INTERNATIONAL CERTIFICATIONS CODES AND REGULATIONS

21ST CENTURY DATA CENTER SYMPOSIUM

**The Future of Data Centers:
Thinking Locally,
Delivering Globally**

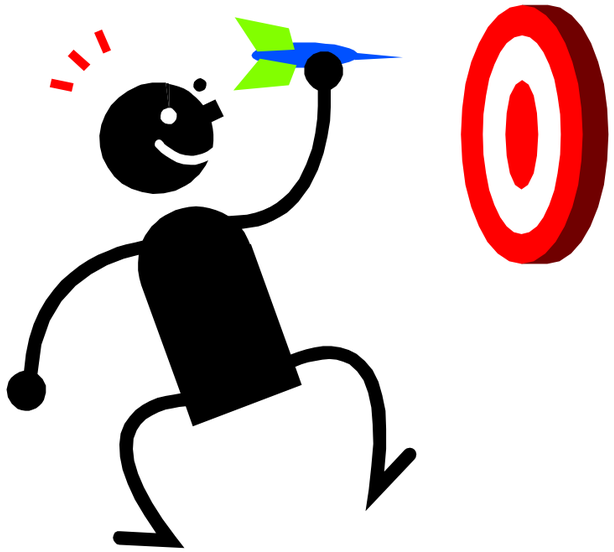
March 20, 2014
Cityplace Conference Center
Dallas, Texas
www.21CDCS.com

21ST CENTURY DATA CENTER SYMPOSIUM

AGENDA

1. CERTIFICATIONS
   - AVAILABILITY
   - OPERATIONS
   - SUSTAINABILITY
2. REGULATIONS / CODES/ STANDARDS
3. DESIGN
   - ELECTRICAL
   - MODULAR
   - COMMUNICATIONS
4. ENERGY CODES
5. PERFORMANCE METRICS

CERTIFICATIONS - AVAILABILITY



UPTIME INSTITUTE Tier Levels (I – IV)

- Performance based

ICREA Levels (I – V)

- Prescriptive based

TIA/ANSI 942 Levels (I-IV)

- Prescriptive and Performance based

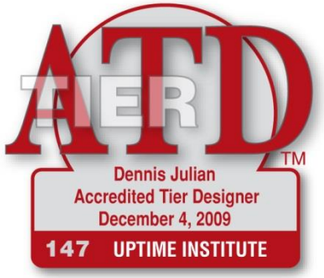
ANSI/BICSI-002 Data Center Design and Implementation Best Practices (Class F0 – F4)

- Performance based

LOCAL REQUIREMENTS – China (Class A, B, C), etc

UPTIME INSITITUTE

- Tier Certifications awarded in over 50 different countries.
- Accredited Tier Designers and Accredited Tier Specialists representing over 60 different countries
- Uptime Institute Networks are currently in growing North America; Latin America; Asia Pacific; and Europe, Middle East, & Africa
- Uptime Institute offices in Sao Paulo, Dubai, London, Singapore, Moscow, Taipei, Kuala Lumpur in addition to U.S. Offices (New York, Denver, Seattle, San Francisco)
- Design Certifications are valid for two years and construction certifications are valid until there are modifications.
- Web site: www.uptimeinstitute.com/



UPTIME INSTITUTE		
Tier	**Description**	**Availability**
I	Basic Data Center Site Infrastructure (N)	99.67%
II	Redundant Site Infrastructure Capacity Components (N+1)	99.75%
III	Concurrently Maintainable Site Infrastructure (N+1)	99.98%
IV	Fault Tolerant Site Infrastructure (N after any failure)	99.99%

1. Output based outcome based Tier standard. Requirements Include:

- Power and cooling systems and auxiliary systems that could effect the Computer Room operation. 12 hours of on site fuel supply required for N capacity.
- Tier IV requires Infrastructure compartmentalization and continuous cooling.

2. Certifications are valid for one year from the date the certificate The renewal of the certificate must meet all the requirements as if were a new certification.

ICREA - International Computer Room Experts Association

1. ICREA Std-131-2013 “International Standard for the Construction of Data Processing Centers” marks the best practices in the construction of datacenters worldwide.
2. ICREA is a nonprofit International association formed by engineers in the design, construction, operation, management, maintenance, procurement, installation and auditing of data centers. It was founded in 1999 in Mexico City, with chapters in the city of Monterrey, Mexico and has an international presence in 21 countries including Mexico, USA, Brazil, Argentina, Philippines, Italy, Bolivia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Nicaragua, Panama, Peru, Switzerland, Venezuela, Colombia, Singapore, Chile and Spain. It has 2049 members (31/December/2012) in 21 countries of which 1300 are in Mexico.
3. Web site: www.icrea-international.org

CERTIFICATIONS - AVAILABILITY

	ICREA	
Level	**Description**	**Availability**
I	Quality Assurance Data Center (QADC)	95%
II	World Class Quality Assurance Data Center (WCQA)	99%
III	Safety World Class Quality Assurance Data Center (S-WCQA)	99.9%
IV	High Security World Class Quality Assurance Data Center (HS-WCQA)	99.99%
V	High Security High Available World Class Quality Assurance Data Center (HSHA-WCQA)	99.998%

1. Requirements Include:

- Electrical Installations, Air Conditioning, Communications, Environment (Elevated Floor, finishes, civil works), Safety (CCTV, Access control, detection and fire fighting)
- DPC Certification Annexes

2. Certifications are valid for one year from the date the certificate The renewal of the certificate must meet all the requirements as if were a new certification.

TIA/ANSI 942

1. TIA/ANSI 942 Levels (I-IV)
2. Convenient to reference in RFPs because the matrix of requirements provides a checklist of items to be provided and covers all major issues.
3. Performance based and prescriptive based matrix of requirements.
4. Some prescriptive items may not apply:
    - There is a requirement for structural passive dampers and isolation bases. Existing buildings not located in a seismic area will typically not have this expensive type of construction.
    - There are also specific separation distances listed from parking, various types of highways, plane traffic paths and train tracks.
    - Level III facilities shall be less 30 miles (48km) and Level IV facilities less than 10 miles (16km) from major metropolitan areas.
5. Third party certification process available. Enterprise Products Integration Pte Ltd. (EPI) www.epi-certification.com/ provides certification and training. Renewed every three years.

TIA / ANSI 942		
Level	**Description**	**Availability**
I	Basic Data Center Site Infrastructure (N)	99.67%
II	Redundant Site Infrastructure Capacity Components (N+1)	99.75%
III	Concurrently Maintainable Site Infrastructure (N+1)	99.98%
IV	Fault Tolerant Site Infrastructure (N after any failure)	99.99%

1. Combination of prescriptive and outcome based requirements based on the Uptime Institute Tier standard. Requirements Include:

- Site, Building, Power, Cooling and Telecommunications.
- Essentially follows the same power and cooling requirements as the Uptime Institute except with prescriptive requirements.
- Level IV requires Infrastructure compartmentalization and continuous cooling.

ANSI/BICSI-002

1. ANSI/BICSI-002 Data Center Design and Implementation Best Practices (Class F0 – F5).

2. Document covers Site, Space Planning, Architectural, Electrical, Air Conditioning, Communications, Safety (CCTV, Access control, detection and fire protection), Risk analysis

3. No certification authority.

1. Used as the Basis for the BICSI Data Center Design Consultant (DCDC) certification.

2. https://www.bicsi.org/bookstore.aspx

	ANSI/BICSI-002	
Class	**Description**	**Availability**
F0	Basic requirements for IT functions without supplementary equipment. A critical power distribution system separate from the general use power systems would not exist.	<99.0%
F1	Basic requirements for IT functions without supplementary equipment. The critical power distribution system would deploy a power conditioning device to allow the critical equipment to function adequately. No redundant components.	99.0%
F2	Redundancy is provided for critical components.	99.9%
F3	Redundancy is provided for critical and non critical components or systems. Concurrently maintainable.	99.99%
F4	Redundancy is provided for critical and non critical components or systems. Concurrently maintainable, fault tolerant and compartmentalized. Redundancy greater than N during maintenance or after a fault.	99.999%

Operations

1. Uptime Institute Tier Certification of Operational Sustainability

2. Tier Levels (Bronze, Silver, Gold)

3. All Tier Certification of Operational Sustainability engagements begun after 1 January 2014 will have validity periods of one year for Bronze, two years for Silver, and three years for Gold.

4. Web site: www.uptimeinstitute.com/

Sustainability / Energy Efficiency

1. LEED (certified, silver, gold, platinum)
2. NABERS - Australia
3. BREEAM
4. US EPA Energy Star Program
5. Japan DPPE
6. Taiwan
7. Green Globes
8. EU Data Centres Code of Conduct
9. FIT4Green: An EU consortium made up of private and public organizations from Finland, Germany, Italy, Netherlands, Spain, and the UK
10. Certified Energy Efficient Datacentre Award (CEEDA) bronze, silver, gold
11. The Singapore Standard SS 564 Green Data Centres - Energy and environmental management systems

Regulations And Standards Vary By Country

1. IBC – International Building Codes
2. NFPA – National Fire Protection Association
3. ANSI – IEC/ISO
4. UL – ULc - CE
5. BS –British Standards
6. NOM – 008 Mexican standards
7. EU standards
8. CENELEC is the European Committee for Electrotechnical Standardization
9. Professional of Record vs AHJ vs DRO

Codes And Standards Effect Design

1. NFPA 70
   - NFPA 70-2013 changes
   - Selective coordination

2. Arc Flash safety

3. IEC vs ANSI

4. British Standards BS and BS EN

Standards and Codes

1. NFPA 70 – Electrical Code
   - Section 645 ITE Rooms
   - Section 646 Modular Data Centers
2. Outline of Investigation for Modular Data Centers UL 2755

Telecommunications infrastructure standards to design the telecommunications pathways, spaces, and cabling system for the data center:

1. ANSI/TIA-942
2. AS/NZS 2834-1995 Computer Accommodation
3. CENELEC EN 50173 Series
4. ISO/IEC 24764

Codes And Standards Affect Design

1. ASHRAE 90.1
   - 2010 version specifically includes data centers
   - Federal regulations require 90.1-2010 as a minimum takes effect as national standard on Oct 18, 2013.
   - 2013 version is more strict - goal of making the standard 10 to 20 percent more stringent than the 2010 standard. Another important change for the 2013 standard is the first alternate compliance path in Chapter 6. The first such alternate path has been developed for computer room systems and was formulated with the assistance of ASHRAE technical committee 9.9, Mission Critical Facilities, Data Centers, Technology Spaces and Electronic Equipment. This path uses the Power Usage Effectiveness (PUE) metric established by the datacom industry. .
2. IECC – International Energy Conservation Code
3. IGC – International Green Code
4. ASHRAE 90.4p – Energy standard for data centers and telecommunications buildings draft 11/2013

Harmonizing Global Metrics for Data Center Energy Efficiency

- To address these inconsistencies, a group of global leaders has been meeting regularly to agree on standard approaches and reporting conventions for key energy efficiency and GHG emission metrics.

- This current document, the last joint statement from the Taskforce, reflects agreements reached as of March 13, 2014.

- These organizations are: the U.S. Department of Energy's Save Energy Now and Federal Energy Management Programs (March 2009 – October 2012); the U.S. Environmental Protection Agency's ENERGY STAR Program; the European Commission Joint Research Centre Data Centres Code of Conduct; Japan's Ministry of Economy, Trade and Industry; Japan's Green IT Promotion Council; and The Green Grid Association.

Harmonizing Global Metrics for Data Center Energy Efficiency

1. Data Center Energy Productivity (DCeP)
   - DCeP is an equation that quantifies useful work that a data center produces based on the
   - amount of energy it consumes. DCeP is computed as useful work produced divided by
   - total energy consumed by the data center. DCeP allows each user to define useful work as applicable to the user's business.
2. Power Usage Effectiveness (PUE)
   - Ratio of Total Facility Power to IT power use. Ideal is 1.0
   - Identifies facility efficiency but does not address IT equipment efficiency
   - Datacenter
3. Data Center Efficiency (DCiE) is the inverse of PUE. Ideal is 100%
4. Water Usage Effectiveness (WUE)
   - Ratio of Annual Water Usage to IT Equipment Energy. Ideal is 0.0
5. Fixed to Variable Energy Ratio (FVER)
   - Proposed by the BCS Chartered Institute for IT in UK.

Harmonizing Global Metrics for Data Center Energy Efficiency

1. Carbon Usage Effectiveness (CUE)
   - CUE is a metric that enables an assessment of the total Green House Gas (GHG) emissions of a data center, relative to its IT energy consumption. CUE is computed as the total carbon dioxide emission equivalents (CO2eq) from the energy consumption of the facility divided by the total IT energy consumption; for data centers with electricity as the only energy source, this is mathematically equivalent to multiplying the PUE by the data center's carbon emission factor (CEF).

2. A broad range of countries have introduced, or are planning, market based emissions trading schemes and carbon taxes.

3. Implemented and planned climate change actions in major emitting economies:

Carbon Taxes

1. There is no nationwide carbon tax levelled in the United States, although a few states and localities have introduced the tax.
2. Although there is no federal carbon tax, some Canadian provinces do have carbon taxes.
3. In Europe, a number of countries have imposed energy taxes or energy taxes based partly on carbon content.[19] These include Denmark, Finland, Germany, Ireland, Italy, the Netherlands, Norway, Slovenia, Sweden, Switzerland, and the UK. None of these countries has been able to introduce a uniform carbon tax for fuels in all sectors.
4. The Australian Government will abolish the carbon tax from 1 July 2014.
5. In October 2012 Japan introduced a Carbon tax
6. On July 1, 2010 India introduced a nationwide carbon tax
7. The Chinese Government Ministry of Finance has proposed to introduce a carbon tax from 2012 or 2013
8. China is reconsidering plans for a carbon tax - March 2014

Harmonizing Global Metrics for Data Center Energy Efficiency

1. Green Energy Coefficient (GEC)
   - GEC is a metric that quantifies the portion of a facility's energy that comes from green sources. GEC is computed as the green energy consumed by the data center (measured in kilowatt-hours or kWh) divided by the total energy consumed by the data center (kWh).
   - For the purposes of GEC, "green energy" is defined as any form of renewable energy for which the data center owns the rights to the green energy certificate or renewable energy certificate, as defined by a local/regional authority.
   - The "total energy consumed by the data center" is the total source energy, calculated identically to the numerator of PUE.
2. Energy Reuse Factor (ERF)
   - ERF is a metric that identifies the portion of energy that is exported for reuse outside of
   - the data center. ERF is computed as reuse energy divided by the total energy consumed
   - by the data center. Reuse energy is measured as it exits the data center control volume.
   - The "total energy consumed by the data center" is the total source energy, calculated
   - identically to the numerator of PUE.

Summary from LEED / GreenGlobes webinar
01.28.2014
Ryan Collier

LEED started in 1993 in the USA. Green Globes started in 1996, and is based out of Canada's adoption of BREEAM.
USGBC is concerned with buildings and quality of life. GreenGlobes is concerned with energy efficiency and environmentally friendly buildings.
LEED has 21 distinct project types, organized into 5 categories (eg "BD+C).
GreenGlobes has 9 project types, with some not available under LEED (like parking garages).
Both systems are points based with multiple levels of certification.
GreenGlobes is from 1 to 4 globes. 1000 points possible. Level of certification is based on the percentage of points achieved, independent of "bucket." (35% minimum). No prerequisites.
LEED have 40 – 100 points, with tiers based on defined point thresholds.
Similarities include:

1. **Site Category**

a. **LEED = Prerequisite + Credits**
b. **GreenGlobes = 4 'topics'**

2. Materials
a. LEED = Prerequisites + Credits
b. GreenGlobes = 6 ‘topics’
c. Both have provision for LCA (Life Cycle Assessment), EPDs (Environmental Product Declarations) though GreenGlobes gives these items more weight than LEED
3. Water
a. LEED = Prerequisite + Credits
b. GreenGlobes = 5 ‘topics’
c. Both have provisions for Cooling Tower efficiency and water reuse.
4. Energy
a. Both use energystar data and certifications, though in different ways
b. LEED = Prerequisites + Credits, including provisions for carbon offset and demand response
c. GreenGlobes = 8 ‘topics’
5. Indoor Environment
a. LEED = Prerequisites + Credits
i. Acoustic Design is not a prerequisite.
b. GreenGlobes = 8 ‘topics’
i. Includes credits for mold prevention measures.

Differences include:

1. **GreenGlobes has project management requirements (for owner, architect, and contractors)**
2. **GreenGlobes has credits for managing product procurement (only available in LEED EB/O+M)**
3. **LEED v4 has more direct approach to location and transportations (which is community related).**
4. **LEED has 'regional' credits and innovation credits.**
5. **Emmission reduction is given credits under GreenGlobes for the following (though not limited to) list:**
   a. **Refrigerant**
   b. **General emissions**
   c. **Particulate**
   d. **Heavy Metals**
   e. **Radon**

Both have online systems for logging data.

Cost Analysis:

1. Cost for GreenGlobes is more up front plus the additional cost for third-party verification member to review the site (sometimes more than once)
2. Cost for LEED is more costly over the life of the project due to documentation requirements.

Personal Accreditations:

1. Green Globes
   a. GreenGlobes Professional
      i. Online study, 5 AIA CEU
      ii. Only available if you have 5 years' experience in building design or construction
   b. GreenGlobes Assessor
      i. GGP + Additional Training
      ii. 10 years experience, minimum.
      iii. Must have a relevant degree in either engineering or architecture.
      iv. Must have experience on three 'green' driven projects.
      v. Makes recommendations and audits during the certification process.
2. LEED
   a. Green Associate
   b. LEED AP
   c. LEED AP Fellow
3. Both have CEU requirements.

Global Reach:

1. LEED is currently being developed by committee representing 30 different nations.
2. GreenGlobes is only in the USA.

News Items:

1. Jerry Yudelson, a LEED AP Fellow, recently joined GreenGlobes.
2. 4+ States have banned LEED due to LEED's wood certification requirements and EPD / LCA requirements.
   a. LEED only accepts FSC wood, where GreenGlobes accepts FSC + 3 other certifications for wood.
3. GSA now allows for either LEED or GreenGlobes to be used on a project.

QUESTIONS?

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