TECHNICAL SPECIFICATION

ISO/IEC TS 22237-2

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Information technology — Data centre facilities and infrastructures —

Part 2: Building construction

Technologie de l'information — Installation et infrastructures de centres de traitement de données —

Partie 2: Construction des bâtiments

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 39, *Sustainability for and by Information Technology.*

A list of all parts in the ISO/IEC TS 22237 series can be found on the ISO website.

Introduction

The unrestricted access to internet-based information demanded by the information society has led to an exponential growth of both internet traffic and the volume of stored/retrieved data. Data centres are housing and supporting the information technology and network telecommunications equipment for data processing, data storage and data transport. They are required both by network operators (delivering those services to customer premises) and by enterprises within those customer premises.

Data centres need to provide modular, scalable and flexible facilities and infrastructures to easily accommodate the rapidly changing requirements of the market. In addition, energy consumption of data centres has become critical both from an environmental point of view (reduction of carbon footprint) and with respect to economical considerations (cost of energy) for the data centre operator.

The implementation of data centres varies in terms of:

a) purpose (enterprise, co-location, co-hosting, or network operator facilities);

b) security level;

c) physical size;

d) accommodation (mobile, temporary and permanent constructions).

The needs of data centres also vary in terms of availability of service, the provision of security and the objectives for energy efficiency. These needs and objectives influence the design of data centres in terms of building construction, power distribution, environmental control and physical security. Effective management and operational information is required to monitor achievement of the defined needs and objectives.

The ISO/IEC TS 22237 series specifies requirements and recommendations to support the various parties involved in the design, planning, procurement, integration, installation, operation and maintenance of facilities and infrastructures within data centres. These parties include:

1) owners, facility managers, ICT managers, project managers, main contractors;

2) consultants, architects, building designers and builders, system and installation designers;

3) facility and infrastructure integrators, suppliers of equipment;

4) installers, maintainers.

At the time of publication of this document, the ISO/IEC TS 22237 series will comprise the following documents:

ISO/IEC TS 22237-1: *Information technology — Data centre facilities and infrastructures — Part 1: General concepts*;

ISO/IEC TS 22237-2: *Information technology — Data centre facilities and infrastructures — Part 2: Building construction*;

ISO/IEC TS 22237-3: *Information technology — Data centre facilities and infrastructures — Part 3: Power distribution*;

ISO/IEC TS 22237-4: *Information technology — Data centre facilities and infrastructures — Part 4: Environmental control*;

ISO/IEC TS 22237-5: *Information technology — Data centre facilities and infrastructures — Part 5: Telecommunications cabling infrastructure*;

ISO/IEC TS 22237-6: *Information technology — Data centre facilities and infrastructures — Part 6: Security systems*;

ISO/IEC TS 22237-7: *Information technology — Data centre facilities and infrastructures — Part 7: Management and operational information*.

The inter-relationship of the specifications within the ISO/IEC TS 22237 series is shown in Figure 1.

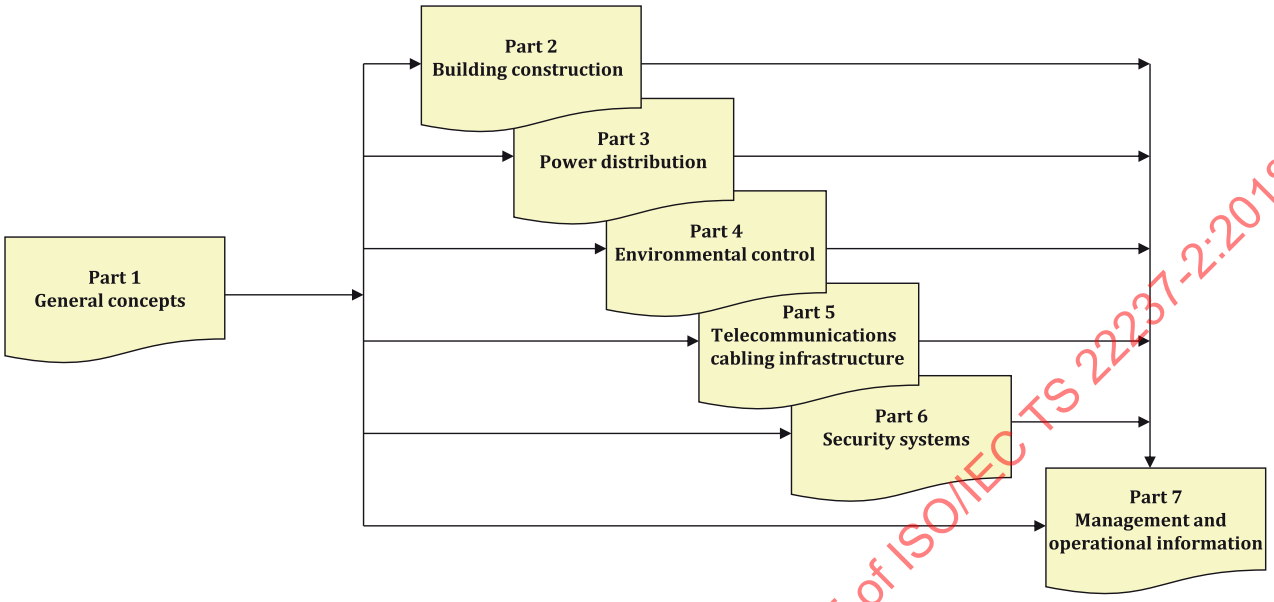

Figure 1 — Schematic relationship between the ISO/IEC TS 22237 series of documents

ISO/IEC TS 22237-2 to ISO/IEC TS 22237-6 specify requirements and recommendations for particular facilities and infrastructures to support the relevant classification for "availability", "physical security" and "energy efficiency enablement" selected from ISO/IEC TS 22237–1.

This document addresses the building design of data centres; it addresses security issues from a constructional point of view, whereas ISO/IEC TS 22237-6 specifies the pertinent security system requirements of those facilities and infrastructures (in accordance with the requirements of ISO/IEC TS 22237–1).

ISO/IEC TS 22237-7 addresses the operational and management information (in accordance with the requirements of ISO/IEC TS 22237-1.

This document is intended for use by and collaboration between architects, building designers and builders, system and installation designers.

The ISO/IEC TS 22237 series does not address the selection of information technology and network telecommunications equipment, software and associated configuration issues.

Information technology — Data centre facilities and infrastructures —

Part 2: Building construction

1 Scope

This document addresses the construction of buildings and other structures which provide accommodation for data centres based upon the criteria and classification for "physical security" within ISO/IEC TS 22237-1 in support of availability.

This document specifies requirements and recommendations for the following:

a) location and site selection;

b) building construction;

c) building configuration;

d) fire protection;

e) quality construction measures.

Safety and electromagnetic compatibility (EMC) requirements are outside the scope of this document and are covered by other standards and regulations. However, information given in this document may be of assistance in meeting these standards and regulations.

Conformance of data centres to the present document is covered in Clause 4.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 14520-1, *Gaseous fire-extinguishing systems — Physical properties and system design — Part 1: General requirements*

ISO/IEC 14763-2, *Information technology — Implementation and operation of customer premises cabling — Part 2: Planning and installation*

ISO/IEC TS 22237-1, *Information technology — Data centre facilities and infrastructures — Part 1: General concepts*

ISO/IEC TS 22237-3, *Information technology — Data centre facilities and infrastructures — Part 3: Power distribution*

ISO/IEC TS 22237-4, *Information technology — Data centre facilities and infrastructures — Part 4: Environmental control*

ISO/IEC TS 22237-5, *Information technology — Data centre facilities and infrastructures — Part 5: Telecommunications cabling infrastructure*

ISO/IEC TS 22237-6, *Information technology — Data centre facilities and infrastructures — Part 6: Security systems*

ISO/IEC 30129, *Information technology — Telecommunications bonding networks for buildings and other structures*

IEC 62305 (all parts), *Protection against lightning*

EN 12825:2001, *Raised access floors*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions in ISO/IEC TS 22237-1 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp

3.1.1
access floor
system consisting of completely removable and interchangeable floor panels that are supported on adjustable pedestals connected by stringers to allow the area beneath the floor to be used by building services

3.1.2
access provider
operator of any facility that is used to convey telecommunications signals to and from a customer premises

3.1.3
building entrance facility
facility that provides all necessary mechanical and electrical services for the entry of telecommunications cables into a building and which may allow for transition from external to internal cable

[SOURCE: ISO/IEC TS 22237-1:2018, 3.1.2]

3.1.4
modular construction
method which uses standardized prefabricated construction elements with the possibility to add extra elements when more space is required

3.1.5
pathway
defined route for different media between identified points

Note 1 to entry: Examples for media are bus bars, cables, conduits, ducts, pipes.

3.1.6
plenum
compartment or chamber to which one or more air ducts are connected and that forms part of the air distribution system

3.1.7
room in room
construction method to have a physically independent chamber (walls and ceiling) in a new or existing building

Note 1 to entry: Room in room can provide high level fire rating, water tightness, smoke tightness and intrusion protection required for IT environments.

3.2 Abbreviated terms

For the purposes of this document the following abbreviated terms apply:

DC Direct Current

HVAC Heating, Ventilation, Air Conditioning

IT Information Technology

4 Conformance

For a data centre to conform to this document:

a) its location shall have been selected following a site assessment as required in Clause 5;

b) it shall comply with the site requirements of Clause 6;

c) it shall meet the building construction requirements of Clause 7 where the data centre spaces are within buildings;

d) it shall meet the building configuration requirements detailed in Clause 8;

e) it shall meet the fire protection requirements of Clause 9;

f) it shall meet the quality construction measures of Clause 10;

g) local regulations, including safety, shall be met.

5 Location

5.1 Assessment of location

5.1.1 Requirements

The location of a site for a data centre can be assessed either for a “green field” construction of a new data centre or the evaluation of an existing site. The location shall be assessed against the following criteria:

a) geographical location (see 5.2);

b) natural environment (see 5.3);

c) adjacencies (see 5.4);

d) infrastructural factors (see 5.5);

e) budgetary factors such as site costs and cost to bring utilities to the site;

f) local regulation issues.

Personnel factors (operational personnel, security personnel) are not covered in this clause.

5.1.2 Recommendations

None.

5.2 Geographical location

5.2.1 Requirements

The elevation above sea level can have a direct influence on the performance of technical equipment and shall be considered.

5.2.2 Recommendations

The choice of a location of a new data centre should consider:

a) assessment of its impact on the environment;

b) any opportunities to take advantage of renewable sources of energy (e.g. wind, solar, aerothermal, geothermal, hydrothermal and ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases).

5.3 Natural environment

5.3.1 Requirements

An environmental risk analysis shall be conducted which, as a minimum, considers the following items:

a) flooding;

b) active seismic zones;

c) high wind velocities;

d) air contamination by natural causes (volcanic activities, etc.);

e) near to coast lines;

f) lower than sea level;

g) on special purpose flood plains.

Where the placement of a data centre in a location with negative environmental influences is unavoidable, these influences shall be mitigated by protective constructional, technical, and/or organizational measures.

5.3.2 Recommendations

None.

5.4 Adjacencies

5.4.1 Requirements

A risk analysis shall be conducted which, as a minimum, considers adjacency to the following items:

a) facilities storing, processing or in other ways dealing with nuclear, explosive, flammable or toxic substances or other hazardous materials;

b) transportation arteries like waterways, highways, railway tracks, flight paths;

c) sources of vibration, e.g. hammer mills, railroad tracks;

d) electromagnetic interference, created by e.g. high-voltage lines, transmitter stations;

e) places of public interest, gatherings or political targets;

f) tall and unstable installations that could damage the data centre if they collapsed;

g) other not related or non-essential operations (e.g. uncontrolled operations in multi-tenant premises).

Where the placement of a data centre in a location with negative infrastructural influences is unavoidable, these influences shall be mitigated by protective constructional, technical, and/or organizational measures.

5.4.2 Recommendations

It is important to ensure that sufficient space is provided around the area or the building to enable the creation of buffer zones and a secure perimeter.

Data centres should be located adjacent to potentially advantageous infrastructure or installations including, but not limited to, the following:

a) emergency response services;

b) vendor support and service personnel;

c) monitoring stations of external security providers.

5.5 Infrastructural factors

5.5.1 Requirements

Consideration shall be given to access to all the utility supplies (e.g. electricity, telecommunications infrastructure, water, sewage and gas) that will be required over the intended lifetime of the data centre in terms of:

a) accessibility (existence of utility services);

b) redundancy (services originating from different sources);

c) availability (reliability based on historical trends, if available);

d) capacity (e.g. electricity: short circuit current; water: pressure and flow; sewage: sizing).

5.5.2 Recommendations

Under consideration.

6 Site configuration

6.1 General

ISO/IEC TS 22237-1 contains a schematic representation of the typical spaces required by a data centre within a building. Figure 2 provides a simplified schematic and shows an example of the Protection Classes of ISO/IEC TS 22237-1 applied to the spaces of the data centre. The data centre is shown within Protection Class 2 and the protection increases as the importance of the facilities and infrastructure accommodated by the spaces increases.

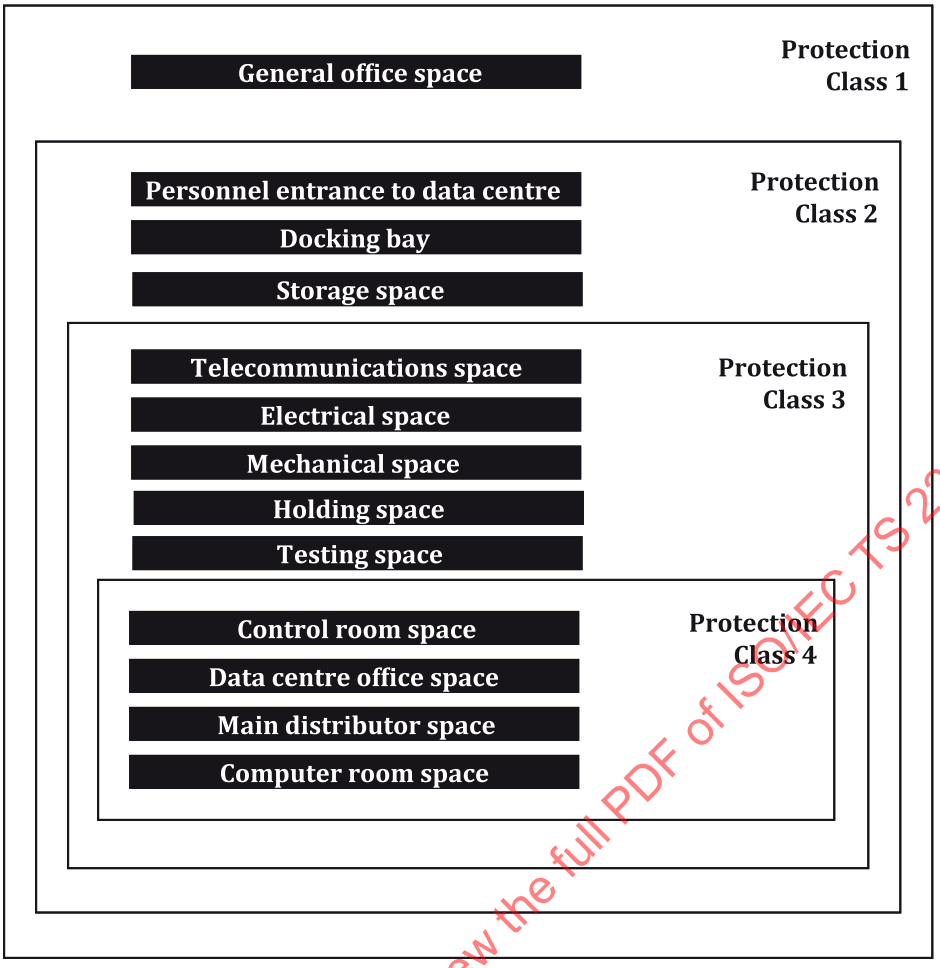

Figure 2 — Site of a data centre

6.2 Site selection

6.2.1 Requirements

The size and shape of a new site shall be suitable to accommodate the intended functions.

A site survey shall be commissioned to include both surface and geotechnical aspects. The results of the survey shall be relevant (i.e. based on current information).

The geotechnical survey shall include the following which would influence the construction and operation of the data centre:

a) buried cavities (natural or man-made) and buried utility infrastructures;

b) measurements, and expected variations of, soil resistivity and ground water conditions;

c) presence of contamination.

The site survey report shall be used to assist in the design of:

1) foundation configurations (taking account of any load increases due to possible building growth);

2) drainage infrastructure.

The design of earthing connections shall be based on the soil resistivity information produced by the geotechnical survey.

The site survey shall consider any need to provide spaces for support equipment such as underground fuel tanks (diesel or natural gas) to supply the generator(s), HVAC heat rejection systems, etc.

The selection of a site shall take into account any restrictions that may exist concerning land use and environmental impact aspects of any hydrocarbon emissions and sound generation and that could restrict fuel storage and generator operation.

6.2.2 Recommendations

The design of adequate drainage and foundation systems that will be required over the intended lifetime of the building should be based on the information provided by the geotechnical survey and should take into account possible future expansion.

6.3 Assessment of existing premises

6.3.1 Requirements

The suitability of the existing premises shall be determined by a risk analysis which reflects the specific needs of the proposed data centre which includes the assessment of criteria of Clause 5. An existing survey may be referred to if the documents are not older than six months. An existing risk analysis shall only be referred to if conducted with a similar objective (see Clause 5).

6.3.2 Recommendations

Under consideration.

6.4 Utilities

6.4.1 Requirements

The provision of external utilities to the premises shall be adequate for the intended availability class of the data centre as defined in ISO/IEC TS 22237-1.

Documentation shall be collated, which allows the risk to data centre operation arising from utility infrastructures to be assessed.

A composite utilities plan showing all underground and above ground utilities shall be provided.

6.4.2 Recommendations

None.

6.5 Access routes

6.5.1 Requirements

The number of access routes to the site shall take into account the risk of blockage which may affect the delivery of labour and materials to the data centre. The design and construction of access routes shall consider expected loads and dimensions of vehicles.

6.5.2 Recommendations

A secondary access route should be considered.

6.6 Deliveries

6.6.1 Requirements

The docking bay shall be designed to accommodate the largest items expected to be delivered or removed from the data centre during operation.

6.6.2 Recommendations

The docking bay should provide protection against precipitation.

6.7 Parking

6.7.1 Requirements

Parking restrictions related to security are detailed in ISO/IEC TS 22237-6.

6.7.2 Recommendations

Consideration should be given to any additional parking facilities which would be necessary during emergency situations including those involving disaster recovery scenarios.

6.8 Exterior installations

6.8.1 Underground facilities

6.8.1.1 Requirements

Vehicular traffic shall not be routed over underground facilities unless they are protected by appropriate slabs installed above the facility.

Above ground exterior installations adjacent to access routes shall be protected.

The requirement for visual or acoustic screening of exterior installations shall be assessed.

6.8.1.2 Recommendations

Underground fuel storage tanks should be installed in proximity to the generator(s) but outside of potential future building expansion areas.

Pumps and refill station should be positioned at the boundary of the Protection Zone 1 (see ISO/IEC TS 22237-6) to avoid the necessity for access of fuel vehicles to the site. The area for the fuel storage tanks should be located outside of potential future building expansion areas.

6.8.2 Telecommunications cabling

6.8.2.1 Requirements

See EN 50174-3 for requirements relevant to information technology cabling installations outside buildings. All routes where conflicts could occur shall be clearly indicated on all plans and relevant details shall be mentioned.

6.8.2.2 Recommendations

None.

6.9 Perimeter

6.9.1 Requirements

The perimeter of the date centre shall be provided in accordance with the outcome of the risk analysis in ISO/IEC TS 22237-6.

6.9.2 Recommendations

A data centre site may be completely or partly surrounded by a fence or wall. The number and functionality of gates and entrances for personnel and vehicles should be minimized and secured according to the level of security chosen (see ISO/IEC TS 22237-6).

The exterior areas should be maintained and buffer zones created to minimize disturbance to or by neighbours.

7 Building construction

7.1 Building structure

7.1.1 General

7.1.1.1 Requirements

The design of, and the materials used in the construction of the structure protecting the data centre spaces, facilities and infrastructures shall be of a design that does not compromise the desired availability class based upon the risk assessment of external environmental events identified in Clause 5 and security requirements of ISO/IEC TS 22237-6.

The requirement for unobstructed clearance above any floor slabs in areas within the structure reserved for data centre spaces shall be determined based on the environmental control concept from ISO/IEC TS 22237-4 and other infrastructure details such as cabinet heights, the requirements of access flooring and of pathways.

7.1.1.2 Recommendations

It should be noted, that data centres typically require a higher physical protection level than is specified by local building regulations.

7.1.2 Load-bearing structure

7.1.2.1 Requirements

The load bearing structure shall be designed to support the anticipated point and distributed loading for the intended life of the data centre. Consideration shall be given to requirements for expansion.

7.1.2.2 Recommendations

None.

7.1.3 Building materials and finishes

7.1.3.1 Requirements

The use of fire resistant materials is required.

All open or rough surfaces shall be sealed to prevent dust or chemically-active particles being distributed by the constant airflow in air conditioned spaces.

The design of, and the materials used to construct, spaces intended to contain gaseous fire extinguishing systems shall provide the required level of air-tightness.

The design of, and the materials used to construct, spaces that have an identified risk of flooding shall provide the required level of watertightness.

Building materials shall be selected which minimize the particulate matter produced during construction, operation or alterations.

Building materials shall be selected to minimize mould growth and rodent damage.

Building materials shall be selected to minimize repetitive maintenance tasks.

The amount of insulation shall consider both the ambient environmental conditions and technical equipment heat rejection.

7.1.3.2 Recommendations

Prefabricated modular construction elements can be selected based on the criteria in 7.1.3.1. Materials should be selected to minimize the emission of toxic gases and smoke during combustion.

The building should be insulated to minimize operating cost.

7.2 Foundations

7.2.1 Requirements

Any foundations used to support the structure(s) accommodating the data centre spaces shall take into consideration the result of the site survey (see 6.2). When looking into a floor below grade level, water infiltration issues shall be considered, including height below surrounding drainage systems, secure, continuous vapour barriers, water and vapour extraction systems.

The layout of the building's foundation and structure shall incorporate the earthing and bonding system as protection against lightning and electromagnetic interference. The design may vary according to the required Lightning Protection Level (LPL) and to the site parameters. See ISO/IEC TS 22237-3 and IEC 62305 (all parts).

7.2.2 Recommendations

The design strength and extent of any foundations should consider any forecast expansion of the data centre spaces (vertical or lateral).

7.3 Exterior walls

7.3.1 Requirements

Requirements for Protection Class boundaries and access at them are specified in ISO/IEC TS 22237-6.

Where exterior walls provide the boundary of Protection Class 1, they shall either be designed to be resistant to the predicted external climatic conditions during the lifetime of the enclosed data centre spaces or the construction of the boundaries of Protection Class 2 shall take into account the need for the repair of the exterior walls.

Where exterior walls provide the boundary of Protection Class 2, they shall be designed to be resistant to the predicted external climatic conditions during the lifetime of the enclosed data centre spaces.

Where exterior walls provide the boundary of Protection Classes 1 or 2, the number of openings shall be minimised consistent with the access requirements during both operation and emergency situations.

The position and size of openings that will provide pressure relief for gaseous fire suppression systems shall be addressed in the design phase.

7.3.2 Recommendations

Recommendations for Protection Class boundaries and access at them are given in ISO/IEC TS 22237-6.

7.4 Interior walls providing boundaries of Protection Class

7.4.1 Requirements

Requirements for Protection Class boundaries and access at them are specified in ISO/IEC TS 22237-6. The number of openings at these boundaries shall be minimised consistent with the access requirements during both operation and emergency situations.

Interior walls shall provide the desired degree of physical security against internal fire and internal environmental events. Interior non-load bearing walls shall be constructed in a way to allow for modifications while at the same time provide the required protection against intrusion. See EN 50600-6. Openings in walls and doors in transportation routes shall be of sufficient width and height to allow for the largest pieces of equipment expected to be transported.

If the wall constitutes a fire barrier then any penetrations shall meet the requirements of Clause 9.

All doors shall be fitted at minimum with a mechanical security lock.

7.4.2 Recommendations

Recommendations for Protection Class boundaries and access at them are specified in ISO/IEC TS 22237-6.

7.5 Roofs

7.5.1 General

7.5.1.1 Requirements

Where a roof covers, directly or indirectly, any data centre spaces, the roof and its sub-structure (i.e. drainage channels) shall be designed and constructed to protect the data centre spaces from predicted external climatic conditions and from air-borne debris.

The design of sub-structures of the roof shall take into account the need for the repair of the roof and shall provide the required protection during the repair process.

The construction of the roof and its sub-structure shall be capable of supporting any additional loads created by, and provide permanent access to, any elements of the data centre facilities and infrastructures that are to be accommodated at roof level.

The requirements for visual screening of roof-top facilities and infrastructure shall be included in any calculations of loads to be supported.

Aesthetics are not a prime requirement for a data centre project. In some cases architectural features such as rooftop HVAC equipment screening can be necessary.

Where the roof acts as a Protection Class boundary, it shall meet the requirements of ISO/IEC TS 22237-6.

Openings in roofs shall be protected against unauthorized access and external environmental events in accordance with ISO/IEC TS 22237-6. Openings in roofs shall maintain the intended function of the roof.

7.5.1.2 Recommendations

Under consideration.

7.6 Rain water drainage

7.6.1 Requirements

The roof and any sub-structure for the drainage of rain water from the roof or elsewhere shall be designed and constructed:

a) to avoid accumulation of rain water which could affect data centre spaces;

b) to ensure that all rain water is carried through a drainage system of appropriate capacity.

The drainage system shall be designed and constructed to facilitate inspection, cleaning and repair.

The routing of drainage systems shall respect Protection Class boundaries in accordance with ISO/IEC TS 22237-6.

7.6.2 Recommendations

None.

7.7 Floors and ceilings

7.7.1 General

7.7.1.1 Requirements

Within data centre spaces containing telecommunications equipment the requirements of ISO/IEC 30129 and ISO/IEC 14763-2 shall be applied in relation to functional bonding structures and electro-static discharge respectively.

7.7.1.2 Recommendations

Flooring in spaces designated for human occupation should be selected to minimize noise. Flooring in testing and holding spaces should have similar properties to that installed in the computer room space. Flooring in secondary areas, i.e. storage, corridors, etc. can be of lesser conductivity.

7.7.2 Access floors

7.7.2.1 Requirements

Where used access floors shall be in accordance with EN 12825:2001, grade 5. They are highly unlikely to be used in a docking bay.

Where the finished floor height is above 500 mm independent standing steel grid floors shall be considered.

The assembly shall be levelled and locked at a selected height, requiring deliberate action to change height setting and preventing vibrating displacement. The assembly shall provide a range of adjustment from ±5 mm.

The edge trim for the tile coverings shall be bonded to the panel surface and flush with the surface covering.

Ventilation panels shall be selected to provide the required airflow. Ventilation panels shall support the same load as solid panels.

7.7.2.2 Recommendations

None.

7.8 Corridors and doors

7.8.1 Requirements

Access routes along which equipment and other goods are to be delivered to and from the data centre spaces shall be of sufficient width and height to allow for the largest pieces of equipment expected to be transported. Doors shall have no door sill and double doors shall have no centre post.

The fire rating of all data centre doors shall be minimum 1 h; the fire rating of all doors between different security zones and doors leading to information technology rooms, computer rooms, communication rooms and technical rooms shall be minimum 2 h. All doors shall be smoke-tight if early smoke detection systems are being used.

7.8.2 Recommendations

Doors within access routes along which equipment and other goods are to be delivered to and from the data centre spaces should provide a minimum clearance of 2,4 m. Consideration should be given to the need for double width doors.

A combined freight and passenger lift is acceptable based on building size and occupancy. Being part of the transportation route, the size of the cabin should allow for large IT and technical components. For the height and width of a freight lift door, the criteria of interior wall openings apply. The load bearing capacity of the lift cabin should be minimum 1 500 kg. The material inside the lift cabin should be scratch resistant, e.g. brushed stainless steel.

8 Data centre spaces and access routes

8.1 Accommodation

8.1.1 General

The number and types of data centre spaces depends upon the size and complexity of the data centre. Consideration should be given to modular construction methods which enable future expansion.

8.1.2 Requirements

The provision of on-site monitoring and/or management functionality shall be considered for all data centres.

Consideration shall be given to locating toilet facilities in such a way as to minimize the requirements that the personnel has to cross the boundaries of Protection Classes.

8.1.3 Recommendations

The accommodation of data centre spaces should consider the impact of:

a) new technologies (flexibility);

b) adaptation to changing parameters (adaptability);

c) increasing demands for space (scalability).

The spatial relationship between the different data centre spaces should facilitate the overall operation based on adjacency factors.

The floor plan should minimize the amount of demolition during any expansion phase.

The organization of the building, the room program and floor layout should mirror the functional and security requirements of data centre operations. For the supply of the building with utility and data services this includes redundant and separate entrance rooms for telecommunication links, fuel lines, water and sewage. For the technical operation of the building this includes spaces for electrical and mechanical systems.

8.1.4 Data centre spaces

8.1.4.1 Control room space

The control room space typically houses computer system and network traffic monitors, and increasingly building automation systems and security systems monitoring equipment.

As needed, office(s) and meeting rooms should be provided adjacent to the control room space for supervisory functions and to form an emergency trouble-shooting area.

8.1.4.2 Computer room space

8.1.4.2.1 Requirements

The computer room space shall be designed to provide adequate space for initial and predicted quantities of IT equipment and support equipment. Cabinets, racks and frames shall be aligned in rows to create aisles.

Factors to determine the location of a computer room space include:

a) proximity to power to reduce lengths of bus bars or cabling;

b) proximity to mechanical distribution rooms to reduce length of pipes and air ducts;

c) proximity to the communications distribution point (carrier entrance rooms) of the building.

8.1.4.2.2 Recommendations

Computer rooms should not exceed 600 m^2 and row length should not exceed 20 cabinets, racks or frames.

The arrangement of the rows should follow the 'cold/hot aisle' methodology. Where this is applied:

a) the fronts of the cabinets shall face each other in a 'cold aisle';

b) the rears of the cabinets shall face each other in a 'hot aisle';

c) for reasons of energy efficiency, maximum effort shall be made to prevent mixing of cool input air with hot exhaust air and to allow the shortest path possible for hot return air flowing back to the air conditioning units. See also ISO/IEC TS 22237-4.

8.1.4.3 Electrical space

Under consideration.

8.1.4.4 Mechanical space

Under consideration.

8.1.4.5 Telecommunications space

Under consideration.

8.1.4.6 Storage space

Under consideration.

8.1.4.7 Testing and holding spaces

Under consideration.

8.1.4.8 Docking bay

Under consideration.

8.1.4.9 General office space

Office areas should be at or near the main building entrance on the building perimeter to allow outside visibility.

8.2 Protection

8.2.1 Requirements

Where the accommodation of the data centre spaces and pathways connecting them lies wholly or in part below the predicted range of ground water level or is at identified risk of flooding then water infiltration issues shall be considered including:

a) height below surrounding drainage systems;

b) secure, continuous vapour barriers;

c) water and vapour extraction systems.

8.2.2 Recommendations

None.

8.3 Floors

8.3.1 General

8.3.1.1 Requirements

During the design phase the requirements for floor loading (including the weight of any access floors) in data centre spaces, and in access routes to those spaces, shall be determined.

Table 1 provides guidance on such loads.

Table 1 — Load capacity guidance

Load capacity guidance		Data centre spaces and access routes to those spaces			
		Other spaces	Electrical and mechanical spaces computer room	Docking bay	Lifts
Floor loads	Uniform load (min)	5 kN/m^2	12 kN/m^2	20 kN/m^2	—
	Point load (min)	2,0 kN	5,0 kN	7,5 kN	1,5 kN
Ceiling loads	Hanging load (min)	1,5 kN/m^2	2,5 kN/m^2	3,0 kN/m^2	—

The floors and flooring materials shall be capable of supporting the required static and dynamic loads.

Flooring materials shall to be resistant to the expected levels of abrasion.

8.3.1.2 Recommendations

Future expansion should be considered when determining the finished floor elevation.

8.3.2 Access floors

8.3.2.1 Requirements

The need for an access floor within any data centre space shall be considered during the design phase since it affects delivery of the infrastructures and any decision may be practically non-reversible.

Where it is desired to accommodate the pathways of the data centre infrastructures (power, environmental control and telecommunications cabling) beneath the equipment they service then an access floor shall be used in accordance with this sub-clause.

Access floors shall consist of interchangeable square or rectangular panels selected to meet specific load requirements, conforming to EN 12825. Panels shall be supported by adjustable pedestal assemblies which positively locate, engage and secure panels and which accommodate horizontal stringers. The pedestals are fixed to the floor with glue and/or bolts.

8.3.2.2 Recommendations

PVC is not recommended as flooring material. Stringers should be bolted. The access floor should have a minimum clear height of 500 mm above the slab. Where, during the anticipated life of the data centre, the environmental control concept or the distribution of infrastructure precludes the installation of a 500 mm access floor, consideration should be given to access floor heights in excess of this height.

8.4 Ceilings

8.4.1 Requirements

During the design phase an assessment of the ceiling loading requirements in data centre spaces shall be made.

Table 1 provides guidance on such loads.

Where suspended ceilings are installed in data centre spaces, a ceiling system constructed from non-particulating materials shall be installed.

8.4.2 Recommendations

The minimum clear height of computer rooms between finished floor to ceiling or ceiling beams depends on the environmental control concept and other infrastructure details (e.g. raised floor, overhead cabling) and should be a minimum of 3,0 m.

In rooms conditioned by freely circulated air the underside of the ceiling should be even without any beams etc. If beams are present, they should run parallel to the air-flow in order not to present any obstruction to air circulation. If beams run in a right angle to the air-flow, a suspended ceiling should be considered.

Suspended ceiling systems should also be considered in areas permanently occupied by personnel (control centre, offices, lobby, etc.) for acoustical reasons. Technical rooms should not have a suspended ceiling, for the computer room and telecommunication spaces it is not recommended unless there are functional reasons, e.g. suspended ceiling space to be used for returning air.

8.5 Access to data centre spaces

8.5.1 Requirements

In data centre spaces and in access routes to those spaces along which equipment and goods will be transported, stairs shall be avoided in favour of ramps or lifts.

The width of ramps and lift doors shall be in accordance with those of doors in interior wall specified in 7.4.2.

8.5.2 Recommendations

None.

8.6 Vapour density

8.6.1 General

A data centre requires humidity control to maintain optimum environmental conditions for the IT and telecommunications equipment. Without humidity control, the electronic equipment can malfunction or experience unacceptable performance. Without vapour barriers, damaging ice or condensation can form behind exterior walls and under the roof during cold weather.

8.6.2 Requirements

A risk assessment concerning vapour seal necessities shall be conducted and measures shall be implemented accordingly. The vapour seal shall maintain a humidity level or prevent vapour infiltration to the controlled spaces.

8.6.3 Recommendations

Since vapour barriers are difficult to install and seal off in existing buildings, areas that could become humidified in the future should have barriers installed during new construction. Flexibility is required to facilitate any on-going expansion. Therefore, it is necessary to analyse and clearly identify the areas needing vapour barriers or may require them in the future.

9 Fire compartments, fire barriers and fire suppression systems

9.1 General

9.1.1 Requirements

The data centre spaces together with the access routes and infrastructure pathways to and between those spaces shall comprise defined fire compartments bounded in three dimensions with appropriate levels of fire performance in order to prevent the spread of fire and its effluent and to minimize the extent of loss.

The selection of compartment boundaries shall take into account the impact of fire within each compartment. Fire compartments shall, at least, be defined by the boundaries of Protection Classes of ISO/IEC TS 22237-6. The fire performance requirements of those boundaries are specified in ISO/IEC TS 22237-6. However, the density of fire compartments may be greater than the areas defined by those boundaries.

To reduce the fire risk within a compartment, containment, detection and suppression systems are applied such that the smoke-producing and flame-spread properties of materials do not have to be considered. Where the compartment contains items of electrical equipment these systems should also be applied so that corrosive-gas-producing properties of materials do not have to be considered.

With each fire compartment, different approaches may be taken in relation to fire containment, detection and suppression. Fire containment, detection and suppression are addressed in ISO/IEC TS 22237-6.

This sub-clause addresses the management of fire barriers together with the constructional aspects of fire compartments and associated spaces related to specific suppression systems.

9.1.2 Recommendations

None.

9.2 Fire barriers

9.2.1 Requirements

Fire compartments are separated in three dimensions by fire barriers with a defined fire rating performance.

All penetrations of fire barriers (e.g. walls, floors or ceilings) shall be protected by appropriate fire-stopping techniques (see ISO/IEC TS 22237-6) that reinstate the original fire rating of the barrier.

NOTE Such techniques include fire-stopping materials and/or penetration sealing systems.

Fire-stopping techniques shall be installed in accordance with the manufacturer's/supplier's installation instructions. Each fire stop shall be clearly labelled or otherwise marked to indicate its function so as to be identifiable during future construction processes.

Any penetration of fire barriers (and seals supporting fire suppression systems) shall be opened only when necessary and resealed on completion of works to re-create original fire rating of the barrier. The re-instatement of the fire rating of fire barriers shall be implemented using the specified fire-stop materials and/or fire-stopping techniques.

When periods of infrastructure installation work are interrupted and unattended, the penetrations shall be at least temporarily sealed with appropriate materials (fire cushions, etc.).

9.2.2 Recommendations

None.

9.3 Fire compartments for gaseous extinguishing systems

9.3.1 Inert gaseous extinguishing systems

9.3.1.1 Requirements

See ISO 14520-1.

Where the suppression system employs the total flooding of a fire compartment, air-tightness shall be considered during design and engineering of the envelope of the fire compartments of the data centre spaces.

9.3.1.2 Recommendations

Longer standing time is recommended to create longer safe period, as fire can ignite again, when the suppression gas disappears.

9.3.2 Oxygen reduction systems

9.3.2.1 Requirements

Where the suppression system employs the total flooding of a fire compartment, air-tightness shall be considered during design and engineering of the envelope of the fire compartments of the data centre spaces. The fire compartment shall be airtight according to the specified N-50 value.

9.3.2.2 Recommendations

None.

9.4 Fire suppression

9.4.1 Requirements

If the fire protection concept includes a gaseous suppression system, space shall be provided for the placement of storage containers of the fire suppression medium. The location of such storage facilities shall consider ease of maintenance.

9.4.2 Recommendations

With most systems, the storage containers of the fire suppression medium should be installed in their own room and, depending on the fire suppression medium, in close proximity to the computer rooms.

Even if no fire suppression system is considered initially an appropriate space should be allocated.

10 Building configurations

10.1 Design phase

10.1.1 Requirements

Under consideration.

10.1.2 Recommendations

Under consideration.

10.1.3 Areas, compartments

10.1.3.1 Requirements

Under consideration.