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A Road to Certified Professional Engineer for Data Centre Design -

# CDCDP<sup>TM</sup> Certified Data Centre Design Professional<sup>TM</sup> Qualification

A Unique Programme offered by **Hong Kong College of Engineering** in Hong Kong. Jointly organized with **CNet Training**, UK



#### Commencing Date:

4<sup>th</sup> Intake - Section A, CDCDP (3-day Course) – Data Centre Design Series 24 November 2010 (24 November 2010 – 26 November 2010)

2<sup>nd</sup> Intake - Section B, CDCDP (4 one-day Courses) - Green Data Centre Series

Data Centre Power : 23 February 2011

Data Centre Management : 24 February 2011

Data Centre Cooling : 8 October 2010 ; 25 February 2011

Data Centre Efficiency : 9 October 2010 ; 26 February 2011

(The four 1-day courses will be linked and offered together in January / February 2011. More details will be announced soonest.)

We are an Exclusive Approved Training Centre in Hong Kong for CDCDP<sup>™</sup> courses delivery.

The Hong Kong College of Engineering is quintuple accredited by:



















Course Code : 10199

Course Name : Certified Data Centre Design Professional <sup>™</sup> Qualification

國際認可數據中心設計師專業資格

This programme is jointly organized with **Hong Kong College of Engineering (HKCE)** and **CNet Training, UK**. **CNet Training** has been offering programmes spanning the entire communications industries since 1996. It has built an enviable reputation for providing communications professionals with the right technical training complemented with the right internationally recognized qualifications over the world.

CDCDP<sup>TM</sup> (Certificate Data Centre Design Professional<sup>TM</sup>) is the accumulation of required courses\* and has an overall **BTEC qualification** upon completion.

#### **Qualification Overview**

The Certified Data Centre Design professional™ (CDCDP™) qualification brings together the essential components of proficiency to independently certify that an individual is professional, highly skilled, knowledgeable and more than an expert; a qualified person with a contemporary standards compliant and European code of conduct visualization of what is required to create preeminent Data Centres and best practice to manage and maintain them.

This BTEC qualification from Edexcel combines (1) Certified Data Centre Design and (2) Data Centre Power; (3) Data Centre Cooling; (4) Data Centre Efficiency; AND (5) Data Centre Management as the only complete Data Centre qualification available worldwide. The program is intended to furnish Data Centre Professionals with depth and breadth of learning and to provide independently verified proof of competency. The unit based structure of the overall qualification allows flexibility to take each unit at your convenience over a period of time and to acquire an additional core qualification in Certified Data Centre Design.

It doesn't stop there, however; there are two optional units, (1) **Certified Data Centre Technician** (CDCT<sup>TM</sup>) and (2) **Data Centre Project Management** (DCPM), provide three additional qualifications: two BTEC and one from TPMA. The CDCDP<sup>TM</sup> package gives you an outstanding **Advanced Professional Level 5 BTEC Qualifications** from Edexcel that provides an unbeatable industry recognized and endorsed level of capability that places you ahead of your competition.

#### **Qualification Framework**

The CDCDP<sup>TM</sup> has been divided into two sections. Section A is **Certified Data Centre Design** course, whereas section B is an advanced qualification including four optional courses (1) **Data Centre Power**, (2) **Data Centre Cooling**, (3) **Data Centre Efficiency** and (4) **Data Centre Management**.

By completing section A - Certified Data Centre Design, you are eligible to acquire CDCD<sup>TM</sup> qualification which is an intermediate level of whole CDCDP<sup>TM</sup> and BTEC qualified. You are required to further study 4 courses in Section B and acquire CDCDP<sup>TM</sup> qualification in 1 year (or in maximum 3 years). Those courses act as refresher

courses and any latest technology information will be added. You may refer to the following diagram:



All the Data Centre Courses have been fully updated to take into account the requirements of the **2009 EU Code** of Conduct on Data Centres Energy Efficiency.

#### **Target Audience**

The course is suitable for: IT, Project and Facilities Managers, Designers, Consultants, etc.

- Existing engineers who wish to update and add skills to their current knowledge
- Existing engineers who wish to gain a qualification to verify their competency
- New entrants to the industry who wish to gain the appropriate knowledge in order to secure employment
- Sales staff who need to understand the issues facing their customers
- Maintenance staff who may need to perform on site maintenance and repair
- Project managers and supervisors managing data centre projects

#### **Career Prospects / Recognition**

The qualification is wholly recognized by **BTEC / Edexcel**, **UK** and is flexible for you to study according to your schedule. Graduates from CDCDP<sup>TM</sup> will be awarded **BTEC Advanced Professional Qualification (NQF level 5)** a Higher National Diploma (HND) qualification in UK.

The course aims at teaching three aspects (1) Design; (2) Construction and (3) Operation of computer room and data centres. Each unit is principally assessed by an ongoing design exercise that lead you through all the steps needed to arrive at a baseline design of a modern data centre.

#### **Entry Requirements**

All applicants are expected to have some knowledge of basic IT and electrical engineering skills. There is no restriction on previous backgrounds, working experience and others are all acceptable. Some basic knowledge in English and computer is essential.

#### Learning outcomes and assessment criteria

#### (A) Learning outcomes

- Use and implement the concepts of data centre design in terms of standards TIA 942
   (Telecommunications Infrastructure Standard for Data Centres), European standards and the Uptime Institute's Tier Performance Standards.
- Describe the principles of and calculate heating, ventilating and air conditioning (HVAC) requirements and explain and calculate power supply principles and power requirements.
- Explain structured cabling concepts, copper cabling components, optical cabling components and optical systems and cable system design.

#### (B) Assessment criteria for pass

- Create a design of a data centre that satisfies TIA 942, EN 50174, BS 6701and the Uptime Institute's Tier Performance Standards.
- Give correct answers to Questions 1 to 45 of the end test compared to the model answers. Create a
  design of a data centre including the calculation of HVAC and power supply requirements.
- Give correct answers to Questions 1 to 45 of the end test compared to the model answers. Create a
  design of a data centre explaining the structured cabling installation and design requirements.

#### **Course Syllabus**

It was divided into Section A, Section B and Supplementary Courses as mentioned above.

Section A ~ CDCD<sup>™</sup> Qualification

Section B ~ Four Courses

- (1) Data Centre Power
- (2) Data Centre Cooling
- (3) Data Centre Efficiency
- (4) Data Centre Management

#### Supplementary Courses

- (1) Certified Data Centre Technician (CDCT™)
- (2) Data Centre Project Management (DCPM)

Section A course is not a pre-requisite for Section B, four 1 day, courses!

You are welcome to join Section B first.

#### Section A ~ CDCD™ Qualification Syllabus

The syllabus, held over **three days (18 hours)**, is aimed at teaching best practice design principles for the **design, construction and operation** of computer rooms and data centres. It consists of a number of subsections that address the fundamental requirements of a successful design such as electrical power supply, air conditioning and data cabling. Best practice is achieved by bringing together the requirements of British Building Regulations, Statutory Instruments, EC Directives and British and European standards. Several case studies are considered to see examples of good, and bad, practice in real situations. The unit is principally assessed by an ongoing design exercise that lead the students through all the steps needed to arrive at a baseline design of a modern data centre.

#### 1 Introduction

- (A) TIA 942 and European standards
- (B) TIA 942 spaces and hierarchical model
- (C) Example projects and costings
- (D) Size of market
- (E) Intro to Uptime Model of Tiering

#### 2 Facilities and location

- (A) TIA 942 recommendations for location, size, heights, floor loading, lighting and raised floors
- (B) Audits of designs
- (C) Emergency lighting and signage
- (D) Services and facilities

#### 3 Raised floor design

- (A) TIA 942 recommendations
- (B) (PSA) Method of Building
- (C) Performance Specification 'Platform Floors (Raised Access Floors)', MOB PF2 PS
- (D) BS EN 12825:2001
- (E) Calculating floor heights
- (F) Ramps and the Disability
- (G) Discrimination Act
- (H) Earthing and bonding

#### 4 Rack location

- (A) TIA 942 and ASHRAE recommendations
- (B) Hot aisle/cold aisle model
- (C) 7-tile pitch model
- (D) Underfloor plenum air distribution
- (E) What makes a rack a server rack?
- (F) 4-post and 2-post systems
- (G) Using tools like Visio and Netzoom

#### 5 Power supplies

- (A) Some electrical principles, volts, amps, watts, kVA, power factor and three phase
- (B) Electrical distribution codes
- (C) Power density
- (D) TIA 942 requirements
- (E) TIA 942 Tiers
- (F) The meaning of N, N+1 2(N+1) etc
- (G) Estimating power requirements
- (H) Uninterruptible Power Supply (UPS) options
- (I) Power distribution to and in a rack
- (J) Power Distribution Units

#### 6 Cooling

- (A) Basics of air conditioning principles
- (B) Comfort vs. precision air conditioning
- (C) TIA 942 requirements
- (D) Fresh air and ventilation requirements
- (E) Power consumption of air conditioning
- (F) Air conditioning options
- (G) Underfloor plenum approach
- (H) Hot aisle/cold aisle model
- (I) The limiting factors for free cooling of racks via floor vents
- (J) Fan assisted floor vents and fan assisted racks
- (K) Min and max throw distances for underfloor air
- (L) Side to side cooling
- (M) Upgrade paths
- (N) Chilled water racks, CO2, Passive Air
- (O) Testing
- (P) TIA 942 Tiering for HVAC

#### Section A ~ CDCD<sup>™</sup> Qualification Syllabus (Cont'd)

#### 7 Earthing

- (A) Applicable standards
- (B) The terminology of earthing, grounding and bonding
- (C) Equipotential bonding
- (D) Functional earths
- (E) TIA 942 requirements
- (F) The Signal Reference Grid (SRG)
- (G) SRG spacing and connection

#### 8 Cable containment

- (A) Applicable standards
- (B) Separation of power and data cables to EN 50174 and BS 6701 and TIA 942
- (C) Types of conduit, trunking, tray etc available
- (D) Fill rules
- (E) Cable management in and to a rack
- (F) Fire stopping
- (G) Earthing and bonding

#### 9 Fire design

- (A) Fire detection and suppression requirements of TIA 942
- (B) Pre-action sprinkler system
- (C) Approved gaseous fire suppression chemicals (clean agent)
- (D) Smoke detector selection
- (E) Aspirating smoke detectors (VESDA)
- (F) BS 5839 requirements for fire detection
- (G) 'L' and 'M' categories
- (H) Siting of fire/smoke detectors
- (I) NFPA 75 requirements
- (J) Cables for smoke detectors and alarm systems

#### 10 Fire - cabling

- (A) Fuel loads of different cable materials
- (B) American building codes
- (C) The riser and plenum grade of cable
- (D) NFPA 262
- (E) Limited Combustible cables
- (F) European Directives
- (G) The Construction Products Directive
- (H) European fire tests and standards
- (I) Insurance perspectives
- (J) Comparing US and European specs
- (K) Relative costs

#### 11 Copper cabling components

- (A) 10GBASE-T and CAT6A standards
- (B) Manufacturers' offerings for CAT6A
- (C) Screened v unscreened cables
- (D) Horizontal, vertical and angled patchpanels

#### 12 Optical cabling components

- (A) Optical connectors, past and present
- (B) Optical patch panels and accessories
- (C) Types of optical cable, loose tube and tight buffered

#### 13 Preterminated cabling

- (C) Advantages and disadvantages of preterminating cables
- (D) The MPO and MTP ribbon connector
- (E) Some manufacturers' examples

#### 14 Optical systems

- (A) The OM1, OM2, OM3, OS1 model
- (B) The OF300, OF500 and OF2000 model
- (C) Optical component loss and link power budgets
- (D) Ethernet's cable requirements
- (E) 10GBASE-xyz cable requirements
- (F) 10GBASE-xyz transmission distances
- (G) Premium fibres
- (H) How many connectors allowed in a channel?
- (I) 10GBASE-LRM
- (J) ISO 11801:2002 requirements for optical systems

#### Section A ~ CDCD<sup>™</sup> Qualification Syllabus (Cont'd)

#### 15 Cable system design

- (A) The 2,3 and 4 connector model from ISO 11801
- (B) Intelligent patching
- (C) The hierarchical structure of a data centre
- (D) LAN and SAN layouts
- (E) Differences between TIA 942 and EN 50173-5 terminology
- (F) TIA 942 topology

#### 16 Security, access control, CCTV and BMS

- (A) Fire detection and monitoring
- (B) Security and access control
- (C) CCTV
- (D) Building management systems
- (E) TIA 942 requirements for security and monitoring
- (F) IP networks that integrate security and monitoring
- (G) Rack level monitoring systems

#### 17 Project management issues

- (A) Safety audits
- (B) Health & safety issues
- (C) Construction Design and Management regulations
- (D) TIA 942 redundancy and Tiering in more details

#### 18 Data Centre Networks

- (A) LAN, SAN, NAS, WAN
- (B) Networking Protocols eg Ethernet, IP, FC, InfiniBand

#### Section B ~ Syllabus of Four Courses:

- (1) Data Centre Cooling (1 day)
- (2) Data Centre Management (1 day)
- (3) Data Centre Power (1 day)
- (4) Data Centre Efficiency (1 day)

#### (1) Data Centre Cooling

- (A) Review of Power and Cooling
- (B) Regulation review and the impact on data centres
- (C) Maximising existing investment by getting the most out of existing hot-aisle/cold-aisle systems
- (D) Coefficiency of performance of CRACs
- (E) Heat pumps and Carnot Efficiency
- (F) Performance factors of air to air heat pumps
- (G) Dynamics and problems of air flow
- (H) Software simulation, advantages and dangers
- Comparison of high-density cooling techniques
- (J) R744 refrigerant comparisons

#### (2) Data Centre Management

#### 1 Introduction & objectives

- (A) Understanding the bigger picture
- (B) The concept of best practice

#### 2 Managing the Data Centre Facilities

- (A) Handover of the data centre facility
- (B) Establishing the design limits
- (C) Controlling the environment
- (D) Maintenance practices
- (E) Data centre inventory and documentation
- (F) Installation practices
- (G) Monitoring and ongoing administration of the facility
- (H) Meeting the needs of regulators and 3rd parties
- (I) Testing for recovery and resilience
- (J) Backup and equipment recovery
- (K) Access and security

#### Section B ~ Syllabus of Four Courses (Cont'd):

#### (3) Data Centre Power

#### 1 The Electricity Supply

- (A) Where does the electricity come from?
- (B) Electrical supply options from Supply Company
- (C) Costs of electrical power
- (D) Types of Tariff available
- (E) Comparison of European and American power systems

#### 2 Distribution in the Data Centre

- (A) 1-phase AC, 3-phase AC and DC power options
- (B) Power distribution and associated losses
- (C) Specifying Power Density
- (D) Power Density Areas
- (E) Peak versus Average Power density
- (F) Harmonic currents and residual losses
- (G) Emergency power off (EPO)

#### 3 Standby Power

- (A) Standby Generators
- (B) UPS, batteries and redundant systems (N+0, N+1, N+N)
- (C) UPS Technologies and Efficiencies

#### 4 Methods of reducing power consumption

- (A) Microprocessor trends
- (B) Multi-core processors
- (C) Server Power Tuning And Clustering
- (D) Virtualisation performance and power consumption
- (E) Low power networking eg Ethernet backplanes
- (F) Intelligent PDUs and software simulation

#### (4) Data Centre Cooling

#### 1 Power trends - an overview

- (A) Past, current and future needs
- (B) Alternative energy sources

#### 2 Cooling trends - an overview

- (A) Past, current and future needs
- (B) Emerging cooling options

#### 3 Power Usage Efficiency (PUE)

- (A) Describing PUE
- (B) Calculating PUE
- (C) Implementing PUE

#### 4 Data Centre infrastructure Efficiency (DCiE)

- (A) Describing DCiE
- (B) Calculating DCiE
- (C) Implementing DCiE

#### 5 The network critical infrastructure

- (A) Overview of network critical infrastructure components
- (B) Heat and power contributions
- (C) Efficient implementation of NCI

#### 5 Modeling of data centre electrical efficiency

- (A) Describing data centre efficiency
- (B) Efficiency myths
- (C) Useful energy versus waste energy

#### 6 Implementing data centre electrical efficiency

- (A) Power costs
- (B) Energy use in the data centre
- (C) Energy use in the IT equipment
- (D) Energy use in the NCI equipment

All the Data Centre Courses have been fully updated to take into account the requirement of the 2009 EU Code of Conduct on Data Centres Energy Efficiency (if it is required).

#### Syllabus of Supplementary Courses

#### (1) Certified Data Centre Technician (CDCT<sup>™</sup>)

#### (2) Data Centre Project Management (DCPM)

#### 1 Introduction to data centres

What is a data centre?

Functional requirements

Overview of design issues (Tier 1 to Tier IV)

#### 2 Standards overview

**TIA 942** 

ANSI/TIA/EIA-568; 569; 606; 607; 758

EN 50173; 50174; 50346; 50310

BS7671 electrical regs

**IEEE** 

**ASHRAE** 

#### 3 Health and Safety

Optical fibre hazards

Electrical hazards

Slips trips and falls

CDM

Manual handling & Lifting devices

Noise & Lighting levels

#### 4 Power overview

Power sources & Back-up power

Electricity supply and distribution

AC/DC

1-phase and 3-phase

#### 5 Security

Data centre protocol (do's and don'ts,

behaviour)

Physical security

#### 6 Cable management, fibre and copper

Capacity Planning

Access floors

Equipment racks/cabinets

Efficient use of cabinet space

Cabling and channel verification

Intelligent Management

#### 7 Data Centre Networks

LAN, SAN, NAS, WAN

Networking Protocols eg Ethernet, IP, FC,

InfiniBand

#### Day 1

#### **Project Management Process**

Lessons Learned

Internal Process

**Technical Process** 

#### Day 2

#### **Project Management Knowledge Areas**

Project Human Resources Management

**Project Scope Management** 

**Project Integration Management** 

**Project Time Management** 

**Project Cost Management** 

**Project Quality Management** 

**Project Communications Management** 

Project Risk Management

**Project Procurement Management** 

#### Day 3, 4, & 5

#### Templates & working in teams

Students work in teams to build a project plan for one of their typical projects including; lessons learned process and teamwork, a quality assurance plan, scope of work, OBS, WBS, network diagrams, Gantt charts, calendar, timeline, safety plan, earned value cost plan and a communications plan. These templates can be used on the TPMA Certification Exam and on future projects.

#### \*\* Feature Programme ~ Data Centre Project Management (DCPM)

You may become a certified data centre project manager in one of the following disciplines by customizing the first part of the exam process to your field of expertise. All specialties have been developed for Project Management Professionals in the telecommunications and information transport industry:

Project Manager (PM), Data Centre Project Manager (DCPM), Wireless Project Manager (WPM), Security Systems Project Manager (SPM), Telecommunications Project Manager (TPM) and Networks Project Manager

#### **Tuition Fee (Section A)**

The tuition fee of CDCD<sup>TM</sup> qualification (3-day) is HK\$9,800 per person. Examination fee has been included. **Early bird enrollment**: The first 15 applicants will enjoy special offer price \$8,820. (Examination fee included)

#### **Tuition Fee (Section B)**

The tuition fee of each 1-day course is HK\$4,000 per person. (Examination fee included.)

**Special Offer (a discount of 20% or 10%):** Register to **four** 1-day courses with HK\$12,800; Register to **two / three** 1-day courses with HK\$7,200 / HK\$10,800

#### <u>Tuition Fee (Other Supplementary / Advanced Courses)</u>

To be announced.

#### Course Schedule & Venue (for Section A and Section B Programme)

5<sup>th</sup> Intake - Section A, CDCDP (3-day Course)

24 November 2010 - 26 November 2010

1st Intake - Section B, CDCDP (4 one-day Courses) - Green Data Centre Series

Data Centre Power : 23 Feb 2011

Data Centre Management : 24 Feb 2011

Data Centre Cooling : 8 October 2010 (Friday) / 25 Feb 2011

Data Centre Efficiency : 9 October 2010 (Saturday) / 26 Feb 2011

**Time:** 10:00 am – 5:30 pm

Venue: Hong Kong College of Engineering

(4/F, Fee Tat Commercial Centre, 613 Nathan Road, Mongkok, Kowloon, Hong Kong)

#### Instructor(s) / Other Course Details

Lecturers : Ir. Dr. Peter Kwan, Ir. C.K. Chan, Ir. Herman Poon, Ir. Dr. Raymond Cheung, Ir. Wallace. Chan

All instructors are Chartered Engineer (CEng) or Registered Professional Engineer (RPE) in Hong Kong or have equivalent qualification with Master Degree & with 15 - 20 years relevant working

Experience.

Medium of Instruction: Cantonese / English (with English Learning Materials)

Application Deadline : Two days before the date of commencement

Intake Target : 15 - 20 students

Remarks : An administration fee (HK\$1,000) will be charged for each withdrawal application.

#### **Enquiries and Registration**

Contact Person: Mr. K.H. Lui

Tel: (852) 3165 8068 Email: <u>lui@hkceedu.org</u>

Website: <a href="http://www.hkceedu.org">http://www.hkceedu.org</a>
Blog: <a href="http://engineer-job.blogspot.com">http://engineer-job.blogspot.com</a>













### **Application Form**

Please complete and return the application form by email <a href="mailto:lui@hkceedu.org">lui@hkceedu.org</a> or by mail: Hong Kong College of Engineering,

4/F, Fee Tat Commercial Centre, 613 Nathan Road, Mongkok, KLN, HK (Attn: Mr. Lui)

We accept cash, EPS, crossed cheque, bank transfer or bank draft (for overseas participants).

Course Name		. <b>_</b> . TM . = =	- TM	
Course Name  Please ☑ (can choose both)	☐ Certified Data Centre Design TM (CDCDTM)			
	(3-day) (Date: 24	(3-day) (Date: 24 - 26 November 2010) (Time: 10:00am – 5:30pm)		
	(CNet) Data Cent	re Power	: 23 Feb 2011	(10:00am – 5:30pm)
	☐ (CNet) Data Cent	re Management	: 24 Feb 2011	(10:00am – 5:30pm)
	(CNet) Data Cent	re Cooling	: 25 Feb 2011	(10:00am – 5:30pm)
	(CNet) Data Cent	re Efficiency	: 26 Feb 2011	(10:00am – 5:30pm)
	☐ (CNet) Data Cent	(CNet) Data Centre Cooling		(10:00am – 5:30pm)
	(CNet) Data Cent	re Efficiency	: 9 Oct 2010	(10:00am – 5:30pm)
	I. Personal Deta	ails (* required inf	ormation)	
English Name *		Chinese Name		
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	II. Ways to	know our progra	mme	
How did you know this	s programme? (please ☑)			
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□ 6. Search Engine / Blog (Please specify : )				
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\* An additional charge HK\$300 for each overseas' transaction.

Bank Name: The Bank of East Asia (HK) Limited - Main Branch: 10 Des Voeux Road, Central, Hong Kong

Account Name: Hong Kong College of Engineering

Account Number: 213-40-10227-1 (Swift code: BEASHKHH)

#### Our participants come from prestigious groups / companies in China, Hong Kong, Macau and overseas.

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Avocent Corporation Ltd.

Cisco Systems (HK) Ltd.

COL Limited (Wharf T&T Group)

CPCNet Hong Kong Ltd.

Crystal Management (Korea) Ltd.

DataSphere (H.K.) Ltd.

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Elibo Engineering Ltd.

Excel Technology International (HK) Ltd.

Gateway Technology Development Co. Ltd.

Hong Kong Exchanges and Clearing Ltd.

Hong Kong Interbank Clearing Ltd.

HNS (Hong Kong) Ltd.

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PT. Bank Negara Indonesia (Persero) Tbk.

Sun Microsystems, Inc.

Telstra Technology Services (Hong Kong) Ltd.

Tencent, Inc. (QQ Messenger Provider in China)

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The Hong Kong University, SPACE

The Venetian Macao-Resort-Hotel

Towngas Telecommunications Fixed Network Ltd.

And more ...

## All Data Centre Events and Seminars are sponsored by:

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# CDCDP<sup>TM</sup> Certified Data Centre Design Professional TM Qualification

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Hotline: (852) 2687 1208 Direct: (852) 3165 8068 Fax: (852) 2609 3708 Email: lui@hkceedu.org Website: http://www.hkceedu.org

Address: 7/F & 4/F, Fee Tat Commercial Centre, 613 Nathan Road, Mongkok, Kowloon, Hong Kong