Computer Services Centre
IIT Delhi

Invitation of expression of interest for design, commissioning and operating a primary data centre and a disaster recovery data centre at IIT Delhi

IIT Delhi invites expression of interest from interested parties for design, commissioning, maintenance and operations of

1. A primary data centre
2. An active disaster recovery data centre

at IIT Delhi. The data centres are to be constructed according to Tier 3 standards. The primary data centre will host approximately 40 server and storage racks and provide IT infrastructure, storage and HPC services to the IIT Delhi community. The disaster recovery data centre will host approximately 12 server and storage racks and will provide IT infrastructure and backup services to the IIT Delhi community.

The scope of the work will include

1. Detailed design and site preparation of the two data centres involving civil, electrical and mechanical work including dismantling, false ceiling, raised flooring, moisture sealing, fortification of windows and all other necessary components.
2. Supply, installation and commissioning of basic infrastructure, UPS, air conditioning, fire prevention and detection systems, lighting, access control and surveillance systems, rodent control system, BMS and data centre integrated management system (DCIM).
3. On site maintenance of the data centres for at least 5 years.
4. On site operations and support by qualified engineers on a 24×365 basis for at least 5 years to ensure at least 99.98% service availability.
5. Real-time measurements of all components of the data centre as per *Ashrae real-time energy consumption measurement in data centres 2009 (best practical)* guidelines.

1 Submission of expression of interest

1.1 Submission procedure

1. Interested parties are requested to submit an **expression of interest** document **latest by 1700 on February 14, 2014** at the office of the **Head, Computer Services Centre, IIT Delhi, New Delhi 110016**, in a sealed envelope.
2. They will also be required to make a detailed presentation to a technical committee tentatively in the third week of February. The exact date of the presentation will be intimated later.
3. The EOI document and the presentation should provide the broad design approach and mention all standards that will be adhered to.
4. Strict confidentiality of the submitted documents will be guaranteed.

1.2 Qualification criteria

1. The bidder should be a Private/ Public Limited company registered under the Companies Act, 1956 or a registered firm. The company/firm should be in existence for more than 5 years.

2. No consortium will be allowed.

3. The bidder should have valid ISO 9001: 2000 certification.

4. The bidder should not be under a declaration of ineligibility for corrupt or fraudulent practices or blacklisted with any government agency or PSU.

5. The bidder should have positive net worth for each of the last three financial years ending on 31.03.2013.

6. The prospective vendors should have adequate experience in data centre construction, setting up of IT, computing and networking services.

7. The bidder should have constructed at least three data centres in India, of similar or larger size and scope as the primary data centre. At least one of these should be within the last three years. The order value of at least one data centre built in the last three years should be more than Rs. 12 Crores.

8. The bidder should have experience in providing on-site support and facility management services to at least three data centres created by them and out of these at least one should be in the last three years.

9. The bidder must have on its roll adequate number of technically qualified professionals in systems integration, product installation, commissioning and related services out of which 10 should have certification as Data centre professional (CDCP) , 10 CDCS and 10 PMPs involved in active projects of similar nature.

10. The bidder should have in-house expertise for design and commissioning of data centres. In particular, they should have

    (a) Electrical consultants for designing the Electrical system, at least 2 experts and should be CDCS certified.

    (b) Mechanical consultants for designing the HVAC and other systems, at least 3 experts and should be CDCS certified.

Supporting documents for relevant qualification criteria should be submitted along with the expression of interest.

1.3 Evaluation criteria

1. Pre-qualification as per above. (Accept/reject).

2. Requirement understanding. (Accept/reject).

3. Compliance to industry standards for Tier 3 data centres - UPTIME, ASHRAE etc. (Accept/reject)

4. Efficiency of design approach in terms of space, power and cooling. Solution innovation towards achieving high efficiency of operations. PUE/DCIE. Value addition. (40 marks)

5. Organization experience and commitment to data centre practice. Past record in data centre construction and maintenance. In-house resources with relevant experience for data centre projects. (30 marks)

6. Rigour in design concepts and analysis. (20 marks)

7. Project execution methodology proposed. (10 marks)

As a part of the expression of interest the bidder should submit

- Basis of design and analysis of cooling solution at full load conditions including full details of assumptions made and the specific tools/softwares/references/standards used for the same.
- Projected average annual PUE based on hourly analysis for Delhi.
- PUE data of any operating modern data centre in India for 1 year (during last 3 years).
- Identify one data centre (address with some details) to which a visit can be organised within couple of days at no cost to the company (preferably same as above).
- Tentative makes/models (1 or more) of equipments such as DG, UPS, chillers, cooling tower, PAC, racks etc.

Bidders can submit more than one design options if they so wish.

In what follows we briefly provide the specifications of the data centres.

2 The envisaged IT load for the primary and the disaster recovery data centres

2.1 Primary data centre

2.1.1 Main server block IT load (indicative)

Equipment	Power/Rack (KW)	Racks (Nos)	Total power (KW)
Infrastructure			
32 blade servers (2x4 core Intel(R) Xeon(R) CPU E5540 @ 2.53GHz and 12 GB RAM)	8	1	8
NetApp 3140V (100 *TB)*	4	2	8
Baadal computing cloud			
96 blade servers (2x4 core Intel(R) Xeon(R) CPU X5670 @ 2.93GHz and 16 GB RAM or higher)	9	3	27
EVA 6400 and NetApp 3210V (120 *TB)*	5	2	10
Data centre and IITD networking			
Data centre switches: N5K × 1, N2K × 2 N7K, Internet access switches, firewall, ASR router	8	2	16
Fiber termination		1	
HPC			
16 2×E5-2670 and 2× K20 GPU with 128 GB	20	1	20
5 × 64 × 2 E5-2670 (or higher) with 128 GB per node, Infiniband	25	5	125
250 *TB* storage	20	2	40
Future HPC expansion			
5 × 64 × 2 E5-2670 (or higher) with 128 GB per node, Infiniband	25	5	125
250 *TB* storage	20	2	40
Future expansion			
32 blade servers (2x4 core Intel(R) Xeon(R) CPU E5540 @ 2.53GHz and 12 GB RAM)	8	14	112
Total primary DC IT load		40	531

2.1.2 Communication room IT load (indicative)

Equipment	Power/Rack (KW)	Racks (Nos)	Total power (KW)
Communication ISP racks	1.5	6	9

2.2 Disaster recovery data centre

Equipment	Power/Rack (KW)	Racks (Nos)	Total power
Data centre switches: N5K × 1, N2K × 2, N7K, Internet access switches, firewall, ASR router	8	2	16
32 blade servers (2x4 core Intel(R) Xeon(R) CPU X5670 @ 2.93GHz and 16 GB RAM or higher)	8	1	8
NetApp (100 *TB*)	3	2	8
ISP equipment	1.5	2	3
Fiber termination		1	
CSE equipment	6	4	24
Total disaster recovery DC IT load		12	59

3 Data centre layout

3.1 Primary data centre

The area identified for the proposed data centre is approximately 3000 *sq. feet* in the ground floor of the Library building of IIT Delhi. The approximate floor to ceiling height of the proposed data centre area is 11 *feet*. It is proposed to provision for the following services in the proposed data centre.

1. Main data centre containing server farming area, space for data centre networking equipment and precision air condition systems.
2. Network room for terminating all ISP connections.
3. UPS and battery rooms.
4. NOC and BMS room.
5. Electrical room.
6. Space for housing fire fighting equipment

An indicative floor plan is provided in Figures 1, 2, 3 and 4. Chillers, cooling towers and water treatment plants are to be installed in the roof of the Library building.

3.2 Disaster recovery data centre

The area identified for the proposed disaster recovery data centre is approximately 800 *sq. feet* in the ground floor (raised) of the newly constructed Khosla School of Information Technology building of IITD. An indicative floor plan is provided in Figure 5. The following services are required to be provisioned in the disaster recovery data centre.

1. Main data centre containing server farming area, space for data centre and ISP networking equipment and precision air condition systems.
2. Electrical room including space for battery and UPS.

4 Civil architecture and preparation of data centre: scope of work

The scope of the civil work will include site preparation and dismantling and disposal of necessary non-load bearing partitions and old air conditioning ducts. It will also include provisions for raised flooring and false ceiling. The following briefly describe the scope of the work.

Construction on the roof of the library building Suitable civil construction have to carried out on the roof of the library building to house the chillers, cooling towers, water side economisers, water treatment plants and other necessary equipment for the primary data centre. Suitable support and reinforcement structures will have to be constructed as necessary.

Demolition and dismantling In the area identified for the primary data centre, all existing partitions, furniture, concrete wall structures, false ceiling and AC ducts, electrical and other cables, switches, sockets, plaster and other related material will have to be dismantled and disposed off in a safe and systematic way minimising disturbance to the adjoining library area.

No dismantling is required for the disaster recovery data centre.

Data centre outer and inner structure The outer and inner structure of the entire data centre should be converted to be **2 hour fire rated**.

False flooring and ceiling Suitable raised false flooring and false ceiling as per prevailing standards should be provided at both the data centres as per site requirements.

Partition walls Partition walls within the data centres should have 2 *hour* fire rating. The walls and columns of the utility rooms should have adequate thermal insulation. Suitable smoke seals should be used with double doors. Fire rated vision panels will have to be provided at suitable locations.

5 Electrical work

Two independent circuits of $415V$ (without DG backup) will be available from IIT Delhi to the **primary data centre**. The DG sets for the primary data centre are to be provided as part of scope of the work.

One circuit of $415V$ with DG backup will be provided by IITD for the **disaster recovery data centre**.

5.1 DG sets

- All DGs will be complete with exhaust piping, fuel piping, exhaust stack structure, earthing etc.
- The DG sets should be of silent type.
- There should be a separate DG synchronising panel to be used for synchronising, auto-start and changeover between grid supply and DG.

5.2 Power supply to the data centres

- To achieve high power availability a $1+1$ solution with two independent power paths should be designed. All equipments such as cables, LT breakers etc. should also be in a $1+1$ configuration. Each path should be able to carry the full data centre load independently.
- There should an independent feeder for the server room. The power source for AC and other equipments should be separated from that of the server room.

5.3 Circuit breakers

There should be provision for adequate circuit breakers for handling in-rush and surge current to the equipment in addition to normal operating current. Each equipment should be provided a separate circuit with a circuit breaker which should be properly labeled in a single line diagram (SLD).

5.4 Power connectors

Power connectors for the server room should conform to prevailing standards. The placement of the power connectors should be properly planned both for redundancy and proximity.

5.5 Emergency power cut-off switch

There should be a cut-off switch to disconnect power from all computing equipment in the data centre. There should be a proper reset mechanism and safety mechanism against accidental operation. It should be located in the path between the MCB and the UPS.

5.6 Automatic transfer switch

A high availability redundant automatic transfer switch should be provided to switch from primary AC source to the redundant source. It should provide redundant power supply to all equipment.

5.7 UPS and battery

- For the data centre IT and communication load a redundant UPS system in $N+N$ configuration should be provided. These should provide 3 phase/neutral power supply to the server racks through a 5 wire system. These should be rack mounted and hot swappable systems in small size modules which can be switched on/off as per IT rack load demand. The UPS should provide backup for at least 10 minutes within which the DG system should automatically be switched on.
- Redundant power to every rack should be provided from at least two separate UPSs.
- The UPS output should be connected to the floor mounted PDUs through external isolation transformers.
- Facility should be provided to monitor and measure the output of each PDU in real-time remotely through an IP based network.

- A dedicated UPS system in $N + N$ configuration should be provided for fire and security system load and emergency lighting load.
- A dedicated UPS system in $N + N$ configuration should be provided for the critical AC pumps.
- The UPS systems should have adequate spike/surge suppression capabilities and should be provided with by-pass switches to isolate the UPS for repair.

5.8 Earthing

Provision for proper earthing of all equipments related to the data centre should be provided as per IEEE guidelines.

5.9 Electrostatic discharge (ESD) control

The data centre should be provided with equipments and methods for proper electrostatic discharge control

5.10 Site tests

Proper site tests as per standards should be conducted as a part of successful commissioning.

6 HVAC

1. The air-conditioning of the **primary data centre** and its associated support area should be provided from a common water cooled chiller system.
2. The water cooled chillers, the cooling towers along with the water treatment plant will be installed on the roof of the building housing the primary data centre.
3. There should be provision for free cooling/water side economisers to increase the cooling efficiency of the primary data centre.
4. Other efficient cooling solutions may be considered for the **disaster recovery data centre**.
5. The HVAC systems for both the data centres should have $N+1$ redundancy (minimum 20% or 1 unit, whichever is higher).
6. The inlet air temperature to the servers should be maintained at $24\pm2\,^{\circ}\mathrm{C}$ and humidity as per ASHRAE guidelines.
7. The cooling system in the server rack area should be designed using a combination of PAC, in-row cooling, rear door heat exchangers (RDHX), rack based cooling, or other efficient systems along with an appropriate layout design and hot/cold aisle containment if necessary.
8. The cooling systems should perform efficiently at variable load conditions. The overall cooling solution should be designed to achieve a low PUE. The target PUE for both the data centers should be around 1.5 or lower.

9. There should be redundant paths for all critical components and there should not be any single point of failure.

10. The areas other than those hosting the server farms and the network racks should be fitted with suitable comfort cooling systems. To the extent possible the cooling for these area should also be provided by the same HVAC units.

In addition, the air conditioning system should provision for

- Air filtration as per standards.
- Heating (if necessary) and humidifiers to maintain correct operating environment throughout the data centre.
- Automatic control systems for programmatic control of the cooling system and real-time monitoring.

The overall cooling solution should follow ASHRAE 2012 thermal guidelines.

7 PUE

- To assess the efficiency of the data centres the power usage effectiveness (PUE) would be computed as

$$\text{PUE} = \frac{\text{Data centre facility power at the main LT panel input}}{\text{Total IT power measured at the rack input}}$$

- The PUE should be estimated as the annualised average of hourly PUE calculations (8760 hours). A bin analysis will not be acceptable.
- The PUE should be estimated at various load factors ranging from 30% to 100%.
- The environmental conditions for estimating the annualised average PUE should be taken for Delhi from any standard source like ASHRAE, ISHRAE, IMD, NREL, energy simulation codes or standard softwares of reputed HVAC companies.
- Free cooling/water side economisers should be included in the scope of the overall design to achieve a low PUE value.
- The PUE calculations should be carried out as a part of the design of both the primary and disaster recovery data centres.

8 Data centre management and real-time measurements

- Both the primary data centre and the disaster recovery data centre should be equipped with state of the art data centre infrastructure management (DCIM) system and building management system (BMS) to remotely monitor and manage all aspects of the data centre on a 24×365 basis.
- The DCIM and BMS systems should use standard IP based protocols.
- There should be real-time reporting of

1. Power consumption, both aggregate and component wise.
2. Temperature and relative humidity at various locations in the data centre.
3. Temperature and pressure sensors for cooling and chilled water, energy, flow, BTU meters etc.
4. Instantaneous PUE , hourly PUE, daily PUE, monthly PUE and annual PUE.
5. Alarm indicators for component failures.

- There should should be real-time monitoring and logging of all parameters of the data centre as per *ASHRAE/TGG 2009 Real time energy consumption measurements in data centres* guidelines (best practical).
- There should be facilities for periodic reports (including uptime reports) of all aspects of the data centre.

9 Other requirements of the data centre

Apart from the main electrical and HVAC components mentioned above the data centres should also have

1. Passive cabling for all racks within the data centre.
2. Fire detection and suppression system.
3. Environmental monitoring and water leak detection system.
4. Rodent repellant system.
5. Video surveillance system.
6. Access control system.
7. A comprehensive building management system (BMS) and data centre infrastructure management (DCIM) system.

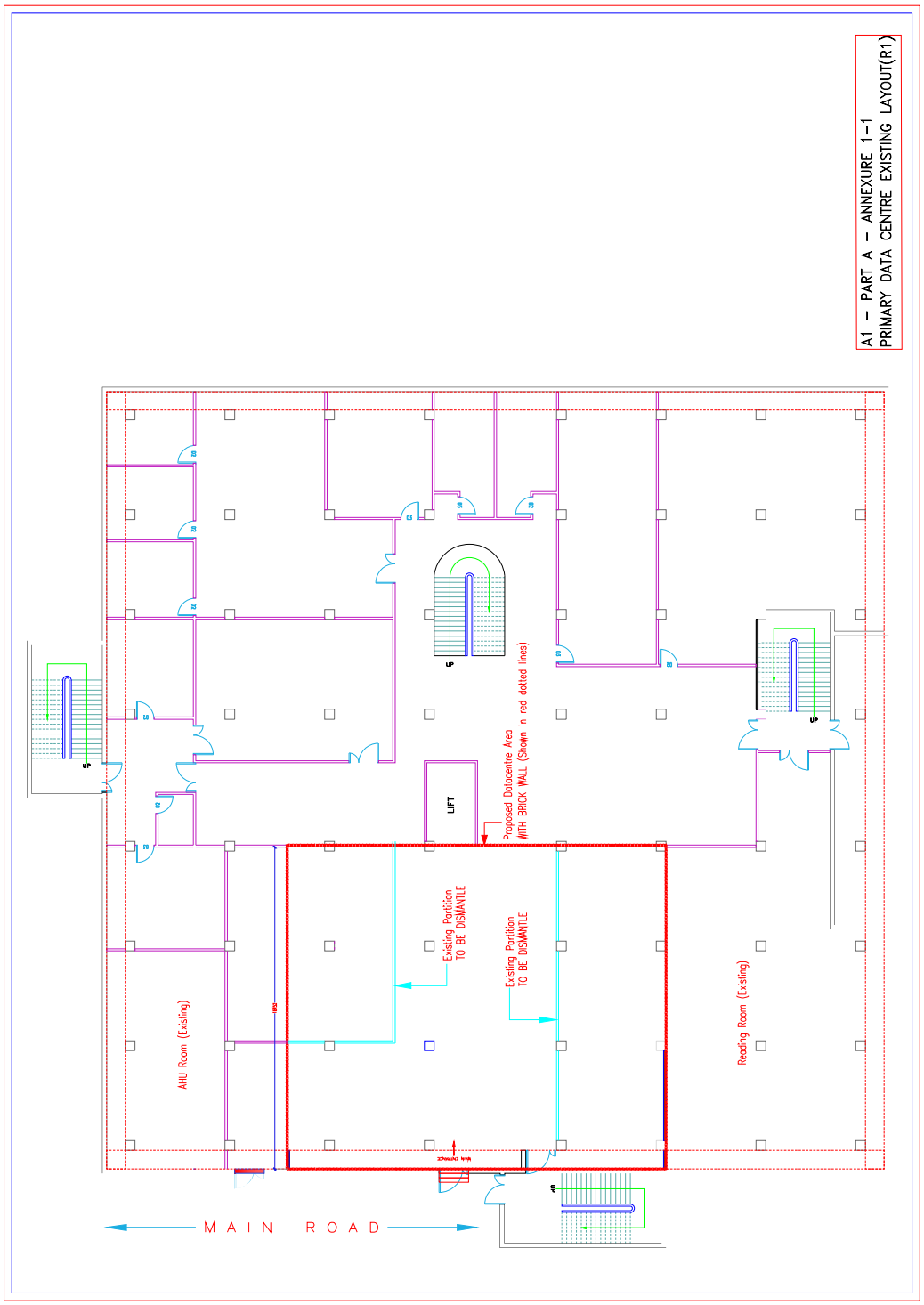

Figure 1: Primary data centre area marked in the Library building

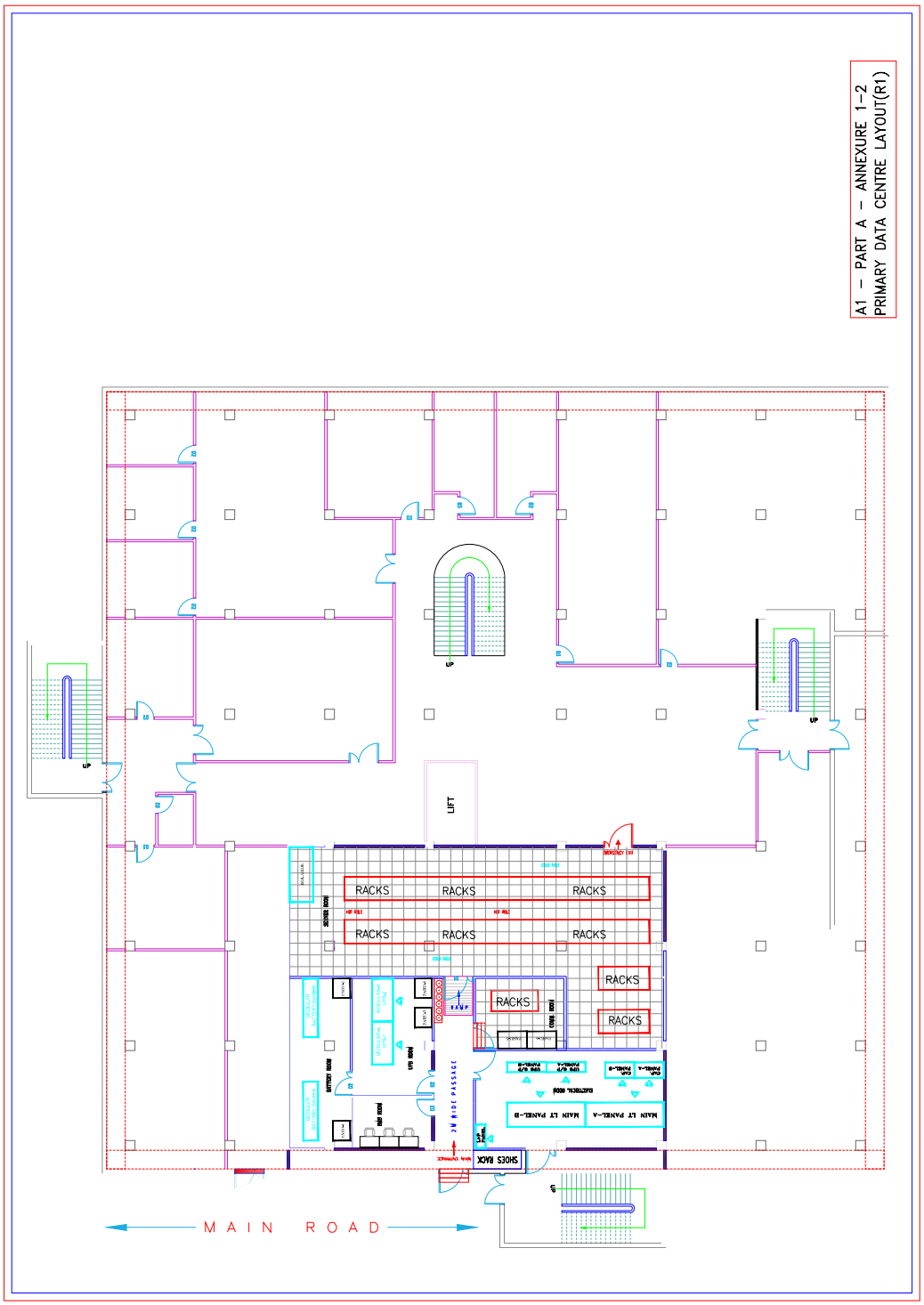

Figure 2: Indicative floor plan of the primary data centre

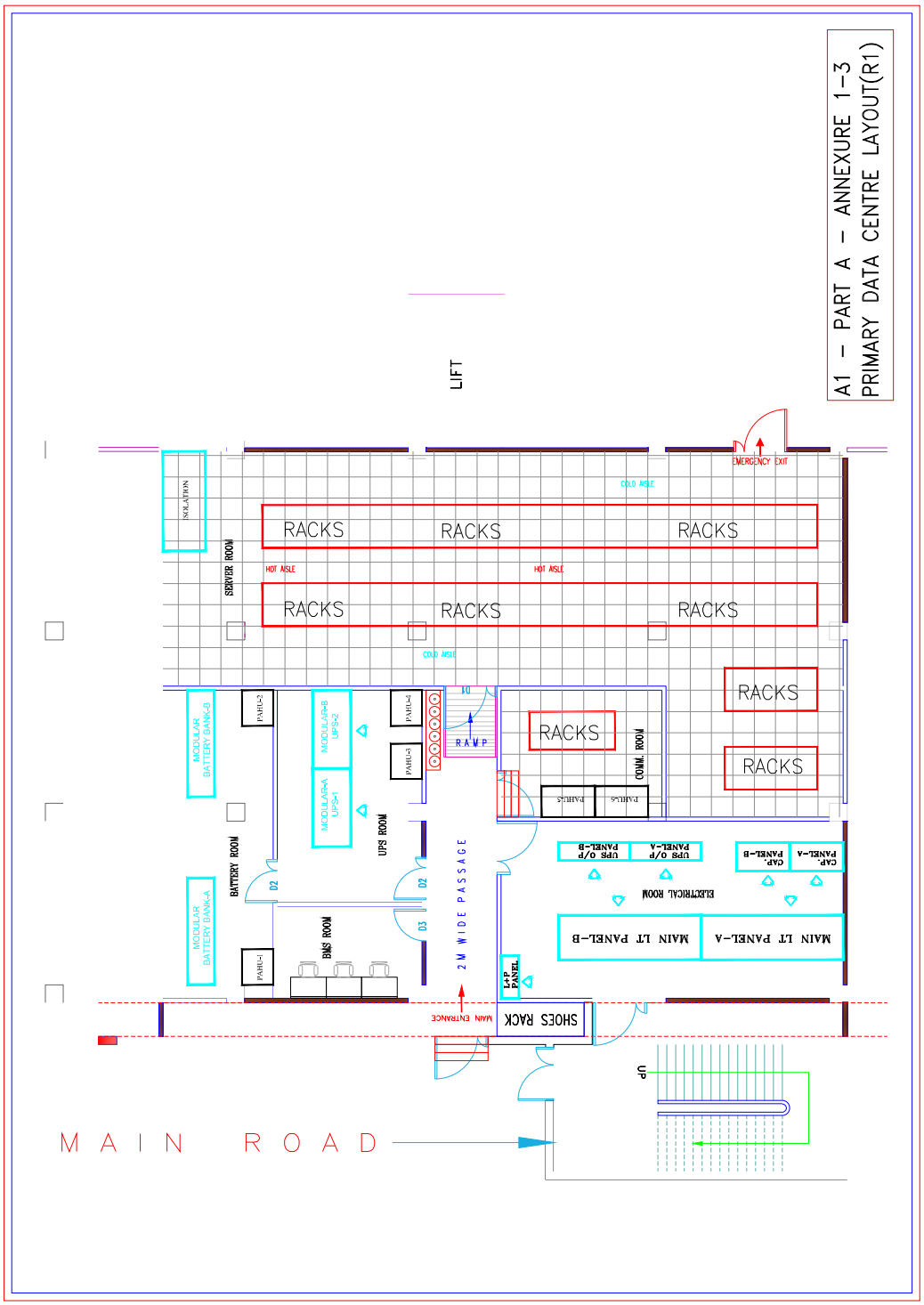

Figure 3: Indicative floor plan of the primary data centre

Sl. No.	Description	Length (mm)	Width (mm)	Area (sq. ft.)
1	Server Room	19135	8300	1708.908
2	BMS Room	7300	2500	196.370
3	Electrical Room	9600	3200	330.547
4	UPS Room	7300	4200	329.902
5	Communication Room	5200	3600	201.427
6	Store Room	3600	2400	92.966
	Total Area			2860.120

Figure 4: Dimensions of the primary data centre

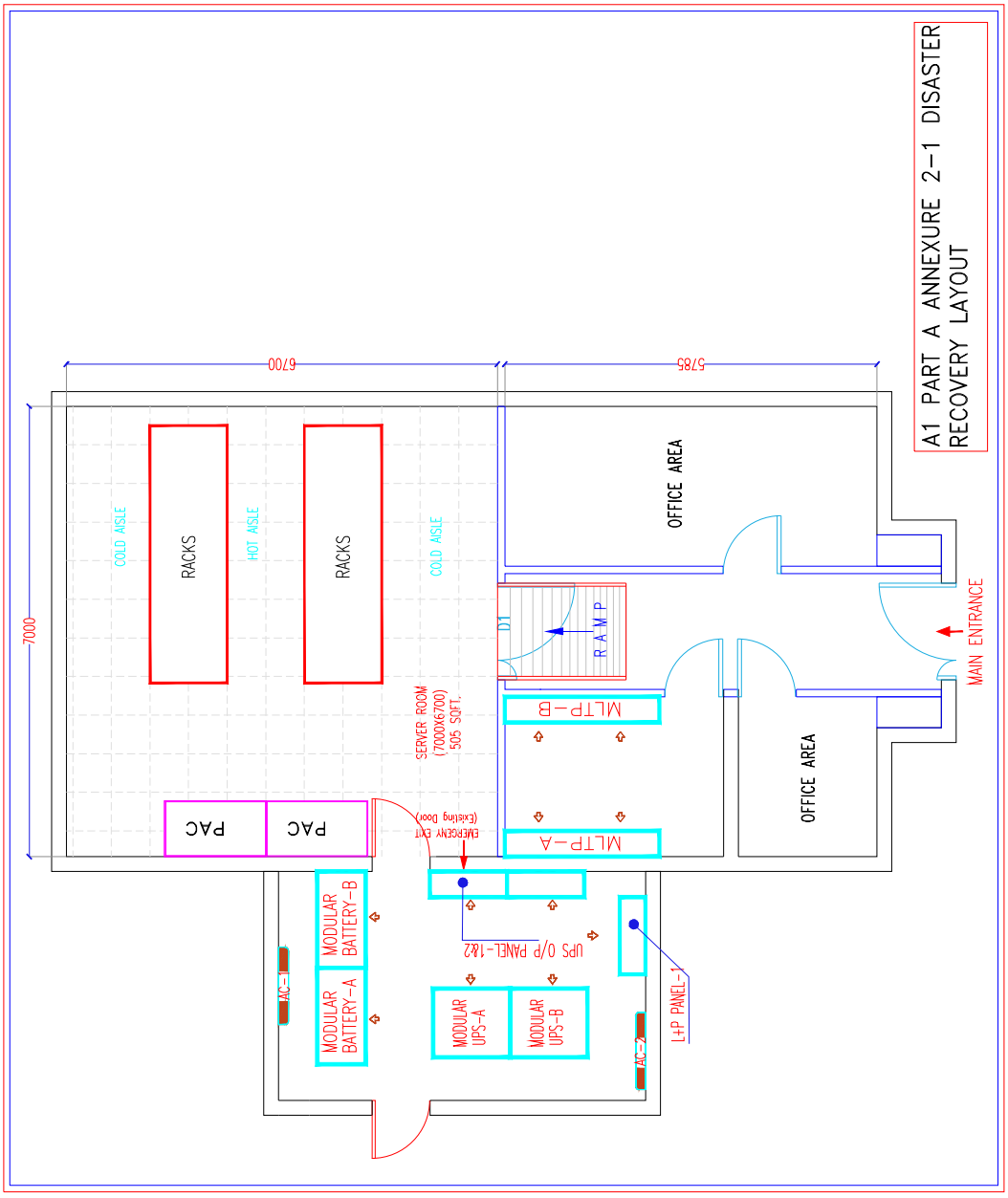

Figure 5: Indicative floor plan of the disaster recovery data centre