µ	0.3µ	RISER	60				60	576						
040		CORRIDOR	4.60	2.00	9.20	99.03	2.40	22.08	779.75	CLASS B	23 ± 2° C	55 ± 5%	10µ/3µ/0.3µ	0.3µ	RISER	60				60	780						
041		FORMULATION	4.00	6.00	24.00	258.33	2.40	57.60	2034.13	CLASS B	23 ± 2° C	55 ± 5%	10µ/3µ/0.3µ	0.3µ	RISER R10µ	60				60	2034						
042		AC UNLOAD	3.00	4.00	12.00	129.17	2.40	28.80	1017.06	CLASS B	23 ± 2° C	55 ± 5%	10µ/3µ/0.3µ	0.3µ	RISER R10µ	60				60	1017						
043		STERILE	3.00	2.00	6.00	64.58	2.40	14.40	508.53	CLASS B	23 ±	55 ±	10µ/3µ/0.3	0.3µ	RISER R10µ	60				60	509						

ROOM.NO.	AHU NO.	ROOM NAME	LENGTH (M)	WIDTH (M)	AREA (M^2)	AREA (FT^2)	HEIGHT (M)	VOLUME (M^3)	VOLUME (FT^3)	CLASS	TEMP. (°C)	RH %	FILTERATION			ROOM PRESSURE	LIGHTING LOAD (W/ft^2)	EQUIP. LOAD (HP)	AREA OCCUPANCY	ACPH	ROOM SUPPLY CFM AS PER AIR CHANGE	DEHUMIDIFIED CFM AS PER HEAT LOAD	FRESH AIR CFM	SELECTED CFM	COOLING LOAD AS PER HEAT LOAD (TR)	SELECTED (TR)	HEATER KW
		STORE									2° C	5%	µ														
044		MAL	2.00	1.00	2.00	21.53	2.40	4.80	169.51	CLASS B	23 ± 2° C	55 ± 5%	10µ/3µ/0.3µ	0.3µ	RISER	60				60	170						
045		MAL	1.00	3.00	3.00	32.29	2.40	7.20	254.27	CLASS B	23 ± 2° C	55 ± 5%	10µ/3µ/0.3µ	0.3µ	RISER	60				60	254						
					77	**833**		**186**	**6560**												**6458**						
056	AHU-2	CIP SKID	3.00	2.00	6.00	64.58	2.40	14.40	508.53	CLASS C	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER	45	1119.4	3.0	4	40	339	1931	300	**3500**	5.23	**5.5**	1.37
057		AC LOAD	3.00	4.00	12.00	129.17	2.40	28.80	1017.06	CLASS C	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER	45				40	678						
058		PREPARATION ROOM	3.00	6.00	20.00	215.28	2.40	48.00	1695.11	CLASS C	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER 10µ	45				40	1130						
			1.00	2.00																							
059		STAGING	4.00	2.00	8.00	86.11	2.40	19.20	678.04	CLASS C	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER10µ	45				40	452						
060		DISINFECTION PRE.	3.00	2.00	6.00	64.58	2.40	14.40	508.53	CLASS C	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER10µ	45				40	339						
					52	**560**		**125**	**4407**												**2938**						
047	AHU-3	WASH & CLEAN ROOM	2.40	5.00	12.00	129.17	2.40	28.80	1017.06	CLASS C	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER R10µ	45	1291.7	2.0	4	40	678	2042	330	**3500**	5.56	**5.5**	1.62
048		DIRTY	4.00	2.0	8.0	86.	2.40	19.2	678.	CLASS	23	55	10µ/5	0.3µ	RISE	30				30	339						

ROOM.NO.	AHU NO.	ROOM NAME	LENGTH (M)	WIDTH (M)	AREA (M^2)	AREA (FT^2)	HEIGHT (M)	VOLUME (M^3)	VOLUME (FT^3)	CLASS	TEMP. (°C)	RH %	FILTERATION			ROOM PRESSURE	LIGHTING LOAD (W/ft^2)	EQUIP. LOAD (HP)	AREA OCCUPANCY	ACPH	ROOM SUPPLY CFM AS PER AIR CHANGE	DEHUMIDIFIED CFM AS PER HEAT LOAD	FRESH AIR CFM	SELECTED CFM	COOLING LOAD AS PER HEAT LOAD (TR)	SELECTED (TR)	HEATER KW
		LUNDRY		0	0	11		0	04	D	± 2° C	± 5%	µ		R												
049		CLEAN LUNDRY	4.00	2.00	8.00	86.11	2.40	19.20	678.04	CLASS C	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER	45				40	452						
050		CHANGE ROOM-1	1.80	2.00	3.60	38.75	2.40	8.64	305.12	CLASS D	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER	30				30	153						
051		CHANGE ROOM-2	1.80	2.00	3.60	38.75	2.40	8.64	305.12	CLASS C	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER	45				40	203						
052		AIR LOCK	1.80	2.00	3.60	38.75	2.40	8.64	305.12	CLASS C	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER	45				40	203						
053		EXIT	1.80	2.00	3.60	38.75	2.40	8.64	305.12	CLASS C	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER	45				40	203						
054		PASSAGE	7.60 7.00	1.00 1.00	14.60	157.15	2.40	35.04	1237.43	CLASS C	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER	45				40	824.95						
055		MAL	3.00	1.00	3.00	32.29	2.40	7.20	254.27	CLASS C	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER	45				40	170						
					60	**646**		**144**	**5085**												**3226**						
031	**AHU-4**	CHANGE ROOM-1	1.80	2.00	3.60	38.75	2.40	8.64	305.12	CLASS D	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER	30	930.0	2.0	3	30	153	1557	240	**2500**	4.23	**5.5**	1.01
030		CHANG	1.80	2.0	3.6	38.	2.40	8.64	305.	CLASS	23	55	10µ/5	0.3µ	RISE	45				40	203						

ROOM.NO.	AHU NO.	ROOM NAME	LENGTH (M)	WIDTH (M)	AREA (M^2)	AREA (FT^2)	HEIGHT (M)	VOLUME (M^3)	VOLUME (FT^3)	CLASS	TEMP. (°C)	RH %	FILTERATION			ROOM PRESSURE	LIGHTING LOAD (W/ft^2)	EQUIP. LOAD (HP)	AREA OCCUPANCY	ACPH	ROOM SUPPLY CFM AS PER AIR CHANGE	DEHUMIDIFIED CFM AS PER HEAT LOAD	FRESH AIR CFM	SELECTED CFM	COOLING LOAD AS PER HEAT LOAD (TR)	SELECTED (TR)	HEATER KW
		E ROOM-2		0	0	75			12	C	± 2° C	± 5%	µ		R												
032		EXIT	1.80	2.00	3.60	38.75	2.40	8.64	305.12	CLASS C	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER	45				40	203						
033		AIR LOCK	1.80	2.00	3.60	38.75	2.40	8.64	305.12	CLASS C	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER	45				40	203						
034		DSP-2	7.20	4.00	28.80	310.00	2.40	69.12	2440.95	CLASS C	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER10µ	45				40	1627						
					43	**465**		**104**	**3661**												**2390**						
019	**AHU-5**	DECONT LOAD	2.00 1.00	4.70 2.70	12.10	130.24	2.40	29.04	1025.54	CLASS C	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER10µ	45	2895.5	3.0	8	40	684	4490	760	**8000**	12.28	**8.5+5.5**	4.13
021		CHANGE ROOM-1	1.80	2.00	3.60	38.75	2.40	8.64	305.12	CLASS D	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER	30				30	153						
022		CHANGE ROOM-2	1.80	2.00	3.60	38.75	2.40	8.64	305.12	CLASS C	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER	45				40	203						
023		AIR LOCK	1.80	2.00	3.60	38.75	2.40	8.64	305.12	CLASS C	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER	45				40	203						
024		EXIT	1.80	2.00	3.60	38.75	2.40	8.64	305.12	CLASS C	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER	45				40	203						
025		PASSA	4.00	2.0	11.	123	2.40	27.4	970.	CLASS	23	55	10µ/5	0.3µ	RISE	45				40	647						

ROOM.NO.	AHU NO.	ROOM NAME	LENGTH (M)	WIDTH (M)	AREA (M^2)	AREA (FT^2)	HEIGHT (M)	VOLUME (M^3)	VOLUME (FT^3)	CLASS	TEMP. (°C)	RH %	FILTERATION			ROOM PRESSURE	LIGHTING LOAD (W/ft^2)	EQUIP. LOAD (HP)	AREA OCCUPANCY	ACPH	ROOM SUPPLY CFM AS PER AIR CHANGE	DEHUMIDIFIED CFM AS PER HEAT LOAD	FRESH AIR CFM	SELECTED CFM	COOLING LOAD AS PER HEAT LOAD (TR)	SELECTED (TR)	HEATER KW
		GE		0	45	.25		8	45	C	± 2° C	± 5%	µ		R												
			1.15	3.00																							
025A		JC	1.00	2.00	2.00	21.53	2.40	4.80	169.51	CLASS C	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER 10µ	45				40	113						
026		IPQC	2.85	3.00	8.55	92.03	2.40	20.52	724.66	CLASS C	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER 10µ	45				40	483						
027		FORMULATION	11.00	3.00	37.50	403.65	2.40	90.00	3178.32	CLASS C	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER 10µ	45				40	2119						
			3.00	1.50											RISER 10µ												
028		PREINOCULUM PREP.	3.00	4.50	13.50	145.31	2.40	32.40	1144.20	CLASS C	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER 10µ	45				40	763						
029		DSP-1	7.00	5.00	35.00	376.74	2.40	84.00	2966.43	CLASS C	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER 10µ	45				40	1978						
					135	**1448**		**323**	**11400**												**7549**						
011	**AHU-6**	MAL	3.00	2.00	6.00	64.58	2.40	14.40	508.53	CLASS D	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER R	15	1504.8	3.0	4	30	254	2738	300	**3500**	6.17	**8.5**	2.73
012		MAL	2.00	2.00	4.00	43.06	2.40	9.60	339.02	CLASS D	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER R	15				30	170						
013		PASSAGE	10.00	2.00	20.00	215.28	2.40	48.00	1695.11	CLASS D	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER R	15				30	848						

ROOM.NO.	AHU NO.	ROOM NAME	LENGTH (M)	WIDTH (M)	AREA (M^2)	AREA (FT^2)	HEIGHT (M)	VOLUME (M^3)	VOLUME (FT^3)	CLASS	TEMP. (°C)	RH %	FILTERATION			ROOM PRESSURE	LIGHTING LOAD (W/ft^2)	EQUIP. LOAD (HP)	AREA OCCUPANCY	ACPH	ROOM SUPPLY CFM AS PER AIR CHANGE	DEHUMIDIFIED CFM AS PER HEAT LOAD	FRESH AIR CFM	SELECTED CFM	COOLING LOAD AS PER HEAT LOAD (TR)	SELECTED (TR)	HEATER KW
014		AIRLOCK	1.00	2.00	2.00	21.53	2.40	4.80	169.51	CLASS D	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER	15				30	85							
015		FEMALE CHANGE ROOM	4.00	2.00	8.00	86.11	2.40	19.20	678.04	CLASS D	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER	15				30	339							
015A		AIR LOCK	1.00	2.00	2.00	21.53	2.40	4.80	169.51	COMFORT	23 ± 2° C	NMT 65	10µ/5µ	DIFFUSER	DIFFUSER	NA				20	57							
016		MALE CHANGE ROOM	4.00	2.00	8.00	86.11	2.40	19.20	678.04	CLASS D	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER	15				30	339							
016A		AIR LOCK	1.00	2.00	2.00	21.53	2.40	4.80	169.51	COMFORT	23 ± 2° C	NMT 65	10µ/5µ	DIFFUSER	DIFFUSER	NA				20	57							
017		AIR LOCK	1.00	2.00	2.00	21.53	2.40	4.80	169.51	CLASS D	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER	15				30	85							
018		PASSAGE	1.00	6.00	6.00	64.58	2.40	14.40	508.53	CLASS D	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER	15				30	254							
020		DECONT UNLOAD & WASH	3.00	3.30	9.90	106.56	2.40	23.76	839.08	CLASS D	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER10µ	15				30	420							
					70	**752**		**168**	**5924**												**2906**							
001	**AHU-**	MAL	2.50	1.50	3.75	40.36	2.40	9.00	317.83	COMFORT	23 ± 2°	NMT 65	10µ/5µ	DIFFUSER	DIFFUSER	NA	2203.4	3.0	6	20	106	3570	430	**4500**	8.36	**8.5**	3.72

ROOM.NO.	AHU NO.	ROOM NAME	LENGTH (M)	WIDTH (M)	AREA (M^2)	AREA (FT^2)	HEIGHT (M)	VOLUME (M^3)	VOLUME (FT^3)	CLASS	TEMP. (°C)	RH %	FILTERATION			ROOM PRESSURE	LIGHTING LOAD (W/ft^2)	EQUIP. LOAD (HP)	AREA OCCUPANCY	ACPH	ROOM SUPPLY CFM AS PER AIR CHANGE	DEHUMIDIFIED CFM AS PER HEAT LOAD	FRESH AIR CFM	SELECTED CFM	COOLING LOAD AS PER HEAT LOAD (TR)	SELECTED (TR)	HEATER KW
	7										C																
002		FEMALE CHANGE ROOM	2.80	2.00	5.60	60.28	2.40	13.44	474.63	CLASS D	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER	15				30	237						
003		AIR LOCK	1.00	2.00	2.00	21.53	2.40	4.80	169.51	CLASS D	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER	15				30	85						
004		MALE CHANGE ROOM	4.00	3.00	12.00	129.17	2.40	28.80	1017.06	CLASS D	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER	15				30	509						
005		AIR LOCK	1.00	3.00	3.00	32.29	2.40	7.20	254.27	CLASS D	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER	15				30	127						
007		JC	1.00	2.00	2.00	21.53	2.40	4.80	169.51	CLASS D	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER	15				30	85						
008		PASSAGE	4.00	2.00	8.00	86.11	2.40	19.20	678.04	CLASS D	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER	15				30	339						
009		PASSAGE	10.00	2.00	20.00	215.28	2.40	48.00	1695.11	CLASS D	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER	15				30	848						
010		PASSAGE	22.00	2.00	44.00	473.61	2.40	105.60	3729.23	CLASS D	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER	15				30	1865						
061		MAL	1.00	2.00	2.00	21.53	2.40	4.80	169.51	CLASS D	23 ± 2° C	55 ± 5%	10µ/5µ	0.3µ	RISER	15				31	88						

ROOM.NO.	AHU NO.	ROOM NAME	LENGTH (M)	WIDTH (M)	AREA (M^2)	AREA (FT^2)	HEIGHT (M)	VOLUME (M^3)	VOLUME (FT^3)	CLASS	TEMP. (°C)	RH %	FILTERATION			ROOM PRESSURE	LIGHTING LOAD (W/ft^2)	EQUIP. LOAD (HP)	AREA OCCUPANCY	ACPH	ROOM SUPPLY CFM AS PER AIR CHANGE	DEHUMIDIFIED CFM AS PER HEAT LOAD	FRESH AIR CFM	SELECTED CFM	COOLING LOAD AS PER HEAT LOAD (TR)	SELECTED (TR)	HEATER KW
					102	**1102**		**246**	**8675**												**4287**						
	FDV-01-S	AHU AREA	25.00	14.00	3500.00	3767.37	3.00	1050.00	37080.44	VENTILATION	AMBT	AMBT	10µ/5µ	GRILL	GRILL	NA	NA	NA	NA	15	9270	NA	9270	**9500**	NA	**NA**	NA
					350	**3767**		**1050**	**37080**												**9270**						
	FDV-01-E	AHU AREA	25.00	14.00	3500.00	3767.37	3.00	1050.00	37080.44	VENTILATION	AMBT	AMBT	10µ	GRILL	GRILL	NA	NA	NA	NA	15	9270	NA	9270	**9500**	NA	**NA**	NA
					350	**3767**		**1050**	**37080**												**9270**						

Annexure IV : List of preferred vendor

List of preferred vendor / suppliers

Any one of the following makes of equipment/components/items are acceptable to the company subject to meeting the technical specifications specified in the tender. Please note that any other makes which are specified as EQUIVALENT should be approved by BIBCOL / & or Technical consultant after submitting required sample and technical specification sheet.

I. Preferred Makes of HVAC & Cleanroom Fabrics / Interiors

S. No.	Item Description	Preferred Make
1	Chilled water pipes class c	Sail / Tata / Jindal / Rensa or Equivalent
2	Globe valve/gate valve/butterfly valve /check valve/	Castle / Advance / Audco / Alfa laval / Forbes Marshall / Zoloto or Equivalent
3	3 way control/mixing valve	Honeywell / Siemens or Equivalent
4	Balancing valves/ flow measuring devices	Bell & Gossett / tour & Anderson or Equivalent
5	Water flow switch	Honeywell / Siemens or Equivalent
6	Air handling Units	Citizen / Vts / Flaktwoods / Edgetech / Systemair / Zeco / Chrisleen / Equivalent
7	AHU Fan blower	Nicotra / Kruger / Flakt Woods or Equivalent
8	Motors for AHU	Crompton Greaves / ABB / Siemens / Bharat Bijili or Equivalent
9	Starter	Siemens / ABB / L&T / Schneider or Equivalent
10	Fire Dampers	Air Master / Caryaire / Ajanta / System Air / Ruskin Titus or Equivalent
11	Ducting – GI Sheets	Sail / Tata / Jindal or Equivalent
12	Duct Insulation	Armaflex / K Flex / Supreme / Trocellene / Armacell /Supreme or Equivalent
13	Damper Actuators	Honey Well / Siemens or Equivalent
14	Grilles/Diffusers/VCD/Ducting fittings	Air Master / Caryaire / Ajanta / System

S. No.	Item Description	Preferred Make
		Air / Flakt wood / Chrisleen / Ruskin Titus or Equivalent
15	FFM with ULPA filters U-15 & HEPA Filters H-14, HEPA filters H – 11, with 95 % efficiency	Camfil / Klenzaides / AAF / Sagicofin / Envirc O / Flanders / Terra Universal or Equivalent
16	Air shower	Klenzaides / I clean/ Gmp / Crp / Chempharma/Terra universal / Fab tech or Equivalent
17	Air Curtain	Almonard / Fabtech / Thermodyne or Equivalent
18	Pass Box	Klenzaides / Iclean / Gmp / Crp / Chempharma / Terra Universal / Chrisleen or Equivalent
19	Garment cubicle	Klenzaides / Iclean / Gmp / Crp / Chempharma / Terra Universal or Equivalent
20	Shoe Racks	Klenzaides / Iclean / Gmp / Crp / Chempharma / Terra Universal or Equivalent
21	Aluminium Honey Comb Wall/Ceiling system, Heavy duty Aluminium T ceiling grid, vision panels, Doors, Emergency Doors, Door Closures etc (internal Fabrics for Cleanroom)	Channel system / Flexicon / Plascore / American Cleenroom System Chrisleen / Dorma / Gizo or Equivalent
22	Wall & Ceiling Cladding/False ceiling Panel in Unclassified Areas 25mm /50mm thick	GMP / Iclean / Nicomac / Fabtech / Ahlada or Equivalent
23	Yellow films for glazed surfaces in Photolithography lab	UVprocessusa / Channel System / Plascore or Equivalent
24	Clean room Raised Flooring &	Hae Kwang / Tate / Veroveria / Access /

S. No.	Item Description	Preferred Make
	Pedastals	Microtek or Equivalent
25	Homogeneous Vinyl Flooring for Unclassified Areas	Wonder floor / GERFLOR / Stat clean / Chempharma / Doy Yee or Equivalent
26	Tear Drop Light Fixtures	Channelsystem / Microtek / Astra / Aaf / Liberty / Solite or Equivalent
27	Cleanroom Flat Diffuser Lights	Channelsystem / Microtek / Astra / Aaf / Liberty / Solite or Equivalent
28	Flat Light Fixtures in Unclassified Areas	Wipro / Solite / Pearlite / Osram / Philips / Havels / Syska or Equivalent
29	RH and temperature indicator	Waree / Hta or Equivalent
30	Magnahaulic gauge	WAREE / DWYER / Terra Universal / Omicron / Dwyer or Equivalent
31	Pressure gauges	WiKA / forbesmarshall / Jihnson Controls / Omicron or Equivalent
32	Flexible duct	Atco / Gp Spiro / Rolastar or Equivalent
33	Pre filter and Fine filter	Aaf / Klenzide / Sagicofin / Ashraecrp Sagicofin / Envirco/ Equivalent
34	Thermostats/Humidistat	Sauter / Siemens / Johnsons / Honeywell or Equivalent
35	DEHUMIDIFIERS	Bry- Air / White Washinghouse / Appidi / Dry Air or Equivalent
36	Pan type humidifier	Rapid Cool / Nordamann / Walter Meier or Equivalent
37	Electrical Strip Heaters	Heatcon / Daspass / Escorts or Equivalent
38	Temperature/RH/Pressure Sensors	Honeywell / Siemens / Johnson or Equivalent
39	BMS & access control	Honeywell / Siemens / Johnson / Smart / Essel / Radix or Equivalent
40	Switch Trunking	MK Electric / GE Electric / L&T / Schneider or Equivalent
41	Thermostat & Humidistat	Sauter / Siemens / Johnsons / Honeywell

S. No.	Item Description	Preferred Make
		or Equivalent
42	Electrical LT Panels	Reputed Manufactures Cpri Test Approved or Equivalent
43	Air Circuit Breaker & Bus Couplers	L & T / Siemens / Schneider / ABB or Equivalent
44	MCCB	L & T / Siemens / Schneider / ABB / CG / Legrand / ABB / L&T / Equivalent
45	MCB's	L & T / Siemens / Schneider / ABB / CG / Hagger / Legrand / ABB / L&T or Equivalent
46	Power/Control Contacts, Over load Relays, Timers, etc.	L & T / Siemens / Schneider / ABB or Equivalent
47	Fuses	CG / L & T / Siemens or Equivalent
48	Energy Meters	L & T / Conserve or Equivalent
49	Power Cables/Control Cables/Wires etc.	Finolex / Universal / Polycab / Unistar / Nicco or Equivalent
50	Electrical Conduits	Technomont / Vn/Jindal/Bharat/Gupta or Equivalent Make With ISI Std.
51	Switches & Sockets	Mk / Hagger / Lingguard / Anchor / Bch / Jabla or Equivalent
52	Cleanroom Intercom	Philips / Panasonic / Miran / Jie Jia or Equivalent
53	Air Compressors	Atlas Copco / Ingersol Rand or Equivalent
54	Air Compressor piping SS 304 Non EP	Sandvik / Valex / Swagelok / Jindal or Equivalent
55	House Vacuum	Roots / Electrux or Equivalent
56	Exhaust System	Flaktwoods / Kruger / ebm- NADI / Alpha Projects Pvt Ltd / Pilani Envirotech or Equivalent
57	Exhaust Ducting UPVC with FRP lining	Finolex / Durapipe / Jindal or Equivalent

S. No.	Item Description	Preferred Make
56	Process Vacuum	Leybold / Edward or Equivalent
59	Process Vacuum Piping – SS 304	Sandvik / Valex / Swagelok / Rensa / Jindal or Equivalent
60	Dry Scrubber	Flaktwoods / CS CleanSystem / Edwards Vacuum UK / Techharmonic / JupiterScience / Kanken Singapore / DAS Environmental Expert GmbH or Equivalent
61	Wet Scrubber	Transtech / Thermax / Alpha Projects Pvt Ltd / Pilani Envirotech / JR Fibreglass or Equivalent

II. Preferred Makes for Utilities

S.No	Item Description	Preferred Makes
1	DI Water Systems	Millipore / Komal / Graur&weil / Purelab-Elga / PAL or Equivalent
2	Compressed Dry Air	Atlas Copco / Ingersol Rand or Equivalent
3	Air Compressor piping SS 304 Non EP	Sandvik / Valex / Swagelok / Rensa / Jindal or Equivalent
4	Wet Extraction System.	Trans tech / Thermax / Alpha Projects Pvt Ltd / Pilani Envirotech / JR Fibreglass or Equivalent
5	Dry Extraction System.	Flaktwoods / CS CleanSystem / Edwards Vacuum UK / Techharmonic / JupiterScience / Kanken Singapore / DAS Environmental Expert GmbH or Equivalent
6	General Process Extraction System.	Trans tech / Thermax / Alpha Projects Pvt Ltd / Pilani Envirotech / Flaktwood or Equivalent
7	House Vacuum	Roots / Electrux or Equivalent

8	BMS, Access control	Honey well / Siemens or Equivalent
9	Effluent Drain	Bionics / Advance Equipment & Projects / SSP Pvt Ltd or Equivalent
10	DG set	Caterpillar / Kirloskargreen /Mahindra / Cummins / Powerica / or Equivalent
11	UPS	Emerson / Fuji Electric / Hitachi / APlab / Microtek / Vertive / Delta / Luminious or Equivalent
12	Process Chiller	Climaventa / ESKIMO / Voltas / Blue star / or Equivalant
13	PLC & SCADA	Honey Well / Midas / Comos / Draeger / Schneider or Equivalent
14	CONTROLLERS	SIEMENS / ABB / Mitsubishi / GE or Equivalent
15	Fire detection & Suppression	Inergen / FM 200 / Ravel / Equivalent or Equivalent

Note: Vendors should choose only among the approved makes of all the items mentioned above