DATA CENTRE STANDARD

National Information Technology Agency
GHANA

Contents

1.0 Introduction

The data centre is home to the computational power, storage, and applications necessary to support an enterprise business.The data centre infrastructure is central to the IT architecture, from which all content is sourced or passes through. Proper planning of the data centre infrastructure design is critical, and performance, resiliency, and scalability need to be carefully considered.

All government Data Centres are expected to provide enough capacity to support all the necessary IT functions of government. The principal goals in Data Centre design are flexibility and scalability, which involve site location, building selection, floor layout, electrical system design, mechanical design and modularity. The advent of new technologies, such as blade servers, that require substantial incremental power and cooling capacity; the pressure to consolidate multiple Data Centres into fewer locations; the need for incremental space; changes in operational procedures; and potential changes in safety and security regulations converge to impose constant facilities changes on the modern Data Centre.

Data Centre Standards will look at the best possible ways of setting up a Data Centre for government use. This will involve the design of the Data Centre, arrangement of equipment, operating conditions, security procedures and practices as well as any other requirement that would go into coming up with a modern and efficiently operational Data Centre. The Data Centre infrastructure should therefore be robust enough to support large amounts of data flow that government handles and efficient enough to ensure continues service availability.

The conditions in the Data Centre should also be ideal to support the optimal operations of its infrastructure while the management of the Data Centre should also be easily adaptable to the current and future government operations. In order to design, build and operate an efficient data centre, there is need to have guidelines that offer the industry acceptable specifications. This section outlines these guidelines that will be adopted by the government to ensure that it reaps the maximum benefits associated with IT Data Centre operations.

2.0 Scope

These guidelines are grouped into the following domains:

- Design and Planning (physical location)
- Planning Layout (space, power, cooling, cabling)
- Environment (Cooling, power and lightning, fire detection and suppression)
- Physical Security
- Data centre monitoring
- Maintenance and SLAs

3.0 Applications

This standard will be applicable to the following:

- Government of Ghana
- Public and Civil Services Institutions
- Local Government Service

4.0 Normative References

The following standards contain provisions which, through reference in this text, constitute provisions of this standard. All standards are subject to revision and, since any reference to a standard is deemed to be a reference to the latest edition of that standard, parties to agreements based on this standard are encouraged to take steps to ensure the use of the most recent editions of the standards indicated below. Information on currently valid national and international standards can be obtained from Ghana Standards Authority as referenced below:

- ANSI/TIA-569-c
- ANSI/TIA-568-c.1
- ISO/IEC 60793
- IEEE, 802.3
- IEEE, 802.1
- IETF RFC 3457, 2709, 1518, 1918
- [ANSI/TIA-568-c.2]
- [ANSI/TIA-568-B.2.1]
- [IEEE 802.3af]
- [ANSI/TIA-568-C.3-1]
- [(ITU-T) Series G.652]
- [IEEE STD-- 802.3-2008]
- [IEEE 802.3an 2006]
- [TIA/EIA 568-B.3]
- [ISO/IEC 11801:2002]
- [ANSI/TIA-568-c.3]
- [IEEE STD-- 802.11-2012]
- [IEEE STD 802.11-2011]
- [IEEE 802.1x]
- [IEEE 802.11i, g]
- [ISO/IEC 17799:2005(E)]
- [IEEE 802.1Q]
- [ISO/IEC 17799:2000]
- [IEEE STD-- 802.3-2008]
- [IEEE 802.3an 2006]
- IEC 62305-4

5.0 Definitions

For the purposes of this Data Centre Standard the following definitions, abbreviations and symbols apply:

5.1 Anti-tailgating

Anti-tailgating refers to an access control for restricting an unauthorized person from gaining access through a turnstile or gate after an authorized person has already gained access.

5.2 Backbone Cable

This is the inter-building and intra-building cable connections in structured cabling between entrance facilities, equipment rooms and telecommunications closets. Backbone cabling consists of the transmission media, main and intermediate cross-connects and terminations at these locations.

5.3 CCTV

CCTV refers to closed-circuit television, or the use of video cameras to transmit images to a specific limited number of televisions on the same network or circuit.

5.4 Cyber Crime

Cybercrime is defined as a crime in which a computer is the object of the crime (hacking, phishing, spamming) or is used as a tool to commit an offense. Cybercriminals may use computer technology to access personal information, business trade secrets or use the internet for exploitative or malicious purposes.

5.5 Data Centre

A large group of networked computer servers typically used by organizations for the remote storage, processing, or distribution of large amounts of data.

5.6 Equipment Distribution Area

This is used in large computer rooms that need additional configuration flexibility between the HDA and equipment. The ZDA houses only passive equipment.

5.7 Horizontal Distribution Area (HDA)

This is the space where the horizontal cross-connect resides. It is the main transition point between backbone and horizontal cabling and houses the LAN, SAN and KVM switches that connect to the active equipment (servers, mainframes, storage devices).

5.8 Hot and Cold aisle

Hot aisle/cold aisle refers to a layout design especially for data warehouses whose purpose is to manage air flow in data centres, consequently lowering the energy, cooling and management cost inside data centres

5.9 Intruder Detection System

Software application that monitors a network or systems for malicious activity or policy violations.

5.10 Main Distribution Area (MDA)
It is the hub of the cabling system. It includes the cross connect and the horizontal cross connects if the equipment they serve is nearby. It holds the core routers and the core LAN/SAN switches.

5.11 Multimode Fiber
Multi-mode fiber is a type of optical fiber designed to carry multiple light rays or modes simultaneously, each at a marginally different reflection angle inside the optical fiber core.

5.12 Multi-tenant building
Refers to a facility in which organizations can rent space to host their data. Businesses can rent to meet varying needs, from a server rack to a complete purpose-built module.

5.13 Power Distribution Units
A power distribution unit (PDU) is a type of electrical component that distributes and manages electricity supply to computers, servers and networking devices within a data centre environment.

5.14 Rack
A rack is a type of physical steel and electronic framework that is designed to house servers, networking devices, cables and other data centre computing equipment. This physical structure provides equipment placement and orchestration within a data centre facility.

5.15 Whitespace
In data centre, it refers to the area where IT equipment are placed.

5.16 Zone Distribution Area (ZDA)
This is used in large computer rooms that need additional configuration flexibility between the HDA and equipment. The ZDA houses only passive equipment.

6.0 Abbreviations

ANCI	American National Standards Institute
BoQ	Bill of Quantities
CCTV	Closed Circuit Television
EDA	Equipment Distribution Area
GEA	Government Enterprise Architecture
HDA	Horizontal Distribution Area
HVAC	Heating, Ventilation, and Air conditioning
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IETF	Internet Engineering Task Force
ISO	International Organization for Standardization
ISPs	International Ship and Port Facility Security
ITU	International Telecommunication Union
MDAs	MDAs Ministry, Departments and Agencies
MDA	Main Distribution Area
PDU	Power Distribution Units
SLA	Service-level agreement
TIA	Telecommunications Industry Association
UPS	Uninterruptible Power Supply
ZDA	Zone Distribution Area

7.0 Data Center
7.1 Design and Planning
7.1.1 MDA shall carry out site surveys to ensure a data centre design is in line with the tiered reliabilities.

7.1.2 The choice of the location, civil works and other installation shall guard the data centre against disasters that are within human control such as floods, lightning, earthquake, fire etc.

7.1.3 MDA shall ensure proper grounding for both lightning protection and grid power. Type 1+2 surge arrestors should be installed to protect the data centre from lightning (as guided by IEC 62305-4).

7.1.4MDA shall develop a data centre design with associated specifications and Bill of Quantities (BoQ)

7.1.5MDA shall ensure that relevant construction and equipment installation is done in line with the specifications and Bill of Quantities (BoQ)

7.1.6 Upon completion of the construction and equipment installation MDA shall carry out the tests and the results formally documented.

7.1.7 MDA shall ensure that the 'as built' physical and logical designs of the data centre are documented.

7.1.8 MDA shall ensure that the data centre project is commissioned, and a Completion Certificate issued.

7.1.9 Physical and logical designs shall be updated whenever changes occur.

7.1.10 MDA shall ensure that the Data centre is designed with flexible and adequate "white space" empty space that can accommodate future racks and cabinets. The space surrounding the data centre must also be considered for future expansion (the facility specifications should be in line with TIA-942 standard).

7.1.11 MDA shall ensure that the data centre includes the following key functional areas (as guided by TIA-942); an Entrance Room, Main Distribution Area (MDA), Horizontal Distribution Area (HDA), Zone Distribution Area (ZDA) and Equipment Distribution Area (EDA) as minimum functional areas. The data centre should also have a staging area for unpacking and possibly for testing new equipment before deploying them in the computer room.

7.1.12 MDA shall consider arrangements for failover / backup facility for business continuity management.

8.0 Planning Layout

8.1 Whitespace

8.1.1 A data centre shall be designed with plenty of flexible white space that can accommodate future racks or cabinets.

8.1.2 The space around the data centre must be considered for future growth and planned for easy annexation.

8.1.3 MDA shall ensure that there is adequate space between the racks/cabinets. The layout should have both hot and cold aisles with a minimum of 1.2 meter for the cold aisle and a minimum of 1.0 meters on the hot aisle.

8.1.4 Wrist strap ports shall be attached to the rack by a means that ensures electrical continuity to ground for static discharge.

8.1.5 The building structural system should be either steel or concrete or fabricated. At a minimum, the building frame should be designed to withstand wind loads in accordance with the applicable building codes for the relevant institutions charged with building approvals.

8.1.6 Truck loading docks shall be provided as required to handle anticipated deliveries and shall be provided with a level of security similar to the other building entrances.

8.1.7 Every data centre shall fall under any of the tiers as per TIA-942 Standard that will be determined from Appendix 1.

8.2 Cooling

8.2.1 There shall be adequate cooling equipment as well as raised floor/overhead cable tray for more flexible cooling.

8.2.2 The cabinets and racks shall be arranged in an alternating pattern to create hot and cold aisle.

8.2.3 The air-conditioning system shall be designed to provide the design temperature and humidity conditions recommended by the manufacturers of the servers to be installed within the data centre.

8.2.4A 24/7/365 dedicated HVAC system with automatic dampers and connected to a backup generator.

8.2.5MDA shall ensure when building new offices/identifying occupation of a new premises that considerations are made for a provision of a floor that meets the data centre required minimum height (18 inches). The recommended rack and cabinet height shall be 2.4 m (8 ft). Racks and cabinets shall preferably be no taller than 2.1 m (7 ft) for easier access to the equipment or connecting hardware installed at the top.

8.3 Power

8.3.1 Power requirements shall be based on the desired reliability tier as per tiered reliability standard- (See Appendix 1) and may include two or more power feeds from the utility, UPS,Multiplecircuitstosystemsandequipment,andon-site generators.

8.3.2 Power requirements shall be estimated for all the existing devices and for devices anticipated in the future.

8.3.3 Power estimation must be made to accommodate required redundancy and future growth.

8.3.4 Every data centre shall be supported by generator(s) and UPS System(s) and shall be designed to supply the harmonic current imposed by the UPS system or computer equipment loads. The UPS batteries should be able to support the computer systems for at least 8 hr.

8.3.5 Data Centre shall have a Power Distribution Units (PDUs) for distribution to critical electronic equipment.

8.3.6 MDA are encouraged to consider the use of green power to cut on cost of power consumption.

8.3.7 Data centre shall at all times have fire detection, extinguisher and suppression systems.

8.4 Fire Detection and Suppression -

8.4.1 The data centre construction shall be separated from other occupancies by fire resistant rated construction (not less

than an hour). Every opening in the fire-resistant construction shall be protected to limit spread of fire and to restrict the movement of smoke from one side to the other.

8.4.2 Automatic detection material shall be installed to provide early fire warning and the equipment used shall be a listed smoke detection type system. The alarms and trouble signals of automatic detection or extinguishing system shall be arranged to annunciate in a constantly occupied location.

8.4.3 MDA shall ensure that the IT personnel designated to man the facility are continually and thoroughly trained in the functioning of the alarm system, desired response to alarm condition, location of emergency equipment, tools and all available extinguishing equipment.

8.4.4 MDA shall ensure that appropriate extractor fans are installed to extract any gas discharge / leakage.

8.4.5 The fire protection systems and hand-held fire extinguishers shall comply with NFPA-75.

9.0 Cabling Infrastructure

9.1 Whitespace

9.1.1 Data centres shall use a minimum laser-optimized 50 microns multimode fiber for backbone cabling and with minimum 24 cores backbone cable.

9.1.2 Data centres shall use the highest capacity horizontal cabling media available as recommended by the current IEEE 802.3 standards to reduce the need for re-cabling in the future

9.1.3 A data centre shall be designed with separate racks and pathways for each media type. The power and communication cables shall be separated on different pathways or separated by a physical barrier.

9.1.4Adequate space must be provided within and between racks, the cabinet and the pathways for better cable management, bend radius protection, and access.

9.1.5A labelling scheme for all racks, power, cabinets, patch panels, patch cords and cables must be maintained.

9.1.6 Branch circuits in data centres shall be in watertight flexible metal conduit. Feeder circuits to power distribution units and panels shall be installed in solid metal conduit. If the feeder circuits are not in solid metal conduit, they should be in watertight flexible metal conduit.

9.1.7 In data centres that use overhead cable trays, the normal separation distances provided by standard practices provides adequate separation. As specified in ANSI/TIA-569-B, a minimum of 300 mm (12 in) access headroom between the top of a tray or runway and the bottom of the tray or runway above shall be provided and maintained.

9.1.8 In data centres that employ access floor systems, adequate separation of power and telecommunications cabling should be accommodated through allocating separate aisles for power and telecommunications cabling in the main aisles. Where this is not possible, horizontal and vertical separation of power and telecommunications cables shall be provided.

9.1.9 In addition, vertical separation shall be provided by placing the telecommunications cabling in cable trays or baskets as far above the power cables as possible, preferably with the top of the cable tray or basket 20 mm (0.75 in) below the bottom of the access floor tile; in the equipment cabinet aisles, allocate separate aisles for power and telecommunications cabling as maybe applicable.

9.1.10 Current alternate standard to raised floor.

9.1.11 Cables shall not be left abandoned under the access floor or in overhead cable trays and shall be terminated on at least one end in the main distribution area or a horizontal distribution area or removed.

9.1.12 Planning of overhead cable trays for telecommunications cabling should be coordinated with architects, mechanical engineers, and electrical engineers that are designing lighting, plumbing, air ducts, power, and fire protection systems. Lighting fixtures and sprinkler heads should be placed between cable trays, not directly above cable trays.

9.1.13 There should be full redundancy in the data centre network; Use two or more ISPs and pairs of IT equipment.

10.0 Environment and Ambience

10.1 Physical

10.1.1 The room shall be protected from contaminants in accordance with ANSI/TIA-569-B.

10.1.2 The Building design shall guard against excessive computer room vibration.

10.1.3 Floors, walls and ceiling shall be sealed, painted or constructed of a material to minimize dust.

10.1.4 Walls, floors and ceilings shall be light in colour to enhance room lighting. Floors shall have antistatic properties as per IEC 61000-4-2.

10.1.5 Sprinkler systems in computer rooms shall be pre-action systems, where risk of water ingress exists, a means of evacuating water from the space shall be provided (e.g. a floor drain). Any water and drainpipes that run through the room should be located away from and not directly above equipment in the room.

10.1.6 Equipment should be placed in cabinets and racks with “cold” air intake at the front of the cabinet or rack, and “hot” air exhaust out the back.

10.1.7 Blank panels should be installed in unused rack and cabinet spaces to improve the functioning of “hot” and “cold” aisles. Perforated access floor tiles should be located in the “cold” aisles rather than in the “hot” aisles to improve the functioning of the “hot” and “cold” isles.

10.1.8 A minimum of 1 m (3 ft.) of front clearance shall be provided for installation of equipment. A front clearance of 1.2 m (4 ft.) is preferable to accommodate deeper equipment. A minimum of 0.6 m (2 ft.) of rear clearance shall be provided

for service access at the ear of racks and cabinets. A rear clearance of 1 m (3 ft.) is preferable. Some equipment may require service clearances of greater than 1 m (3 ft.) as may be guided by equipment manufacturer requirements.

10.1.9The data centre should have an adequately sized storage room so that boxed equipment, spare air filters, spare floor tiles, spare cables, spare equipment, spare media, and spare paper can be stored outside the computer room.

10.1.10 Access to the Data Centre shall require protective gears/garments to minimize dust and other risks.

10.1.11 The Data Centre building shall conform to all applicable national, state, and local codes.

10.1.12 Where the building is not dedicated to the data centre, other tenant spaces should be nonindustrial, International Building Code type 'B' offices, and non-intrusive to the data centre. Avoid buildings with restaurants and cafeterias to minimize fire risk.

10.1.13 If the data centre is to be on an upper floor of a multi-tenant building, then there shall be adequate shaft and conduit space for generator, security, telecommunications, and electrical conduits as well as supplemental HVAC, grounding conductors and cabling to antennas, as needed.

10.1.14 The building hosting the Data Centre shall not be in the flight path of any nearby airports. The building shall be no closer than 0.8 km (½ mile) from a railroad or major interstate highway. The building shall not be within 0.4 km (¼ mile) of an airport, research lab, chemical plant, landfill, river, coastline, or dam as applicable. The building shall not be located adjacent to a foreign embassy the building shall not be located in high crime areas.

10.2 Cooling

10.2.1 There shall be adequate cooling equipment as well as raised floor system for more flexible cooling as may be appropriate.

10.2.2 The air-conditioning system shall be designed to provide temperature and humidity conditions recommended by equipment manufacturers. The temperature and humidity shall be controlled to provide continuous operating ranges for temperature and humidity.

10.2.3 There shall be a 24/7 dedicated HVAC system with automatic dampers and connected to a backup generator.

10.3 Power

10.3.1 Power requirements will be based on the desired reliability as per tiered reliability standard – Appendix 1.

10.3.2 The power system shall be supported by at least two standby generator system. Where batteries are used for backup, adequate ventilation and spill containment as required shall be provided.

11.0 Physical Security

11.1 The perimeter of the site shall be protected by appropriate intruder detection system and monitored by visible or infrared Closed-Circuit Television (CCTV) system. All common areas shall be monitored, including parking lots, loading docks, and building entrances.

11.2 Access to the site shall be secured by identification and authentication systems.

11.3 There shall be only one single point of entry. Consideration can be made for physical access control with anti-tailgating / anti-pass-back turn-style gate that permits only one person to pass at any one time after authentication.

11.4 The security of information at the data centre should be in line with; information security standard, ISO 27001/2, and the computer misuse and cybercrime Act 2018

12.0 Data center monitoring

12.1 MDA shall ensure that monitoring system are installed to check the health status of all the active and computing devices.

12.2 MDA shall install a monitoring tool to check on the data centre environment i.e. temperature, humidity and power.

12.3 MDA shall install a real time monitoring system to check the Physical security of the data centre.

13.0 Maintenance and SLAs

13.1 All the components of the data centre shall be tested periodically once the data centre is in operation to ensure that they will continue to function properly. The records for the test shall be kept always.

13.2 Maintenance programs shall be identified to detect imminent or conditional failures for all data centre equipment and service tags / maintenance schedule.

13.3 MDA shall ensure Service Level Agreement (SLA) are maintained with a minimum of data centre services availability of 99.99%.

Appendix I

Tiered Reliability Standard
Refer to the uptime Institute standard

Tier 1 = Non-redundant capacity components (single uplink and servers).

Tier 2 = Tier 1 + Redundant capacity components.

Tier 3 = Tier 1 + Tier 2 + Dual-powered equipment and multiple uplinks.

Tier 4 = Tier 1 + Tier 2 + Tier 3 + all components are fully fault-tolerant including uplinks, storage, chillers, HVAC systems, servers etc. Everything is dual-powered.

SUBTOPIC	DETAILS	RATING		
		YES	NO	%
7.0 Data Centre	The National Data Centres (Primary & Secondary) shall be the Data Centres for all MDA/MMDAs.			
7.1 Design and Planning	7.1.1 Where an MDA require its own Data Centre, a justification to NITA and approval must be sought to carry out site surveys to ensure a data centre design is in line with the tiered reliabilities.	☐	☐	☐
	7.1.2 The choice of the location, civil works and other installation shall guard the data centre against disasters that are within human control such as floods, lightning, earthquake, fire etc.	☐	☐	☐
	7.1.3 The MDA shall ensure proper grounding for both lightning protection and grid power. Type 1+2 surge arrestors should be installed to protect the data centre from lightning (as guided by IEC 62305-4).	☐	☐	☐
	7.1.4 With approval and consultation (from/with NITA) the MDA shall develop a data centre design with associated specifications and Bill of Quantities (BoQ)	☐	☐	☐
	7.1.5 MDA shall ensure that relevant construction and equipment installation is done in line with the specifications and Bill of Quantities (BoQ)	☐	☐	☐
	7.1.6 Upon completion of the construction and equipment installation MDA shall carry out the tests and the results formally documented and reported to NITA.	☐	☐	☐
	7.1.7 MDA shall ensure that the 'as built' physical and logical designs of the data centre are documented.	☐	☐	☐
	7.1.8 MDA shall ensure that the data centre project is commissioned, and a Completion Certificate issued.	☐	☐	☐
	7.1.9 Physical and logical designs shall be updated whenever changes occur.	☐	☐	☐
	7.1.10 MDA shall ensure that the Data centre is designed with flexible and adequate "white space" empty space that can accommodate future racks and cabinets. The space surrounding the data centre must also be considered for future expansion (the facility specifications should be in line with TIA-942 standard).	☐	☐	☐
	7.1.11 MDA shall ensure that the data centre includes the following key functional areas (as guided by TIA-942, ISO/IEC TS 22237-2:2018); an Entrance Room, Main Distribution Area (MDA), Horizontal Distribution Area (HDA), Zone Distribution Area (ZDA) and Equipment Distribution Area (EDA) as minimum functional areas. The data centre should also have a staging area for unpacking and possibly for testing new equipment before deploying them in the computer room.	☐	☐	☐
	7.1.12 MDA shall consider arrangements for failover/backup facility for business continuity management.	☐	☐	☐
8.0 Planning Layout 8.1 Whitespace	8.1.1 A data centre shall be designed with plenty of flexible white space that can accommodate future racks or cabinets.	☐	☐	☐
	8.1.2 The space around the data centre must be considered for future growth and planned for easy annexation.	☐	☐	☐
	8.1.3 MDA shall ensure that there is adequate space between the racks/cabinets. The layout should have both hot and cold aisles with a minimum of 1.2 meter for the cold aisle and a minimum of 1.0 meters on the hot aisle.	☐	☐	☐
	8.1.4 Wrist strap ports shall be attached to the rack by a means that ensures electrical continuity to ground for static discharge.	☐	☐	☐

	8.1.5	The building structural system should be either steel or concrete or fabricated. At a minimum, the building frame should be designed to withstand wind loads in accordance with the applicable building codes for the relevant institutions charged with building approvals.	☐	☐	☐
	8.1.6	Truck loading docks shall be provided as required to handle anticipated deliveries and shall be provided with a level of security similar to the other building entrances.	☐	☐	☐
8.2 Cooling	8.2.1	There shall be adequate cooling equipment as well as raised floor/overhead cable tray for more flexible cooling.	☐	☐	☐
	8.2.2	The cabinets and racks shall be arranged in an alternating pattern to create hot and cold aisle.	☐	☐	☐
	8.2.3	The air-conditioning system shall be designed to provide the design temperature and humidity conditions recommended by the manufacturers of the servers to be installed within the data centre.	☐	☐	☐
	8.2.4	A 24/7/365 dedicated HVAC system with automatic dampers and connected to a backup generator	☐	☐	☐
	8.2.5	MDA shall ensure when building new offices/identifying occupation of a new premises that considerations are made for a provision of a floor that meets the data centre required minimum height (18 inches). The recommended rack and cabinet height shall be 2.4 m (8 ft.). Racks and cabinets shall preferably be no taller than 2.1 m (7 ft.) for easier access to the equipment or connecting hardware installed at the top.	☐	☐	☐
8.3 Power	8.3.1	Power requirements shall be based on the desired reliability tier as per tiered reliability standard- (See Appendix 1) and may include two or more power feeds from the utility, UPS, Multiple circuits to systems and equipment, and on-site generators.	☐	☐	☐
	8.3.2	Power requirements shall be estimated for all the existing devices and for devices anticipated in the future.	☐	☐	☐
	8.3.3	Power estimation must be made to accommodate required redundancy and future growth.	☐	☐	☐
	8.3.4	Every data centre shall be supported by generator(s) and UPS System(s) and shall be designed to supply the harmonic current imposed by the UPS system or computer equipment loads. The UPS batteries should be able to support the computer systems for at least 8 hr.	☐	☐	☐
	8.3.5	Data Centre shall have a Power Distribution Units (PDUs) for distribution to critical electronic equipment.	☐	☐	☐
	8.3.6	MDA are encouraged to consider the use of green power to cut on cost of power consumption	☐	☐	☐
	8.3.7	Data centre shall at all times have fire detection, extinguisher and suppression systems.	☐	☐	☐
8.4 Fire Detection and Suppression	8.4.1	The data centre construction shall be separated from other occupancies by fire resistant rated construction (not less than an hour). Every opening in the fire-resistant construction shall be protected to limit spread of fire and to restrict the movement of smoke from one side to the other.	☐	☐	☐
	8.4.2	Automatic detection material shall be installed to provide early fire warning and the equipment used shall be a listed smoke detection type system. The alarms and trouble signals of automatic detection or extinguishing system shall be arranged to annunciate in a constantly occupied location.	☐	☐	☐
	8.4.4	MDA shall ensure that appropriate extractor fans are installed to extract any gas discharge / leakage.	☐	☐	☐
	8.4.5	The fire protection systems and hand-held fire extinguishers shall comply with NFPA-75	☐	☐	☐
9.0 Cabling Infrastructure 9.1 Whitespace	9.1.1	Data centres shall use a minimum laser optimized 50 microns multimode fiber for backbone cabling and with minimum 24 cores backbone cable.	☐	☐	☐
	9.1.2	Data centres shall use the highest capacity horizontal cabling media available as recommended by the current IEEE 802.3 standards to reduce the need for re-cabling in the future	☐	☐	☐
	9.1.3	A data centre shall be designed with separate racks and pathways for each media type. The power and communication cables shall be separated on different pathways or separated by a physical barrier.	☐	☐	☐

	9.1.4	Adequate space must be provided within and between racks, the cabinet and the pathways for better cable management, bend radius protection, and access.	☐	☐	☐
	9.1.5	A labelling scheme for all racks, cabinets, patch panels, patch cords and cables must be maintained.	☐	☐	☐
	9.1.6	Branch circuits in data centres shall be in watertight flexible metal conduit. Feeder circuits to power distribution units and panels shall be installed in solid metal conduit. If the feeder circuits are not in solid metal conduit, they should be in watertight flexible metal conduit.	☐	☐	☐
	9.1.7	In data centres that use overhead cable trays, the normal separation distances provided by standard practices provides adequate separation. As specified in ANSI/TIA-569-B, a minimum of 300 mm (12 in) access headroom between the top of a tray or runway and the bottom of the tray or runway above shall be provided and maintained.	☐	☐	☐
	9.1.8	In data centres that employ access floor systems, adequate separation of power and telecommunications cabling should be accommodated through allocating separate aisles for power and telecommunications cabling in the main aisles. Where this is not possible, horizontal and vertical separation of power and telecommunications cables shall be provided.	☐	☐	☐
	9.1.9	In addition, vertical separation shall be provided by placing the telecommunications cabling in cable trays or baskets as far above the power cables as possible, preferably with the top of the cable tray or basket 20 mm (0.75 in) below the bottom of the access floor tile; in the equipment cabinet aisles, allocate separate aisles for power and telecommunications cabling as maybe applicable.	☐	☐	☐
	9.1.10	Current alternate standard to raised floor.	☐	☐	☐
	9.1.11	Cables shall not be left abandoned under the access floor or in overhead cable trays and shall be terminated on at least one end in the main distribution area or a horizontal distribution area or removed.	☐	☐	☐
	9.1.12	Planning of overhead cable trays for telecommunications cabling should be coordinated with architects' mechanical engineers, and electrical engineers that are designing lighting, plumbing, air ducts, power, and fire protection systems. Lighting fixtures and sprinkler heads should be placed between cable trays, not directly above cable trays.	☐	☐	☐
	9.1.13	There should be full redundancy in the data centre network; Use two or more ISPs and pairs of IT equipment.	☐	☐	☐
10.0 Environment and Ambience	10.1.1	The room shall be protected from contaminants in accordance with ANSI/TIA-569-B.	☐	☐	☐
10.1 Physical	10.1.2	The Building design shall guard against excessive computer room vibration.	☐	☐	☐
	10.1.3	Floors, walls and ceiling shall be sealed, painted or constructed of a material to minimize dust.	☐	☐	☐
	10.1.4	Walls, floors and ceilings shall be light in colour to enhance room lighting. Floors shall have anti-static properties as per IEC 61000-4-2.	☐	☐	☐
	10.1.5	Sprinkler systems in computer rooms shall be pre-action systems, where risk of water ingress exists, a means of evacuating water from the space shall be provided (e.g. a floor drain). Any water and drainpipes that run through the room should be located away from and not directly above equipment in the room.	☐	☐	☐
	10.1.6	Equipment should be placed in cabinets and racks with "cold" air intake at the front of the cabinet or rack, and "hot" air exhaust out the back.	☐	☐	☐
	10.1.7	Blank panels should be installed in unused rack and cabinet spaces to improve the functioning of "hot" and "cold" aisles. Perforated access floor tiles should be located in the "cold" aisles rather than in the "hot" aisles to improve the functioning of the "hot" and "cold" isles.	☐	☐	☐
	10.1.8	A minimum of 1 m (3 ft.) of front clearance shall be provided for installation of equipment. A front clearance of 1.2 m (4 ft.) is preferable to accommodate deeper equipment. A minimum of 0.6 m (2 ft.) of rear clearance shall be provided for service access at the ear of racks and cabinets. A rear clearance of 1 m (3 ft.) is preferable. Some equipment may require service clearances of greater than 1 m (3 ft.) as may be guided by equipment manufacturer requirements.	☐	☐	☐

		10.1.9 The data centre should have an adequately sized storage room so that boxed equipment, spare air filters, spare floor tiles, spare cables, spare equipment, spare media, and spare paper can be stored outside the computer room.	☐	☐	☐
		10.1.10 Access to the Data Centre shall require protective gears/garments to minimize dust and other risks.	☐	☐	☐
		10.1.11 The Data Centre building shall conform to all applicable national, state, and local codes.	☐	☐	☐
		10.1.12 Where the building is not dedicated to the data centre, other tenant spaces should be nonindustrial, International Building Code type 'B' offices, and non-intrusive to the data centre. Avoid buildings with restaurants and cafeterias to minimize fire risk.	☐	☐	☐
		10.1.13 If the data centre is to be on an upper floor of a multi-tenant building, then there shall be adequate shaft and conduit space for generator, security, telecommunications, and electrical conduits as well as supplemental HVAC, grounding conductors and cabling to antennas, as needed.	☐	☐	☐
		10.1.14 The building hosting the Data Centre shall not be in the flight path of any nearby airports. The building shall be no closer than 0.8 km from a railroad or major interstate highway. The building shall not be within 0.4 km of an airport, research lab, chemical plant, landfill, river, coastline, or dam as applicable. The building shall not be located adjacent to a foreign embassy the building shall not be located in high crime areas.	☐	☐	☐
10.2	**Cooling**	10.2.1 There shall be adequate cooling equipment as well as raised floor system for more flexible cooling as may be appropriate.	☐	☐	☐
		10.2.2 The air-conditioning system shall be designed to provide temperature and humidity conditions recommended by equipment manufacturers. The temperature and humidity shall be controlled to provide continuous operating ranges for temperature and humidity.	☐	☐	☐
		10.2.3 There shall be a 24/7 dedicated HVAC system with automatic dampers and connected to a backup generator.	☐	☐	☐
10.3	**Power**	10.3.1 Power requirements will be based on the desired reliability as per tiered reliability standard – Appendix 1.	☐	☐	☐
		10.3.2 The power system shall be supported by at least two standby generator system. Where batteries are used for backup, adequate ventilation and spill containment as required shall be provided.	☐	☐	☐
11.0	**Physical Security**	11.1 The perimeter of the site shall be protected by appropriate intruder detection system and monitored by visible or infrared Closed-Circuit Television (CCTV) system. All common areas shall be monitored, including parking lots, loading docks, and building entrances.	☐	☐	☐
		11.2 Access to the site shall be secured by identification and authentication systems.	☐	☐	☐
		11.3 There shall be only one single point of entry. Consideration can be made for physical access control with anti-tailgating / anti-pass-back turn-style gate that permits only one person to pass at any one time after authentication.	☐	☐	☐
		11.4 The security of information at the data centre should be in line with; information security standard, ISO 27001/2, and the computer misuse and cybercrime Act 2018	☐	☐	☐
		12.1 MDA shall ensure that monitoring system are installed to check the health status of all the active and computing devices.	☐	☐	☐
		12.2 MDA shall install a monitoring tool to check on the data centre environment i.e. temperature, humidity and power.	☐	☐	☐
		12.3 MDA shall install a real time monitoring system to check the Physical security of the data centre.	☐	☐	☐
		13.1 All the components of the data centre shall be tested periodically once the data centre is in operation to ensure that they will continue to function properly. The records for the test shall be kept always.	☐	☐	☐
		13.2 Maintenance programs shall be identified to detect imminent or conditional failures for all data centre equipment and service tags / maintenance schedule.	☐	☐	☐
		13.3 MDA shall ensure Service Level Agreement (SLA) are maintained with a minimum of data centre services availability of 99.99%.	☐	☐	☐

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