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The standard UNE 50600

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Objective and Background

Objetive

This document aims to provide a practical guide for understanding the European standard EN/UNE 50600 regulations within the critical infrastructure management scope

Background

This document is based on the publication of the EN/UNE 50600 standard, specifically UNE-EN 50600-1:2019 (Ratified).

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Management of Data Centers and Infrastructures

The critical applications and services of businesses are hosted in data centers. Examples can range from accessing websites, databases, and customer information to controlling air traffic, telecommunications, and banking operations. It is because of this that the infrastructure supporting them also becomes critical, and therefore, its management is crucial to ensure the maximum continuity and quality of service.

To achieve this, various standards and regulations have been developed that involve three main concepts:

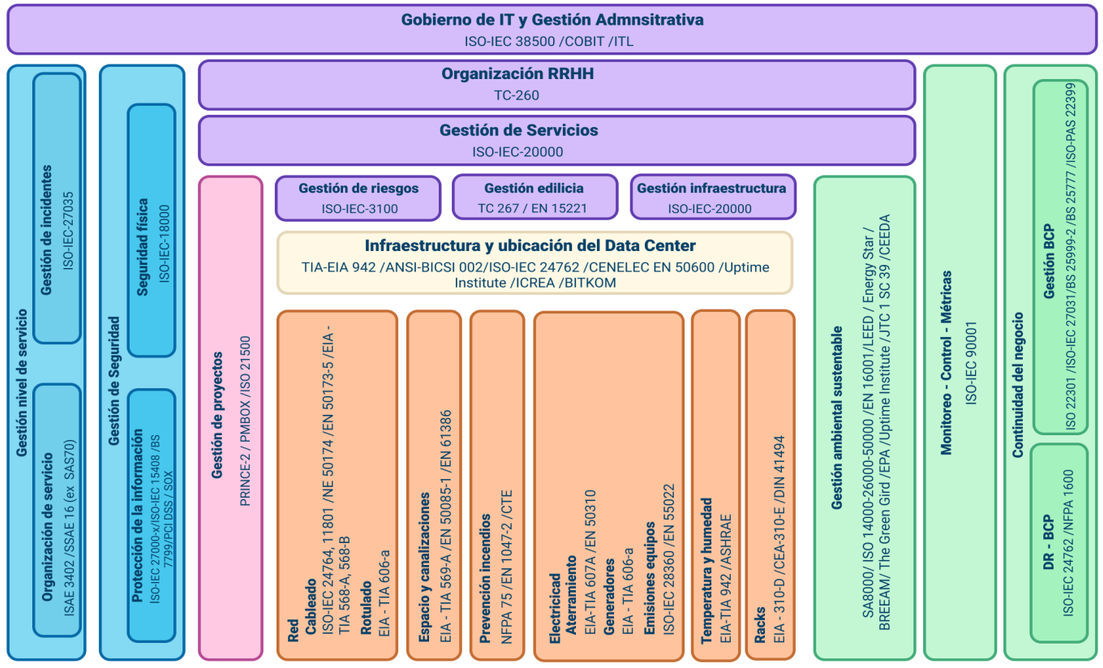
When building a data center or enhancing an existing one, numerous doubts and questions arise regarding the establishment of the correct standards to meet the business needs. The same happens in companies that choose to outsource their infrastructure when selecting a provider. Questions about the quality and levels of services offered can generate uncertainty.

Complying with the requirements of a standard is complex and costly. Moreover, in the market, there are many standards, and it is not possible to meet all of them simultaneously as they have different objectives and requirements. Therefore, it becomes essential to align the certification strategy with the company’s business.

In the following chart, you can holistically visualize all the standards and how they relate to each other and different areas. They are grouped into modules ranging from the management of Data Center resources to the strategic management of IT governance.

The modules are grouped by color according to the application area within IT, with the following being highlighted prominently:

- Service Level Management: Service organization and Incident Management.
- Security Management: Information protection and Physical Security.
- Project Management.
- Infrastructure Management: Network Management, Physical Space, Fire Prevention, Electricity, Temperature and Humidity, Racks.
- Service Management: Risk Management, Building Management, Infrastructure Management.
- Environmental Management.
- Monitoring and Metric Control.
- Business Continuity: BCP (Business Continuity Plan) Management, DR (Disaster Recovery) Management, and BCP.
- IT Governance, HR Management, and Administrative Management



Infraestructure Management Silos

Within the universe depicted in the chart above, the following differences are clarified:

Regulations: are mandatory based on the type of activity. They are governed by law, and failure to comply may lead the regulatory body to revoke the business's operating license for that activity. Examples include SOX, HIPAA, etc.

Standards: are specific provisions suggested by recognized bodies. In the context of compliance with established norms, certification indicates that the company meets the criteria outlined in the model. Examples include ISO standards, among others.

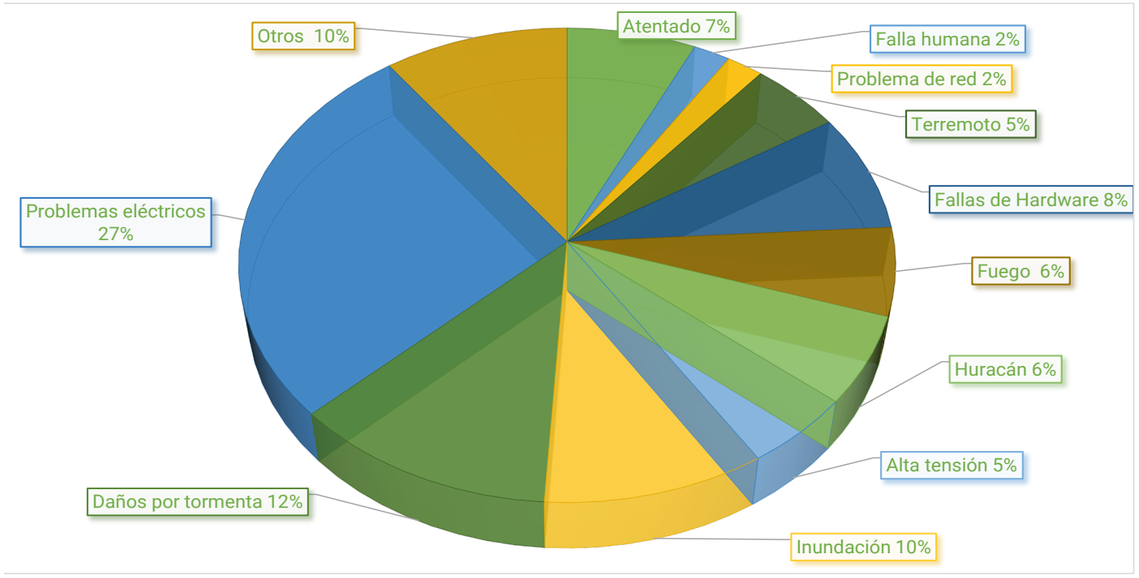
Frameworks: As the name suggests, frameworks provide a flexible approach as they are not regulated. They offer a suggested methodology that can be adapted to the operational needs of the business. Examples include ITIL, COBIT, etc.

The first level of criticality: Physical Security

Due to the importance of physical infrastructure, it is reasonable to focus on it as the first step before examining organizational and management processes, where common recognized standards such as ISO 27001 (information security management) or ISO 9001 (service quality) are found.

Many factors could cause disruptions in data centers, ranging from human errors, cyber attacks, failures in critical infrastructure, lack of appropriate equipment to ensure availability, heat-related failures, or even the outbreak of a fire, among many others.

If we set aside natural events, the causes of service outages in data centers are predominantly dominated by failures in physical infrastructure



Principales causas de eventos en infraestructuras crísti

The cost of downtime for a data center can range from thousands to millions of dollars per minute, depending on the business and the criticality of its affected services. However, it should be noted that a company experiencing downtime is not only facing financial damage but also legal implications and harm to its brand reputation

The following examples can contextualize and quantify these impacts:

British Airways: $200 million, over 3 days.

On May 27, 2017, British Airways (BA) experienced a disruption in its data center, forcing the cancellation of over 400 flights and stranding more than 75,000 passengers.

Following a power outage at the UK data center, there was an uncontrolled power restoration, leading to a power surge that damaged an IT equipment power supply.

BlackBerry: $350 million, over 4 days

The disruption spanned four days and five continents, impacting over half of its 70 million users worldwide, with millions of critical emails for its clients left unsent. Loss estimates ranged from a isolated estimate of only $26 million in the UK to a global retrospective of $350 million in total.

For BlackBerry, it meant a massive loss of corporate customers and mobile phone users, contributing to the company's downfall. This situation was seized upon by competitors like Apple, Google, and Samsung.

How to address service continuity? Standard EN/UNE 50600

In order to address the causes of data center downtime and minimize its costs, the EN 50600 standard has been developed, evolving into the international standard ISO 22237.

This standard, developed by CENELEC (European Committee for Electrotechnical Standardization), is not limited to the use in European data centers, as it applies design and management principles that are common worldwide.

It sets standards for availability, security, and energy efficiency throughout the entire life cycle of data centers, including potential energy savings

The requirements for data centers are classified into 4 levels of availability, covering minimum standards in the construction environment, fire detection and suppression, security systems and organization, cabling, power supply, ventilation and air conditioning, and documentation

1.- Structure

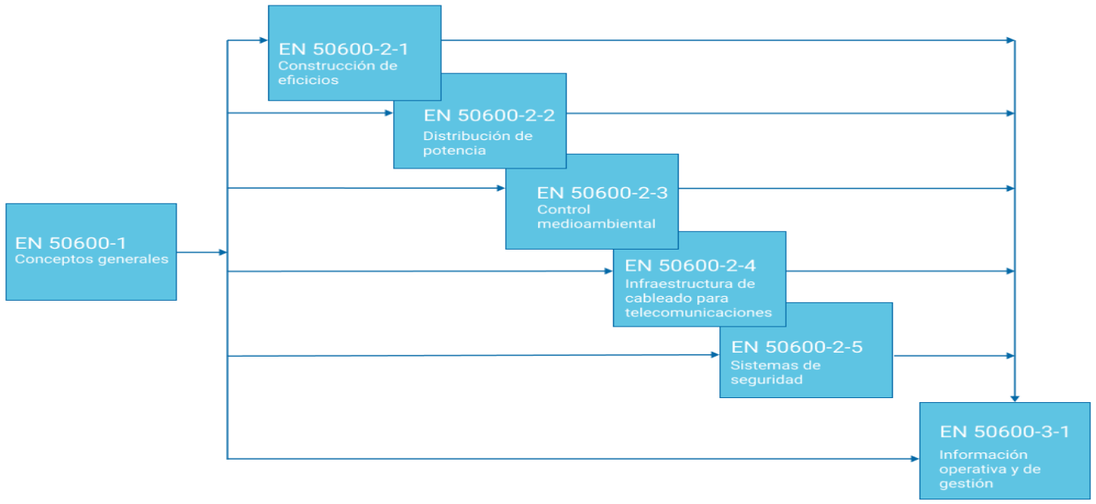
Primarily, the standard begins with general concepts to define the level (1 to 4) of overall availability for a data center, based on the lowest level among the three detailed infrastructure elements below:

- Building construction
- Power distribution
- Environmental control
- Telecommunications cabling infrastructure

Then, the requirements are defined for:

- Physical security of data center spaces regardless of the infrastructure level.
- Record of operational and management information.

The mentioned structure is summarized in the following table.



The structure of EN 50600

2.- Main Content

The key contents of the standard are

- An analysis of risks and requirements designed to define and ensure appropriate design and planning.
- Four classes of availability for technical infrastructure, including power distribution, environmental control, and telecommunications cabling.
- Four classes of protection for physical security and space utilization.
- Management and operation, including a definition of measurable KPIs and requirements for operational management and energy efficiency.

2.1-General Concepts

As an introduction, common aspects of data centers are defined, including terminology, parameters, and infrastructure (functional elements and their location).
Then, general design principles for data centers are described, upon which the requirements of the EN 50600 series are based. This includes symbols, labels, coding, quality assessment, and training.
The central theme of this section is the definition of availability as the continuity of processing, storage, and data transportation functions; and how to identify the acceptable level of availability throug:

- Risk Assessment: Impact (criticality of services and redundancy) and probability (high, low, medium)).

- Cost of downtime with parameters such as:

    - o Penalties from customer contracts.
    - o Physical damages.
    - o Market reputation

Using this information, specify a classification system based on the criteria of availability, security, and energy efficiency over the planned life of the data center.

The following chart displays the key design criteria based on the selected availability class for power distribution, environmental control, and telecommunications cabling

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	Disponibilidad del conjunto total de instalaciones e infraestructuras			
	Baja	Media	Alta	Muy alta
	CLASE DE DISPONIBILIDAD			
Infraestructura	**1**	**2**	**3**	**4**
Distribución/suministro En50600-2-2	Ruta única (sin redundacia de componentes)	Ruta única (disponibilidad proporcionada por la redundancia de componentes).	Multiruta (disponibilidad proporcionada por la redundancia de sistemas)	Multirruta (tolerantes a fallos incluso durante un mantenimiento)
Control medioambiental NE506000-2-3	Sin requisitos específicos	Ruta única (sin redundancia de componentes)	Ruta única (disponibilidad proporcionada por la redundancia de componentes)	Multirruta (disponibilidad proporcionada por la redundancia de sistemas). Permite el mantenimiento durante el funcionamiento.
Cableado para telecomunicaciones EN50600-2-4	Conexión directa o Infraestructura fija de ruta única	Ruta única mediante infraestructura fija con redundancia ENI	Multirruta mediante infraestructura fija con redundancia ENI y diferentes canalizaciones	Multirruta mediante estructura fija con redundancia ENI, diferentes canalizaciones y áreas de distribución redundantes

Design criteria based on availability

Finally, security is based on:

- Class of protections: Access, fires

And the level of energy efficiency in
- Equipment and monitoring

2.2- Construction

EN 50600-2-1 defines the requirements and recommendations for building construction, regardless of the size and function of the data center. It addresses a wide range of situations, including the choice of location and site selection for a new data center to the assessment of existing buildings and structures. It then outlines the requirements for constructional aspects and is directly related to EN 50600-2-5 concerning physical security aspects.

One of the most important concepts is that of Modularity and Flexibility, where it is indicated that the planning of the installation of modular, prefabricated building elements, as well as multi-layer constructions, room-in-room systems should be considered to meet increased space requirements.

2.3- Power Distribution

EN 50600-2-2 defines the requirements and availability class recommendations for the design of the power supply, distribution systems, and the quality of the provided supply. It adopts the four availability classes starting from the simplest, which is a basic service supply with uninterrupted power supply (UPS) support. The description of protection systems in power distribution equipment is included.

It also defines locations for energy consumption monitoring points that can be used to determine key performance indicators for energy management.

Power distribution according to availability classes is illustrated in the following chart:

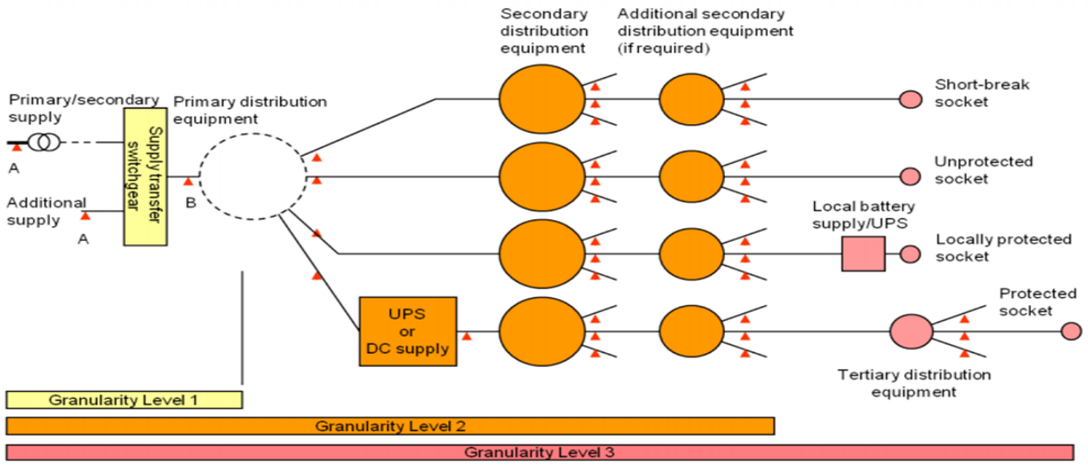

Illustration 4 Design criteria based on availability

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2.4- Environmental Control

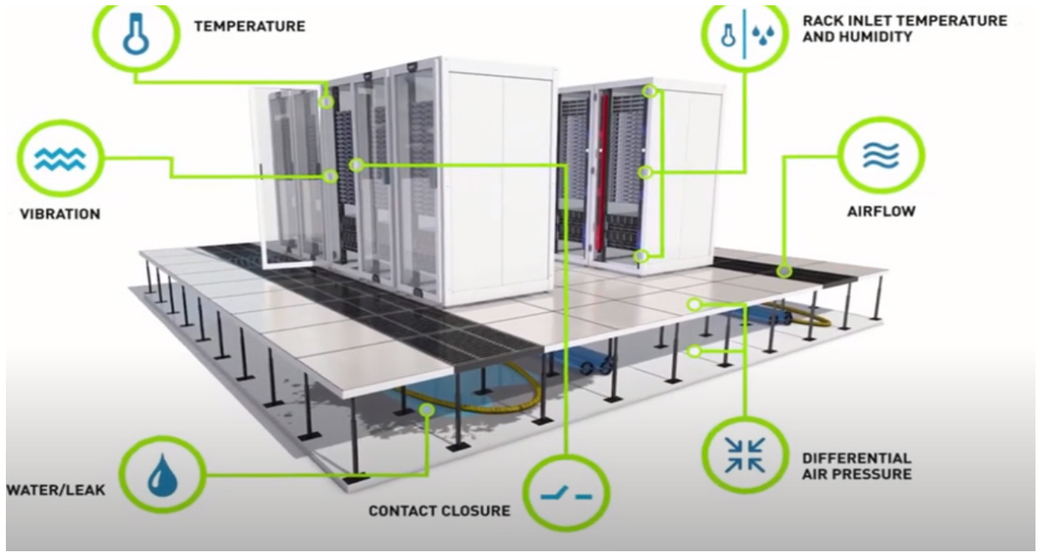
EN 50600-2-3 define los requisitos ambientales para los distintos espacios del centro de EN 50600-2-3 defines environmental requirements for different areas of the data center based on the design of environmental control systems in relation to Availability classes.

Additionally, it defines protection classes applicable to pathways and spaces containing environmental control infrastructure elements.

Key concepts include

- Environmental Control Values by Rooms:
  - o Temperature
  - o Airflow
  - o Pressure
  - o Humidity
  - o Vibration (malfunction index)
  - o Liquid spill

- Data granularity: heights, inlet and outlet.
- Redundancy.
- Modularity



Environmental Concept Scheme

2.5- Telecommunications Cabling

Telecommunications cabling is a fundamental part of the data center infrastructure. It not only connects information technology devices in the clean room but also provides connectivity for telecommunications in general, automation systems, along with infrastructure monitoring.

EN 50600-2-4 defines the requirements and recommendations for this cabling infrastructure by referencing existing design standards for generic cabling with appropriate planning and installation practices in support of the EN 50174 series standards.

The standard also addresses the installation of cabling to maximize the efficiency of environmental control systems, which affects the overall energy management of the data center.

EN 50600-2-4 specifies requirements and recommendations for the following:

- Telecommunications cabling for network and IT (e.g., SAN and LAN)
- General information technology cabling to support the operation of the data center
- Telecommunications cabling to monitor and control, as appropriate, power distribution, environmental control, and physical security of the data center
- Automation cabling for other buildings
- Layouts, spaces, and enclosures for telecommunications cabling infrastructures.

Another key objective is to define architectures and requirements for IT capacity growth and application migration to higher speeds. The cabling infrastructure of a data center should support rapid and easy expansion (e.g., commissioning additional equipment) and provide migration paths for storage and network applications. The standard supports this by defining appropriate requirements for cabling architectures, cross-connections, and raceway system.

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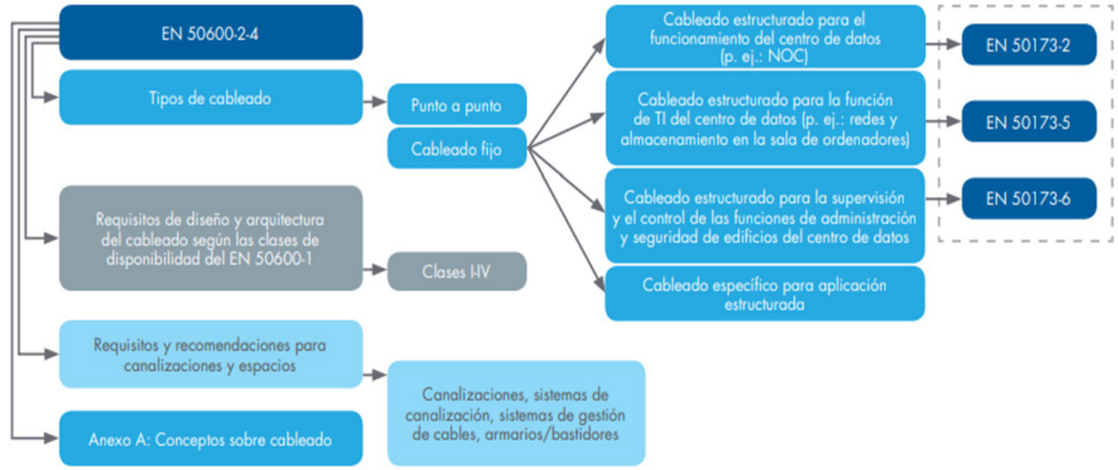
In the following table, the content of this section is summarized



Summary Table - Cabling

2.6- Physical Security/Operational and Management Information Record

These sections complement each other by addressing the requirements and recommendations for the automated control of physical security in data center spaces (including access controls, fire detection, and suppression).

Fire Resistance and Fire Containment.

- Construction of server rooms (floor, walls, and ceiling) and the materials used
- Installation of detection and early warning systems
- Suppression systems
- Room-in-room (vault) systems are recommended for all IT areas.

Examples of these systems are illustrated in the following image

Protection against Environmental Influences.

In addition to the requirements for doors, ceilings, and cable penetrations, they must prevent the penetration of contaminating substances (particles, liquid, or gas) and firefighting water for certain areas.

Monitoring.

Monitoring point locations are defined to support their objectives and, where applicable, specifies accuracy levels. It addresses the management of this operational information that can be used to assess the data center's performance using key indicators.

Automation.

Aspects of building automation such as general heating and lighting are covered in a wide range of standards, including generic cabling standards, to increasingly support services for distributed spaces comprising the entire building.

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3.- Supplementary Content

3.1- KPIs

To provide an order of magnitude and conduct an analysis of efficiencies for various data center resources, the following KPIs are defined:

- PUE: Power Usage Effectiveness
- REF: Renewable Energy Factor
- ERF: Energy Reuse Factor
- CER: Cooling Effectiveness Ratio
- CUE: Carbon Usage Effectiveness
- WUE: Water Usage Effectiveness.

3.2-Best Practices for Energy Management

Utilization, Management, and Planning of the Data Center

- **Operation:**
  - o Adopt standardized standards for energy and asset management
  - o Document and update processes and tasks to avoid errors and inefficiencies in the operation of (people and equipment)
  - o Monitoring and management of air quality to ensure purity, humidity, and necessary cold.
  - o Constant training in best practices for energy efficiency
  - o Conduct business risk analysis to determine the level of redundancy

- **Organization**

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Establish groups with representatives from all areas within the DC for decision-making with significant impact.

- Sizing

o Limit power and cooling sizing to 18 months of planning, eliminating excess relative to installed capacity.
o Consider modular equipment o modular

IT Equipment and Services.

- Equipment and services

o Constant audit to identify unused equipment and services for decommissioning.
o Identify IT equipment with restrictive operating ranges (temperature and humidity) for replacement or relocation to special conditions rooms.
o Incorporate equipment with power and input temperature measurement.
o Assess power and cooling capacity per rack before installing new equipment.
o Size power and cooling to be provided based on actual installation rather than taking data from board plates.
o Deploy virtualization technology in services and applications.
o “Cold standby” equipment instead of “hot standby.”
o Use software that consumes the least amount of energy to perform required tasks.

• Data Storage

Management based on the knowledge of what data needs to be stored, for how long, and with what level of security.

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Cooling

•Dise Design and management of airflow
o Install blanking panels, remove obstacles or deviations.
o Divide the equipment into different areas with environmental requirements

• Cooling and humidity management
o Review the possibility, according to equipment specifications and room design, of expanding operating ranges for temperature and humidity.
o Cold aisle/hot aisle configuration
o Racks with perforations.
o Select chillers with high performance levels
o Select equipment with variable speed compressors, pumps, and fans
o Select systems that facilitate the use of “free cooling “free cooling”

Power distribution equipment.

•UPS High-efficiency and modular UPS
• Eliminate isolation transformers

Monitoring.

• Installation of monitoring hardware for energy consumption in IT and facilities equipment and measurement of temperature and humidity per rack
• Periodic reading, reporting, and analysis of these values
• Take readings of operating times for air conditioning equipment vs. Free Cooling times with the aim of increasing the latter.

Alternative Practices.

• Reduce the volume of stored data and select low-power storage equipment.
• Use plenums for cooling return air
• Use modular air conditioning equipment
• Control and correct power factor
• Consider using an Energy and Climate Monitoring Platform
• Monitoring and management of IT equipment usage, network capacity, and storage
• Reuse the heat generated in the DC to heat different areas of the building.
• Locate the DC in areas with low temperature and humidity ad Ambiental.

Consideration Practices

- When sourcing network equipment for a global cloud strategy, consider their consumption.
- Evaluate energy storage with the goal of moving towards a Smart Grid system.
- Allocate research and development resources in the area of energy efficiency for software..

4.- Application of the UNE-NE 50600 Standard

The adoption of this standard, both for the construction of new Data Processing Centers and for the renovation of existing ones, entails:

- Having an objective identification of failure points and sizing resources accordingly to address these situations.
- Prioritizing the necessary investments to meet the demand for these critical infrastructures.
- Having energy-efficient infrastructures, in line with European requirements.
- Creating an internationally competitive ecosystem as it evolves into an ISO standard.

The key is to follow the standard, and if deviations are necessary due to site limitations, financial limitations, or availability limitations, all stakeholders in the facility must document and accept them.

One of the most significant requirements is a comprehensive assessment of physical, operational, and business risks, which requires establishing a business continuity strategy, essential for these facilities. The incorporation of operational and maintenance processes in the standard itself helps build a robust infrastructure in both technical and human aspects

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Following a standard like this will also increase customer confidence by establishing objective criteria for construction and operation and reducing the risks associated with these activities. It enables operators to offer a differential value in their services, making it more attractive to potential clients.

5.- Certification TSI/EN 50600

The TSI/EN 50600 certification is based on a proven method for the assessment and certification of the physical security and availability of data centers established in 2002 in accordance with Trusted Site Infrastructure (TSI) in the context of EN 50600.

Starting with one-day workshops, site assessments, concept and design evaluations, it focuses on providing the highest possible security in the planning and construction of your new data center. Design or implementation errors that would later be an obstacle to certification and could result in availability restrictions or data center downtime must be identified as early as possible to minimize the high costs of error correction.

For existing data centers, the current state of the art can be evaluated based on the TSI.EN50600 criteria catalog within the scope of conformity assessments (also known as GAP analysis). With a defined target specification, a comparison is made with the actual state. Deviations are presented in an assessment report and are often the basis for necessary improvement measures.

All areas with an impact on data center availability are evaluated, including infrastructure criteria identifying vulnerable elements. It provides very specific data regarding cabling in data centers, pays special attention to fire prevention and extinguishing measures, procedures must be well-documented and available, incorporates organizational aspects and facility maintenance, and has sufficient redundancy to ensure availability

The areas evaluated include:

- Environment
- Construction
- Fire prevention plan
- Security policy and contingency plans
- Cabling requirements
- Power supply
- Cooling and ventilation
- Organization
- Documentation

TSI/TSI.EN 50600 has a validity of two years, and a follow-up audit must be conducted in the first six months of the second year to maintain the validity of the certification. Once the two years are completed, the recertification process begins, mainly auditing areas identified for improvement. If the data center has undergone significant changes during these two years, the complete audit and certification process must be initiated anew ación.

5.1- Example: DARZ Germany..

The German company DARZ, which provides Data Center services, has built a new site with the following characteristics:

• Adapt the DARZ building, formerly owned by the German Federal Bank, and convert it into a data center (2,300 m² IT room space) and provide modern conference rooms and office space.
• The EN 50600 specifications were fully met to convert the building into a data center, both during planning and execution.
• As a result:
o The data center is classified as Availability and Protection Class 3.
o Its energy efficiency is extremely high in both power supply and air conditioning nado.

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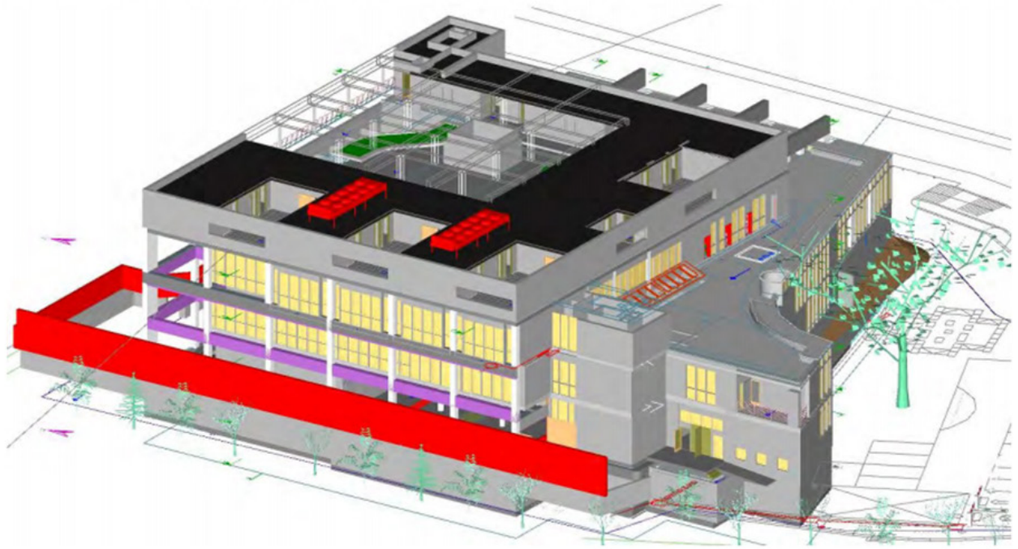
o Its energy efficiency is extremely high in both power supply and air conditioning



DC Darz

5.2- Certification Supplement

Regardless of the standard followed, documentation and maintenance of records for your operation and maintenance activities are one of the most critical aspects of the process. Software management tools like DCiM (Data Center Infrastructure Management), CMMS (Computerized Maintenance Management System), EPMS (Electrical Power Monitoring System), and DMS (Document Management System) for operations and maintenance can provide a unified view of information to track all required procedures, infrastructure assets, capabilities, maintenance activities, and operational issues

6.- Conclusion

The aim of this document is to provide context to the field of application of the UNE 50600 standard and how it can serve as the foundation for ensuring the continuity of service in a data center.

The guidance provided by the standard and the TSI/EN 50600 certification, starting with a risk analysis, categorization into levels of infrastructure availability/physical security, and concluding by relating this to management and operation, allows for a path to be traced towards the optimal availability level based on the resources and business of the data center.

In conclusion, it is worth mentioning the importance of the standard's contribution to operational and energy efficiency, both of which rely on the monitoring and management systems available in the market today.

A detailed and practical description of how to address the continuity of services for critical infrastructures has been presented by applying the EN/UNE 50600 Standard. We hope it meets your satisfaction and interest, and we take this opportunity to extend our cordial greetings.

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