

Annexure – 1

Best practices and Guidelines to Physical Security of the State Data Centre

The Data Centre should ideally be built in a central location within the building complex. An approximate area of 4000 sq. ft. for Large Data Centre (Large States), 2500 sq. ft. for Medium Data Centre (Medium States) and 1500 sq. ft for Small Data Centre (Small States) each would be required for the Data Centres. The flooring should be capable of handling full load of the equipments hosted at the Data Centre. An ideal location for the Data Centre would be the first floor. It should never be built in the basement or at the top floor. It would be difficult to maintain the environmental & physical controls at the basement or at the top floor. Lifting of heavy servers, SAN boxes, UPS, etc. to the top floor will also be difficult. The proposed Data Centre space /floor should be free from water leakages from the floors which are above and below it.

The Data Centre area should be logically divided in Zones based on the level of security as described below:

I. Large Data Centre

Zone A: is the DC Server room area that has server racks, storage racks and networking equipment. The area required for Zone A should approximately be 1500 sq. feet.

Zone B: comprises of NOC room, reception area, Help Desk area, Call Centre, Testing/Monitoring room. This zone requires approximately 1500 sq. feet.

Zone C: comprises of room for power panels, BMS Manager Room, AHU, UPS, Telecom Room, etc. This zone requires approximately 1000 sq. ft.

II. Medium & Small Data Centres:

For Medium Data Centres the demarcated area for ZONE-A is approx. 1000 sq. ft and for Small Data Centres the approx area for ZONE-A is 600 sq. ft. The area for ZONE-B and ZONE-C shall be according demarcated in case of Medium and Small States.

The rack should be designed taking into consideration the maximum amount of cooling for equipments / servers. Modeling techniques such as Thermal modeling should be used to arrive at the placement of racks in the DC server room.

1.0 Design Parameters

1.1 Data Centre Floor Usage Allocation

The facilities could be divided into the following sections according to usage and reliability requirements:

ZONE A	ZONE B	ZONE C
Server racks, Networking racks, Structured cabling racks, Storage Area Network box, High end Servers, etc	<ul style="list-style-type: none">• NOC Room (Network Operation Centre)• Archival/backup room• Data Centre Manager room• Centralized Building Management Systems (BMS) monitoring room for console operators• Help-Desk Area• Shift Engineers room for incident management, testing	<ul style="list-style-type: none">• Electrical Room (Power Supply room)• Telecom Room• UPS and battery room• AHU• Fire Suppression System

1.2 Air conditioning

Since Zone A is a critical area, a separate air conditioning system (precision air conditioning) should be exclusively installed to maintain the temperature requirements for Zone A. Zone B & C can have a common air conditioning system. The general requirements for the two zones are as specified below:

Zone A: Zone A should be provided with precision air conditioning on a 24 x 7 operating basis at least meeting with Tier – I architecture requirements and having enough provision to scale it to next level as may be required in a later stage. The units should be able to switch the air conditioner on and off automatically and alternately for effective usage. The units should be down-flow fashion, air-cooled conditioning system.

Zone B/C: Zone B/C should be provided with split-type comfort air-cooled system (at least meeting with Tier – I architecture requirements). Help Desk & NOC area should be provided with a separate air conditioning system, so that the air conditioning units can be switched off whenever required.

General Description of Equipment

The equipment should be manufactured to ISO 9001 quality assurance standard and should be factory tested prior to dispatch. These units should be factory assembled which confirms to the following.

- Air Filtration conforming to EU3 standards with 50mm thick disposable pleated cell filters fitted on the return airside of the evaporator coil and having a maximum efficiency of 30%.
- Cabinet conforming to Class 1 BS 476 Part 6 & 7 standards.
- Electric Re-heater should be operating at black heat temperature and should be protected against airflow failure and overheat cutout.

- Humidifier should be capable of having an adjustable capacity control ranging from 40%-100%. The steam cylinder should be constructed from high temperature and should be suitable for operation on mains water without use of a break tank. The humidifier should be equipped with an automatic water supply and flushing system.
- Power Panel should be capable of operating at 420V, 3 phases, and 50Hz electrical supply and should be capable of withstanding voltage variation of $\pm 5\%$. A main isolator should be provided and sized accordingly to meet the systems total power requirements. Within the panel individual power loads should be distributed equally across the three phases and all individual wires should be color-coded and numbered to facilitate ease of servicing.

Precision Air Conditioning systems specifically designed for stringent environmental control with automatic monitoring and control of cooling, heating, humidification, dehumidification and air filtration function should be installed.

The server room should have an emergency panic latch door with automatic alarm system. The vendor should provide a fireproof cabinet to store on-site backup tapes taken daily, weekly, monthly and half-yearly. Walls for the Data Centre should be Fire-Rated to prevent any further spread of fire.

1.3 Microprocessor controller Panel

The control panel makes it easy for the user to have all the data and factors available in a precise, clear, and easy to understand manner at all times. The display panel should be located on the front of the unit with LCD display for monitoring and alarm indication of the followings.

- Status indication
- Cooling on
- Electric heating on

- Humidifier on
- Dehumidifier on
- Alarm Indication with Visual & Audible
- Power failure
- Fan overload
- Humidifier power fault
- Humidifier control fault
- Heater fault
- Airflow failure
- Change filter
- Control circuit trip
- Return air temperature / RH out of range
- Supply air temperature out of range
- Return air humidity sensor alarm
- Return air temp. Sensor alarm
- Data Error
- Service alarm
- Electric heater alarm
- Microprocessor fault
- Humidifier flood
- Water leakage alarm
- Smoke alarm

The Control panel should provide comprehensive alarms & status indications, having the following functions: -

- Graphical display of temperature and humidity curves over the last 24-hour.
- Self-diagnostic functionality.
- Supply air fan surge to let fan continue on operation for a period of 180 second before total shutdown.
- An automatic changeover for duty / standby unit's base on time interval setting

and any failure of duty unit.

- An automatic restart function with sequence start program to prevent power surge during start-up on multi-system installation.
- A graphic display to review the return air temperature and humidity condition.
- Comprehensive event storage system by date and time of occurrence.
- Should be capable of connecting to tele-monitoring systems and other building management systems by means of an open interface.
- Simple user-friendly operating guidance.

1.4 Electrical System

1.4.1 Availability for distribution system:

The distribution system should meet with tier – I requirements and should have enough provision to scale up if required in a later stage. It should have provision for Dual Bus configuration in order to have dual power supplies to each rack, thus minimizing downtime during maintenance operations. Dual feeders should also be provided for incoming feed from the main feeder.

1.4.2 Redundancy:

Power Supply for each rack should be from different power sources. The concept is based on $n + 1$ redundancy, where n is the number of systems or main items of equipment required to maintain the specified operational requirements. That means, failure of a single such system or equipment item can be tolerated.

1.4.3 Switchboard

All switchboards should be designed to support non-linear load with neutral conductors at least 1.7 times or 2x phase/line conductors, this is as per IEEE1100-1999 specifications. Panel boards should be divided into two, one from UPS and the other from generator. These panels should be installed separately in their respective zones.

Incoming electrical lines should have primary and secondary Transient Voltage Surge Suppressors (TVSS) installed, primary TVSS just after the Main LT switchboard and secondary just before the UPS. The primary should take care of very high transients (kilovolt range) caused by lightning strikes or HT surges and the secondary should take care of what ever manages to pass through (several hundred volts in range) the primary TVSS.

1.4.4 Lighting:

Adequate illumination (Lux) should be designed for the Data Centre. The illumination can be divided into two zones; specific rooms & other areas. Power source for lighting in these specific rooms should be from Emergency Panel for high availability purpose.

10% of the power for lighting in other areas should be from emergency panel and the rest from direct electricity board. Emergency panel should supply lighting on Walkway and emergency exit path.

Lighting on rack area and cage area need to be adjusted in order to eliminate lighting in un-proper areas such as over the top of the rack for the purpose of energy saving and cost saving.

1.4.5 Grounding:

Design of grounding should be a single ground system with separated ground window for power and data conforming to international standards.

1.4.6 UPS System:

UPS System design concept is based on redundancy and availability, with true-online system. To support the dual bus system configuration, two units of UPS should be installed. The Zone A area should be having two parallel redundant UPS and other areas like NOC and help desk should have another UPS system. Dual redundant UPS systems will take care of following

needs -

- Computers within the Data Center
- NOC equipment/ Workstations
- Emergency Lighting
- Access Control / Fire Detection, suppression / surveillance system

The solution should be automatic with power supply from the transformer as the primary source and automatic switchover to DG set as a secondary source for the data centre. Earthing should be provided from the electrical room control panel to the Earthing pits.

1.4.7 Generator

The Data Centre should have generator set to take care of high availability. The generator should have adequate capacity to supply to full load specifications.

1.4.8 Surge Protection System

Surge protection should be installed at switchboard to suppress surge and EMI conforming to IEEE62.41 and UL1283.

1.4.9 AMF Panel

The Data Centre should have an AMF Panel connecting the DG, UPS such that automatic switchover takes place during power failure.

1.5 Surveillance

1.5.1 Video Surveillance

Video Surveillance or CCTV System has to be provided mainly for security purposes. Adequate units of cameras should be installed to cover all areas of the Data Centre and premise surveillance. All these cameras should be coupled with motion sensors so that cameras can start recording only when they detect movement in the corresponding area. All the data should be recorded in digital format onto hard disk/Tapes for future investigation. There

should be a central monitoring room to monitor the movement in the Data Centre & premises.

1.5.2 Access Control

Proximity card reader and proximity access control system should be installed with its software for monitoring the access of individual persons in the Data Centre. This should be installed inside as well as outside the Level 2 premises.

Biometric authentication should be deployed at the main access door of the server room area (Level 3). This device should support fingerprint scanning and numeric authentication.

1.6 Civil Work Specification

1.6.1 Raised floor and insulation

Cement fill raised floor panel with anti-static finish should be installed on bolted-stringer system in order to maintain more rigidity and stability for the concentrate load and rolling load. This type of system is better for frequent panel movement.

Insulation under the raised floor should be provided to prevent the condensation caused by down-flow conditioning within DC area and network area. Perforate panels should be provided for at least 10% of total DC area and network area.

Galvanized coating for materials such as ceiling grids, raised floor supports, etc should be electroplated galvanized. This is to avoid zinc whiskers or metallic contamination.

1.6.2 Water Leak Detection System

Sensing cable should be installed along room perimeter especially along the glass windows, and wall area, toilet adjacency area, and under air condition units in order to sense liquid leakage.

1.7 Fire Detection

Industry standard ionization and photoelectric detectors should be installed all over the Data Center area. A separate fire alarm panel should be deployed for Data Centre area. In case of fire detection, this panel should communicate the alarm signal to the master fire panel that monitors the entire premise. It should also have the capability to send audio/visual signal at security area.

The whole system should have fire detection and alarm panels along with manual call stations. For added protection, Very Early Smoke Detection System (VESDA) should be installed for the server room area only. The technology is based on lasers and very effective for detecting fire possibilities.

1.7.1 Fire Suppression

The entire Data Centre is divided into two major areas, critical and non-critical. The critical area consists of server room (Zone A) and non-critical areas consist of other areas (Zone B, C).

NFPA standard 2001 compliant fire suppression system should be installed for Zone A. For other areas, hand-held fire fighting devices should be installed at accessible locations; these are primarily CO₂ gas based Fire Extinguishers.

1.8 Pest Control & Rodent Repellent & System

Pest Control system should be provided for the entire Data Centre & Rodent repellent system should be provided mainly in areas where false flooring is

provided within the Data Centre. The electronic Repellent system shall be provided in such a manner so as to protect the entire volume of space under consideration including above false ceiling, below false ceiling and below false floor.

1.9 Architectural Work

Architectural design of the Data Centre should be done considering the following key parameters areas:

- Space Planning
- Lighting
- Redundancy factors
- Color Scheme

Idea of area zoning for the architecture is based on the security purpose and practical situation. Customer accessible area should be near to the reception counter, an existing area. This is the first cut off area for visitors. NOC room and monitoring rooms should be located just after the reception and should have proximity card security. Ease of accessibility and scalability should be taken into consideration for designing the rooms. Permanent lighting fixtures should be installed to give lighting intensity of approximately 350-400 Lux.

A separate entrance is recommended for access to UPS/Power room, and client room maintenance. The technician and engineers will frequent these areas.

Access to Data Centre can be from main entrance near NOC room, and from monitoring room. For bringing in racks and systems, a dual door of at least 6ft wide should be provided. In normal operation this door should be closed and locked. Access control mechanism would not be required for this door or this door can be used as emergency exit and emergency door opening system.

2.0 Monitoring System

The monitoring system for all the installed equipments should be installed in one centralized panel at NOC room, which can monitor the following equipment(s):

- Water leak Detection
- On and Off of Air-conditioning system, and its alarm
- Humidity and Temperature

All the systems proposed should be connected to a BMS system. Planning for the BMS should accordingly be carried out.