For queries please email:
Imtiaz.issadeen@gmail.com

Minimum specifications guideline for a Greenfield Hyper Scale Data Centre

3000W/m2 power density, total of 18MW IT capacity.

STRICTLY CONFIDENTIAL

Fully Revised Version

Tokyo, March 2019

Date Printed: July 21, 2020

CONFIDENTIAL

Copyright© 2020. All Rights Reserved Do not alter without the permission of Imtiaz issadeen
CONFIDENTIAL

For queries please email:
Imtiaz.issadeen@gmail.com

INDEX to this document

Section 1. General Information.

Section 2. Definitions.

Section 3. External Areas.

Section 4. All Areas Construction and Finishes Standards.

Section 5. MEP System Capacity Requirements.

Section 6. Generators, Life Safety, Plumbing etc.

Section 7. Central HVAC Plant Criteria.

Section 8. High Tension Transformers, Grounding and other Electrical components.

Section 9. Data Hall MEP Criteria.

Section 10. HVAC Components.

Section 11. Electrical System Components.

Section 12. Generator Fuel Pump Building.

Section 13. Access Control and Security.

Section 14. Physical Security.

Section 15. Building and Energy Management System (BEMS)

Section 16. Miscellaneous

CONFIDENTIAL

Copyright© 2020. All Rights Reserved Do not alter without the permission of Imtiaz issadeen
CONFIDENTIAL

For queries please email:
Imtiaz.issadeen@gmail.com

GENERAL INFORMATION

1.1 INTRODUCTION

The primary mission of this document is to establish design and operational standards and policies that will provide safeguards and enhanced system availability.

1.2 DOCUMENT PURPOSE

The purpose of this DESIGN STANDARDS document is to define the different criticality classifications of the various DC facilities and provide specific design, and commissioning and operational criteria for such facilities.

1.3 DOCUMENT INTENDED USE

The DESIGN STANDARDS document is intended to be used by internal and external project management administrators, project architects and engineers, as well as facility managers.

This document is to be referenced for specific guidelines, standards and specifications for the design, construction, and commissioning of a New Greenfield Data Centre in Japan.

1.4 DOCUMENT APPLICATIONS

This document pertains to the critical building infrastructure which supports well designed Data Centre spaces.

1.5 DOCUMENT AVAILABILITY

The FULL document is available in from Imtiaz.issadeen@gmail.com . Please email to discuss.

1.6 PROJECT PERFORMANCE STANDARDS

1.6.1 General

The project design team shall confer with the project management team to define the scope of work to be included in the construction documents.

The design team shall prepare construction drawings and specifications that comply with all codes, applicable laws, regulations, ordinances, and requirements of governmental authorities and/or agencies having jurisdiction.

Conflicts that arise between codes, applicable laws, regulations, ordinances and/or requirements of governmental authorities, and/or agencies and these standards shall be directed to project management team for resolution. In general, the design shall accommodate the most stringent requirement.

CONFIDENTIAL

Copyright© 2020. All Rights Reserved Do not alter without the permission of Imtiaz issadeen
CONFIDENTIAL

The design team shall obtain all necessary documents to produce detailed construction drawings and specifications in sufficient clarity to obtain required permits and construct the work.

In addition to standard printed copies, the design team shall provide copies of the construction drawings in AutoCAD, PDF and specifications in Microsoft Word.

1.6.2 Design Services

The design team shall manage, coordinate, and be responsible for the design of the following disciplines:

- Architectural
- Civil
- Structural
- Mechanical
- Plumbing
- Fire Protection
- Public Address system / Emergency PA System
- Electrical
- Data points list for Building Automation, Monitoring and Controls
- Basic BEMS design.

The design team shall provide technical and administrative services during the construction and acceptance testing phases of the work. These services shall be sufficient to ascertain to the design team's satisfaction that the work is being completed in accordance with the design intent.

The construction documents shall include (but not be limited) to the following:

Finishes schedule will provide full details describing colour and materials for all architectural finishes, wall coverings, floor coverings, wall and floor paints etc.

Mechanical plans showing main building HVAC systems, which are to service the relevant areas, the duct and piping connection points. Where possible flow rates and duct sizes shall be indicated.

All areas that require twenty-four hour operation, such as

All exhaust fans, pumps, and operating systems to be

Air conditioning units shall be located and briefly

CONFIDENTIAL

Copyright© 2020. All Rights Reserved Do not alter without the permission of Imtiaz issadeen
CONFIDENTIAL

A lighting layout shall be provided showing the location of all light

Electrical plans showing electrical distribution required to support the following:

- Super High voltage systems including GIS and VCBs
- Generator Standby Power Systems
- Uninterruptible Power Supply (UPS) Systems
- Maintenance by pass system
- Overload by pass system.
- Building and Energy Monitoring Systems
- Emergency lighting system per Code must have 90 minutes minimum battery run time. *Note Generator time is not to be confused with battery time.*
- Emergency exit sign locations.

There shall be NO single point of failure anywhere in this building.

There shall be NO Emergency Power Off (EPO) in this building.

The design must provide for sufficient VCBs cabinets to service additional electrical equipment that may be required during the life of the building. As an assumption, allow 10% extra.

1.7 PROJECT DOCUMENTS

1.7.1 Request for Proposal

1.7.2 Basis of Design

- Expected future maintenance requirements
- Specific configuration details pertinent to the project

1.7.3 Standards Conformance and Variance

For each project, a Standards Conformance and Variance

Due to the possibility of such variances, the Standards

A “waiver” is a formal sign-off to acknowledge that criteria

1.7.4 Close-Out Documents

At project completion the following documentation will be provided to the Chief Design & Build

- A Basis of Design document (BOD)

CONFIDENTIAL

Copyright© 2020. All Rights Reserved Do not alter without the permission of Imtiaz issadeen
CONFIDENTIAL

- Specific deviations from the original schematic Basis of Design, including any scope changes from the original BOD
- A completed Standards Conformance and Variance document
- A complete set of as-built blueprints
- Portions of the project which were deferred
- Minimum of 75 photos taken by a reputed architectural photographer in print in an Album and in TIFF format on DVD.

DEFINITIONS

2.1 CAPACITY, RATING AND REDUNDANCY

2.1.1 Rating

“Rating” is the performance rating of a piece of equipment as defined by the manufactures nameplate.

2.1.2 Capacity

For the purposes of this document “Capacity” is defined as the defined

2.1.3 “N” System

An “N” System is the minimum system configuration which will deliver the required system Capacity without redundant components.

2.1.4 “N+1” Redundancy

“N+1” Redundancy is the minimum system configuration which will

2.1.5 “N x 4” Redundancy

N x 4 Redundancy is when 4 independent UPS units are provided per 1000m2 DC Hall of 3000kW

2.1.6 Other levels of Redundancy

Systems with two (2) spare energy conversion devices shall be defined as N+2 and so on. For all Mission Critical Facilities systems the

2.1.7 “2N” Redundancy

“2N” Redundancy (System + System) is a system configured as two (2) “N” systems

In a 2N system the energy delivery systems (i.e. pipes, ductwork, power cabling etc.) of the redundant system.

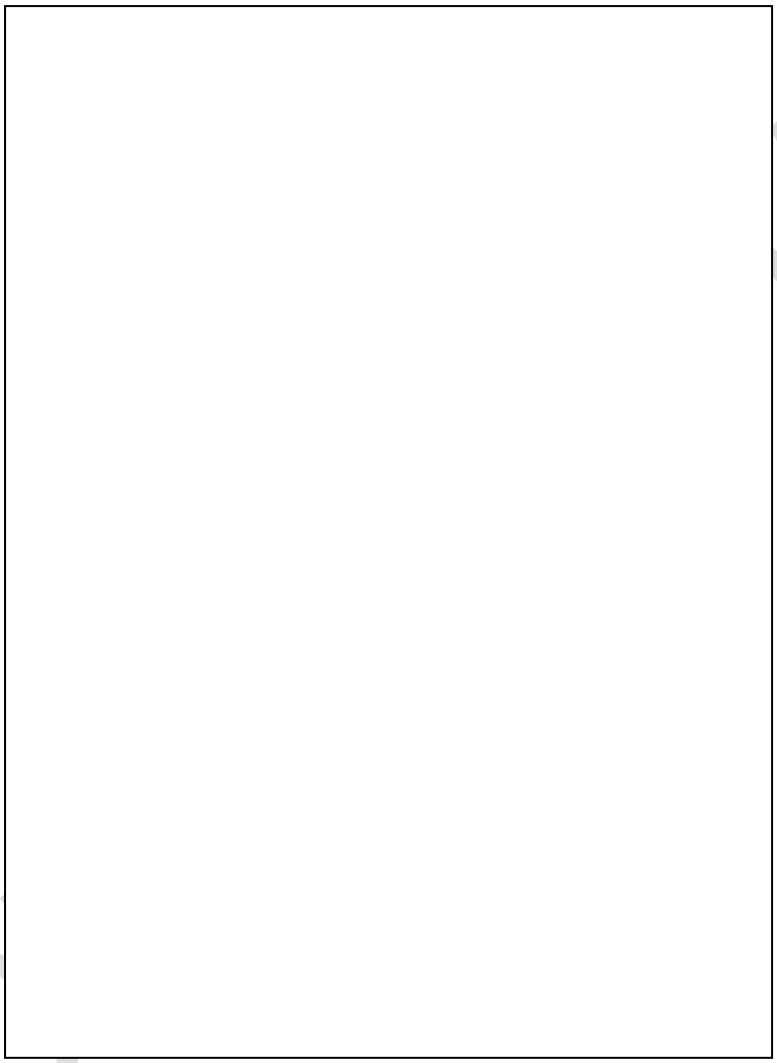
CONFIDENTIAL

Copyright© 2020. All Rights Reserved Do not alter without the permission of Imtiaz issadeen
CONFIDENTIAL

For queries please email:
Imtiaz.issadeen@gmail.com

For a system to be true “2N” the end device must be capable of accepting power (all power, not just electrical, example: cooling) from two separate and isolated sources.

N X 4 UPS design sketch. 1000m2 Data Hall with 3000kW IT power.



Copyright© 2020. All Rights Reserved Do not alter without the permission of Imtiaz issadeen
CONFIDENTIAL

2.1.8 MEP - Mechanical, Electrical, Plumbing, (including Fire Protection) which serve the facility.

2.1.9 RPP - Remote power panel; PDU - Power Distribution Unit.

2.2.0 UPS - Uninterruptible Power Supply. IGBT – Insulated Gate Bipolar Transistor

2.2.1 CRAC/CRAH - Air Conditioner. Any Air Conditioner/Heat Rejection unit which is dedicated to cooling IT hardware rather than comfort cooling for people.

2.2.2 GEN - Emergency Generator.

2.2.3 ATS - Automatic Transfer Switch;

2.2.4 STS - Static Transfer Switch.

2.2.5 VRLA – Valve Regulated Lead Acid; AGM – Absorbent Glass Mat

2.2.6 TCO – Total Cost of Ownership

2.2.7 PUE – Power Usage Effectiveness. The calculation of the PUE shall meet international standards and not rely on JDC recommended calculations. The PUE shall be calculated at an assumed IT load of 66% in ALL DC Halls.

2.2.8 Others shall be described in words or with the use of industry standard abbreviations - Examples include pumps, fans, chillers, cooling towers, UPS systems, engine-generators and transformers.

2.2.9 Distribution System
An assembly of components used to convey energy between energy converters or from an energy converter to an end device. Examples include piping, ductwork, and electrical wiring.

2.2.10 Dual Power Source Technology

2.2.10.1 Dual Power Source Technology

“Dual Power Source” implies that a user device is supplied electrical power from two or

In its simplest form, dual power can be achieved by providing two separate power circuits from different PDU.

2.2.10.2 IT Equipment Requirements

Design criteria and standards presented within this document assume

2.2.11 Units - All units are indicated in metric scale in this document, the only exception is the

CONFIDENTIAL

Copyright© 2020. All Rights Reserved Do not alter without the permission of Imtiaz issadeen
CONFIDENTIAL

For queries please email:
Imtiaz.issadeen@gmail.com

3.0 EXTERNAL AREAS

3.1 Gates and Fences

3.1.1 A permanent perimeter FENCE to be installed prior to hand over of the completed building. All sections which face roads, car parks and similar vehicle access areas

3.1.1.1 The Fence must be of welded metal and substantial enough to take the force of an intruder attack.

3.1.1.2 The Fence should be painted with a base coat, a second coat of anti

3.1.2 A motorized front (Main) gate which is mounted on rails is to be

3.1.2.1 The Gate must be at

3.1.2.2 In the event the Gate is very wide, the designer must

3.1.2.3 The main gate shall be provided with a suitable pole to fit video

3.1.3 A rear gate can be manual if only designed to be used in an emergency or infrequently.

3.1.4 A turnstile of suitable width is to be installed at the pedestrian

3.1.4.1 The turnstile selection must be done in coordination with the Security Design consultant at all times.

3.2 Flora and foliage

3.2.1 The Greenery Act of Japan must be followed at all t

3.2.1.1 Where ever possible, only shrubs are to be planted on

3.2.1.2 If the Code requires tall trees, the selected tress shall

3.2.1.3 Where ever possible, the selected trees shall be such

4 GENERAL AREA COMMON CONSTRUCTION STANDARDS

4.1 Entrance Lobby area and Loading Docks

4.1.1. Main Entrance paved, covered and configured such that unauthorized

4.1.1.1 The Entrance Lobby shall be designed and fitted out with two (2) Circle

CONFIDENTIAL

Copyright© 2020. All Rights Reserved Do not alter without the permission of Imtiaz issadeen
CONFIDENTIAL

For queries please email:
Imtiaz.issadeen@gmail.com

4.1.1.2 To the LEFT of these Circle gates, a 2m high stainless

4.1.1.3 The Entrance Lobby shall be designed to include a meeting room

4.1.1.4 A waiting area of at least 25m2 is to be provided in the Entrance lobby

4.1.1.5 The Entrance Lobby will also have 24 lockers for the safe storage of

4.1.1.6 A Security Command Center (SOC) is to be provided with a minimum area of 75m2

4.1.1.6.1 The SOC must have a clear view of the following areas:
The turnstile and the.
The Circle Gates
The Loading Dock and entry from

4.1.1.7 The SOC shall have a window of shatter proof

4.1.1. 8 After the Circle gates, the SOC shall have a Roller

4.1.1.9 Two x 2 secure steel conduits of 100mm diameter shall be provided from the SOC to closest IDF or

4.1.2 Receiving Loading Dock Paved, covered and configured such that u

4.1.3 Signage visible from areas of public access outside the building **shall not**

4.2 Service Equipment Access

4.2.1.1 Loading Dock to have a minimum door height of

The Loading Dock is to be designed to accommodate a 20 foot ISO container

The design must provide a turning radius for the above sized truck to back into the

The loading dock must be covered overhead and provide at least 8m space between the Loading Dock

4.2.1.2 Freight/Goods Elevators to be sized and load rated to accommodate the largest equipment,

4.2.1.3 Elevator door minimum 2000mm width x 2,800mm height.

4.2.1.4 Elevators shall be operated with the use of a Security card where authorized

4.2.1.6 Temporary Storage Room located near the loading dock.

CONFIDENTIAL

Copyright© 2020. All Rights Reserved Do not alter without the permission of Imtiaz issadeen
CONFIDENTIAL

For queries please email:
Imtiaz.issadeen@gmail.com

Provide 110m2 storage room with security for temporary storage of goods. Access with ID Card is required.

4.2.1.7 Emergency Ration Storage Room.
Provide about 25m2 room with proper ventilation and shelving for the storage of dry rations and water for emergency use. Shelving load of 300kg per shelf.

4.3 Staff amenities

4.3.1 A toilet fitted out to conform with Disability Person's Toilet design is to be

4.3.2 Separate Male & Female toilets to be located in proximity to the Client office area. At a minimum the toilets will have the following features.
Male Toilet: 3 urinal, 3 toilets with washlets, 2 hand wash basins with suitable counter top and mirror. Hot water unit of 5 to 7 liters to be fitted under-bench for each washbasin.
Female Toilet: 3 toilets with washlets, 2 hand wash basins with suitable counter top and mirror. Hot water unit of 5 to 7 liters to be fitted under-bench for each washbasin.

4.3.3 The design must also provide a single unisex toilet on each DC floor.

4.3.4 A Vending machine area with space for 3 typical vending machines shall be provided. Suitably rated, Power points with Earth to located 1800mm from the floor. Space for bottle/can disposal to be provided.

4.3.5 Two changing rooms are to be provided on 1F. One for males with 24 lockers of 1750mm high, 300mm wide and 515mm depth.

4.4 Mechanical, Electrical, Plumbing areas Construction Standards.

4.4.1 General Requirements

4.4.1.1 Fire Rating High risk fire areas shall be determined by individual

4.4.1.2 Notwithstanding anything to the contrary, a minimum one hour Japanese standard fire rating i

4.4.1.3 All doors shall be designed and fitted with Electric Mortice locks and

4.5 DATA CENTER HALL AREA COMMON CONSTRUCTION STANDARDS

4.5.1 Room Location Critical IT data center areas should not be exposed to adjacent areas of high risk, i.e. kitchens, UPS rooms, bathrooms, etc.

4.5.1.1 The Data Center Hall MUST have a room enclosure integrity level of at least 10 minutes when tested to ISO 15420-1 standards and/or NFPA 2001.

CONFIDENTIAL

Copyright© 2020. All Rights Reserved Do not alter without the permission of Imtiaz issadeen
CONFIDENTIAL

For queries please email:
Imtiaz.issadeen@gmail.com

4.5.1.2 As a proof of the DC Hall cooling design concepts, the designer must provide multiple CFDs of the Data Hall with various failure scenarios beginning with the normal

4.5.2 Roof

4.5.2.1 Fully adhered dual roofing system composed of a torched on layer of rubberized

4.5.2.2 Roof penetrations
No penetrations permitted over IT areas. All penetrations shall be pre-planned and

4.5.2.3 Minimum Roof Loading Capacity
Code requirement for roof loading plus collateral loading of 500 kg/sq m for all areas. A

4.5.2.4 Roof Drainage Requirements Roof Slope: Minimum 6.0mm in 300mm. O

4.5.2.5 The roof will be fitted with a Lightning Arrestor design that will conform to applicable Codes. The Lightning arrestor shall be Level 3 or better and suitable for a high-grade building.

4.5.3 Ceiling in Data Halls

4.5.3.1 The Ceiling height shall be calculated such that 1000mm clearance over a 52U rack

4.5.3.2 The Ceiling shall be provided with suitable openings for the hot air to

4.5.4 Internal Walls

4.5.4.1 LGS Stud wall with gypsum board finish and integral vapor barrier or

4.5.4.2 Fire Rating As required by Code, however for all Electrical areas a

4.5.4.3 Finishes Anti-Static Anti-Dust Acrylic paint over vapor barrier duly primed and sealed.

4.5.4.4 Vapor Barrier shall be in accordance to existing standards applied to similar areas.

4.5.4.5 Windows at exterior walls is not permissible for Data Centre halls or

4.5.5 Other Walls

4.5.5.1 LGS stud wall with gypsum board finish

4.5.5.2 Finishes Anti-Static paint primed and sealed.

4.5.6 Interior Wall Fire Rating one hour rating at IT and critical MEP infrastructure spaces. Minimum level would be as required by Code.

CONFIDENTIAL

Copyright© 2020. All Rights Reserved Do not alter without the permission of Imtiaz issadeen
CONFIDENTIAL

4.5.7 Internal Doors and Corridors

4.5.7.1 Minimum width of any Corridor to be 2000mm with protected corners and kick board at the base of the walls on both side. Kick boards will be of PVC or metal and will be at least 150mm high.

4.5.7.2 Doors: The Data Centre Hall to be Double 900mm + 900mm with no center post

4.5.7.3 Door height to all areas leading from the loading dock to the Data Centre Hall t

4.5.7.4 Doors to other areas to conform to Japanese Code.

4.5.7.5 All doors shall have names but not necessarily indicate the

4.5.8 Penetrations

4.5.8.1 Pipes and Conduits Fire sealed at penetrations through rated walls/taped to maintain vapor barrier integrity.

4.5.8.2 Ducts Fire sealed at penetrations through rated walls/taped to maintain vapor barrier integrity.

4.5.8.3 Cable Tray Cabling fire sealed at penetrations through rated walls/taped to maintain vapor barrier integrity.

4.5.9 Doors ratings and sealing

4.5.9.4 Door must be Fire Rated as required by Code.

4.5.9.5 Doors leading to any area where Gas Fire Suppression is installed shall be positive pressure rated perimeter gasketing and drop seal gasket at door bottom is required. The drop seal gasket should ideally be fitted to the door and not to the floor.

4.5.9.6 Door Size Minimum 900 mm x 2,800 mm height.

All doors into

CONFIDENTIAL

16. Miscellaneous

16.1 Power availability must be verified for each site and never assumed as the same for another site.

Copyright© 2020. All Rights Reserved Do not alter without the permission of Imtiaz issadeen
CONFIDENTIAL

For queries please email:
Imtiaz.issadeen@gmail.com

Supply voltage and Cycles vary in the Kanto and Kansai areas of Japan.

16.2 Noise levels at the boundary fence vary with the Site categorisation by the local council. The designer must verify the permitted sound levels and incorporate these into the design.

16.3 The designer must request a soil and boring tests to determine the depth, thickness and hardness of the bedrock. This should be extended to provide a comprehensive Liquefaction report. If the probability of Liquefaction is found, there are several mandatory measures that must be satisfied. The seasonal depth of the water table should be investigated during the boring tests.

16.4 Obtaining an updated site survey and a site topological survey should be done early in the project.

16.5 Air quality analysis must be performed before any air side free cooling systems are designed. A report must be obtained on any future construction where the exhaust may impact the air quality.

16.6 Prior to land purchase, an archeological report should be obtained to ensure no buried items exists.

16.7 If the area is a landfill, a Settlement report must be obtained to ensure construction, cable, pipes and fuel tanks that are not on piles to bedrock will not sink resulting in breaks or crack.

16.8 Height above Sea Level is critical. If the area is designated as a Flood Zone, the designer must consider raising the entire building above the flood level PLUS two meters.

16.9 The schedule must include On Site & Off Site work such as the Ultra Long Lead items.

CONFIDENTIAL

Copyright© 2020. All Rights Reserved Do not alter without the permission of Imtiaz issadeen
CONFIDENTIAL