

DCT - Data Centre Specialist

Duration: 5 Days

Course Code: DCT-DCS

Overview:

The DCT Data Center Specialist course, covers the basic concepts of data centres, data centre design and construction standards, construction process, challenges faced by data centre construction, and overview of data centre solutions. The Course covers the many aspects of the most typical electrical systems and equipment for data centers, including terminology, standards, acronyms, operation, efficiency, and more. As the data center power and density has increased every year, the need to remove the heat generated has become a more important factor for the design and operation of the facility.

Target Audience:

This program has been designed for individuals who have exposure to data centre facilities or for those who sell products and services to the data centre sector ie. Data Centre Operations Managers, Data Centre Designers, Facilities Managers, IT Service Delivery Managers, IT Technical Marketing & Technical Sales Reps, IT Department Managers.

Objectives:

- Identify best practices used when building a new or updating an existing data centre.
- Apply sustainability concepts to a data centre design.
- Identify the systems housed in a data centre.
- Examine the phases in a datacenter construction, commissioning, operation and maintenance process.
- Redundancy concepts for electrical distribution and equipment.
- Understanding of electrical equipment, systems, and controls
- What differing priorities and data centre types change the electrical design
- Understand Redundancy concepts for mechanical and cooling systems.
- Understanding of mechanical & plumbing systems and control.
- What differing priorities, locations, and more change the cooling design.

Pre-requisite

- Basic understanding of data centres, layouts, and common terms.
- Exam: BICSI DCDC-001 Certificates

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Course Outline

Datacentre Overview

Data centre infrastructure standards.

Data center types

- Architectural, space planning and site selection requirements.
- Determine the criteria for Architectural, space planning & site selection.
- Importance of Architectural, space planning and site selection

Data center cabling and I.T.

- Cable Containment, Management and Protection.
- Copper and Optical Fiber Cabling Connectivity.
- Cabling pathways and Raised Access Floors.
- Cabinets and racks.

Advanced Electrical Infrastructure:

- Power calculation in relation to data centre power requirements
- Electrical engineering drawings
- Power protection devices : Circuit breakers (MCB, MCCB, VCB, ACB, Fuses) and Earth leakage devices (RCB, RCD, ELCB, RCBO etc)
- Switchgear and power distribution requirements for Data Centers
- Lightning strikes and surge protection devices (TVSS/SPD), how they operate, where to use and how to install
- Earthing, and Grounding Bonding
- Power cabling and cable Sizing for power reticulation considerations
- Cable trays and cable trunkings
- Cable conduits - PVC and Metallic

Generators;

- Types of generators
- Generator Room Specifications
- Generator Sizing
- Fuel storage and calculation
- Fuel Management and optimization
- Generator Redundancy/Parallel

Introduction to Advanced UPS Systems

- Purpose and critical role of UPS in data center reliability
- Evolution of UPS technology
- UPS classification (VFI, VI, VFD – per IEC 62040)

UPS Architectures and Topologies

- Standalone (centralized) vs. distributed vs. decentralized systems
- Modular and scalable UPS systems
- Line-interactive, double conversion (online), and delta conversion types
- N, N+1, 2N, and 2(N+1) configurations
- UPS selection for Tier I to Tier IV data centers

Key UPS Components and Functions

- Rectifier/charger
- Inverter
- Static switch and bypass paths
- Control and monitoring systems
- Battery management system (BMS)

UPS Battery Technologies

- Battery types:
 - a. VRLA (Valve Regulated Lead Acid)
 - b. Lithium-ion
 - c. Nickel-Cadmium
- Battery sizing and runtime calculation
- Environmental and lifecycle considerations

Advanced Features and Capabilities

- Intelligent battery monitoring
- Load sharing and energy optimization
- UPS synchronization and paralleling
- Integration with DCIM and BMS platforms
- Communication protocols (Modbus, SNMP, BACnet)

UPS Installation and Commissioning Best Practices

- Site preparation and space planning
- Cabling and grounding
- Environmental requirements (temperature, humidity, ventilation)
- Functional testing and commissioning checklist

Common Failures and Risk Mitigation

- Root causes of UPS failure
- Risk scenarios: overload, battery failure, poor maintenance
- Redundancy planning and failover strategies
- Bypass operation and manual transfer switch usage

Emerging Technologies and Trends

- Lithium-ion adoption and impact on design
- Integration with renewable energy (solar, wind)
- UPS-as-a-Reserve (grid support models)
- Flywheels and supercapacitor hybrid UPS systems

Harmonic Filters and Power Conditioning Devices

- Active/Passive filters and their application
- AVR/AVS systems

Battery Energy Systems

Overview of Battery Energy Storage Systems (BESS)

- Introduction to battery energy systems and their role in power backup and grid support
- Common types of batteries: Lead-acid, Lithium-ion, Nickel-Cadmium, and others

Understanding Battery Banks

- Configuration and purpose of battery banks in backup systems
- Key considerations in capacity planning and voltage alignment

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Battery Charging Considerations

- Common issues during battery charging (e.g., overcharging, undercharging, sulfation)
- Importance of selecting and using the correct type of charger for each battery type

Use of Parallel Battery Banks

- Proper methods for installing batteries in parallel
- Limitations and risks: current imbalance, unequal aging, and potential for thermal issues

Battery Testing and Replacement Strategy

- Best practices for testing batteries (voltage, impedance, load tests)
- Guidelines for determining when to replace individual cells, blocks, or entire strings.

Battery Casing Materials

- Comparison of casing types: ABS, V0, V1, V2
- Impact on fire resistance, durability, and compliance with safety standards

Alternative Energy Storage Technologies

- Overview of non-battery storage options:
 1. Flywheels
 2. Reusable (regenerative) cells
 3. Compressed air UPS systems
 4. Supercapacitors and hybrid solutions

Advanced Electro Magnetic Interference

- Identify common sources of electromagnetic interference (EMI) in electrical and electronic systems.
- Understand how EMF characteristics vary across different power distribution systems.
- Overview of tools and techniques for EMF measurement
- Difference between single-axis and composite (tri-axial) measurement methods
- Guidelines for analyzing and interpreting measurement data
- Consideration of shielding material permeability
- Impact of material saturation on shielding effectiveness
- Use of attenuation formulas and correction factors

Datacentre cooling

- Cooling system Concepts, definitions
- Heat Transfer
- Data centre cooling systems
- Free cooling and Air Management
- Datacentre cooling systems
- Reliability and Risk management
- Recommendation and Best Practices
- Energy Efficiency and PUE

Datacentre fire suppression

- Detection systems in detail (VESDA, VIEW, smoke sensors)
- Considerations for installation of sensors
- Proper testing of smoke sensors
- Water based systems i.e. deluge, wet-pipe, dry-pipe, pre-action and why most of them don't work and how to detect this
- Details on Inert and Halocarbon systems and how to select the correct system for your data centre
- How to calculate the gas content ensuring the appropriate level is installed to suppress the fire including safety considerations
- Other requirements for gas systems such as release times, hold times, pipe install requirements and other important factors
- Requirements for the fire detection panel
- Installation verification, methods, what to check and how
- New advanced fire suppression technologies

Datacentre monitoring

- Monitoring considerations and requirements
- Datacentre Infrastructure Monitoring systems
- Acoustic noise effects, regulations, specifications and limits
- Data centre contaminations and classifications
- Measurements, standards and limits
- Preventive measures and avoidance

Data centre sustainable management and operation

- Business drivers to go Green
- Sustainability versus high availability
- Green guidelines and standards
- Power Usage Effectiveness (PUE), values, classes, considerations and improvements
- Open Compute Project (OCP) and current datacenter trends
- Sustainability of cooling infrastructure
- Efficiency and optimization of light infrastructure

Data Center Maintenance Strategies

- Operation and maintenance
- Types of Maintenance Strategies
- Key areas of maintenance
- Maintenance Scheduling
- Planned downtime
- Redundancy and failover systems
- Maintenance logs and Documentation
- Best Practices in maintenance