

Datacenter Certification

The Gap between Theory and Implementation

Quality Procedures in Data Center Project

COMMISSIONING & CERTIFICATION

המצגת הוצגה ע"י שמעון כץ
במסגרת תפקידו כמהנדס ראשי בחברת אלקטרה M&E
במסגרת כנס Electricity 2015

Commissioning

- Common practice:
 - Pharmaceutical industry
 - Chemical industry
 - IC industry
 - Owners
 - Regulatory tests: Integration safety tests



Definition

Commissioning

is the process of assuring that all systems and components of a building plant are designed, installed, tested, operated, and maintained according to the operational requirements of the owner or final client.



Commissioning

(according to the Uptime Institute)

Commissioning

- A process designed to test both individual components and whole systems to ensure that they operate as the designer intended
- Commissioning (Cx) is the 'official' beginning of the facility hand off from the Contractor and Designer to Maintenance and Operations
- A commissioning agent (CxA) is generally appointed to lead the team through the commissioning process

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Commissioning

(according to the Uptime Institute)

CxA

- The CxA should be hired during the design phase to begin coordinating and planning the commissioning process
- Most effective when the CxA is an unbiased, third party who works directly for the owner
- Responsible for the following
 - > Directing the planning of all phases of commissioning
 - > Scripting all tests for the Integrated Systems Testing (IST)
 - > Gathering documentation from all sources and compiling into a final commissioning report

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Project Characteristics

- Integration between technology, building and electromechanical infrastructures
- High availability – Tier III (or IV)
- High physical protection (unique for Israel)
- Challenging schedule
- After delivery – zero tolerance for failures
- Datacenter – necessary condition for business operation
- Energy efficiency
- Sole responsibility of contractor



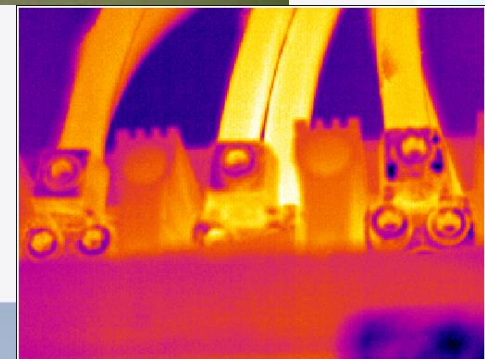
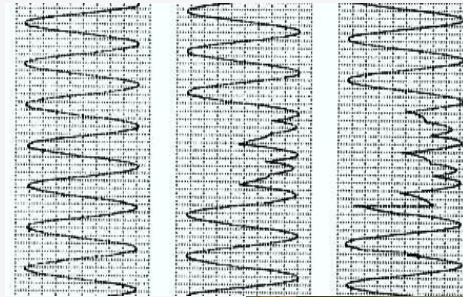
Project Quality Procedures

- Quality design
- Construction:
 - Design reviews
 - Supervision, QC, QA
 - Commissioning
 - LEED
- Uptime Institute's Certification
- Internal Audits
- Risk management audits

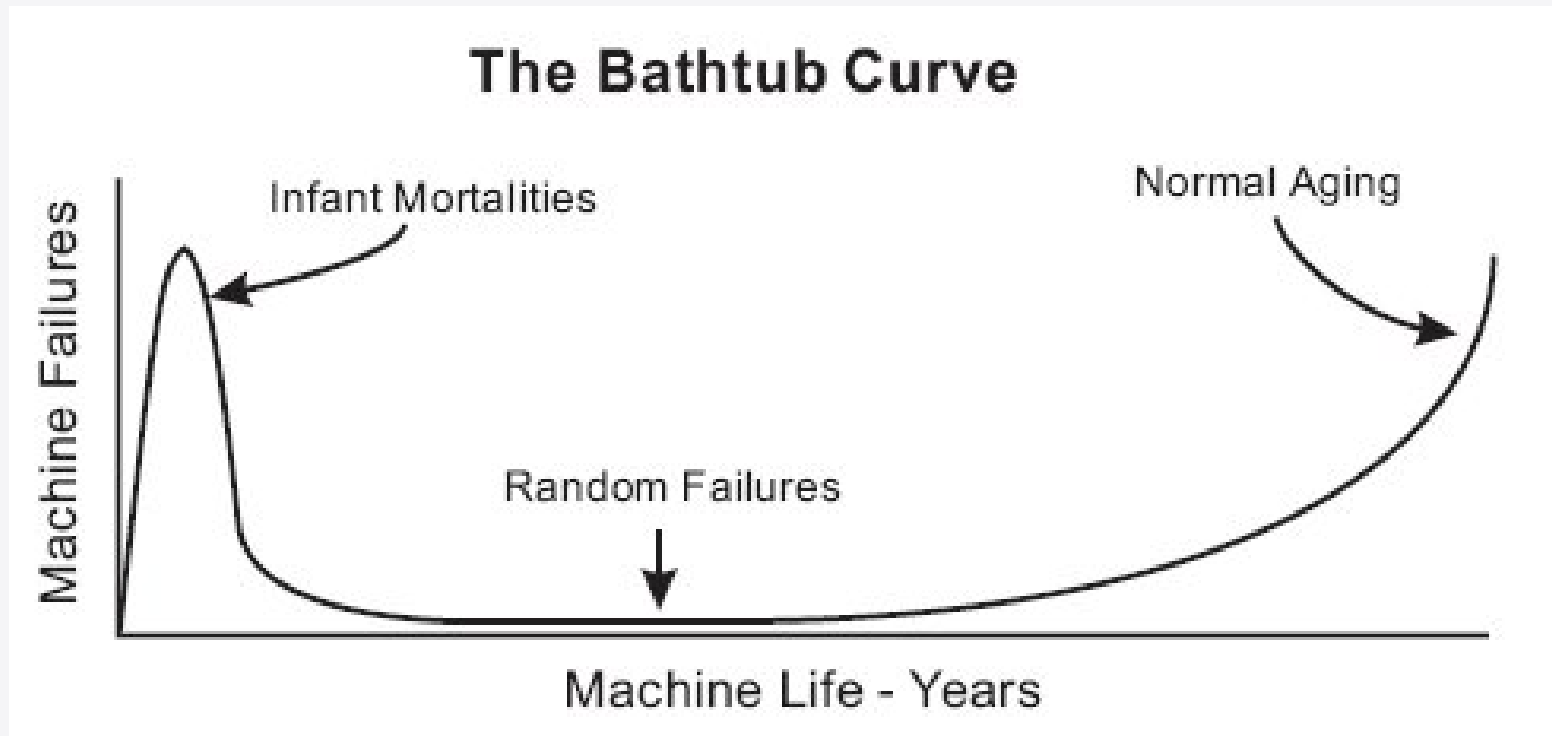


Need for Commissioning & Certification

- Design phase
- Gap analysis
- Quality of construction:
 - Shortcuts
 - Improper, missing works
 - Integration between sub-systems
 - Components failures
 - Components compliance to specification
 - SPOFs
- Training and preparation for maintenance

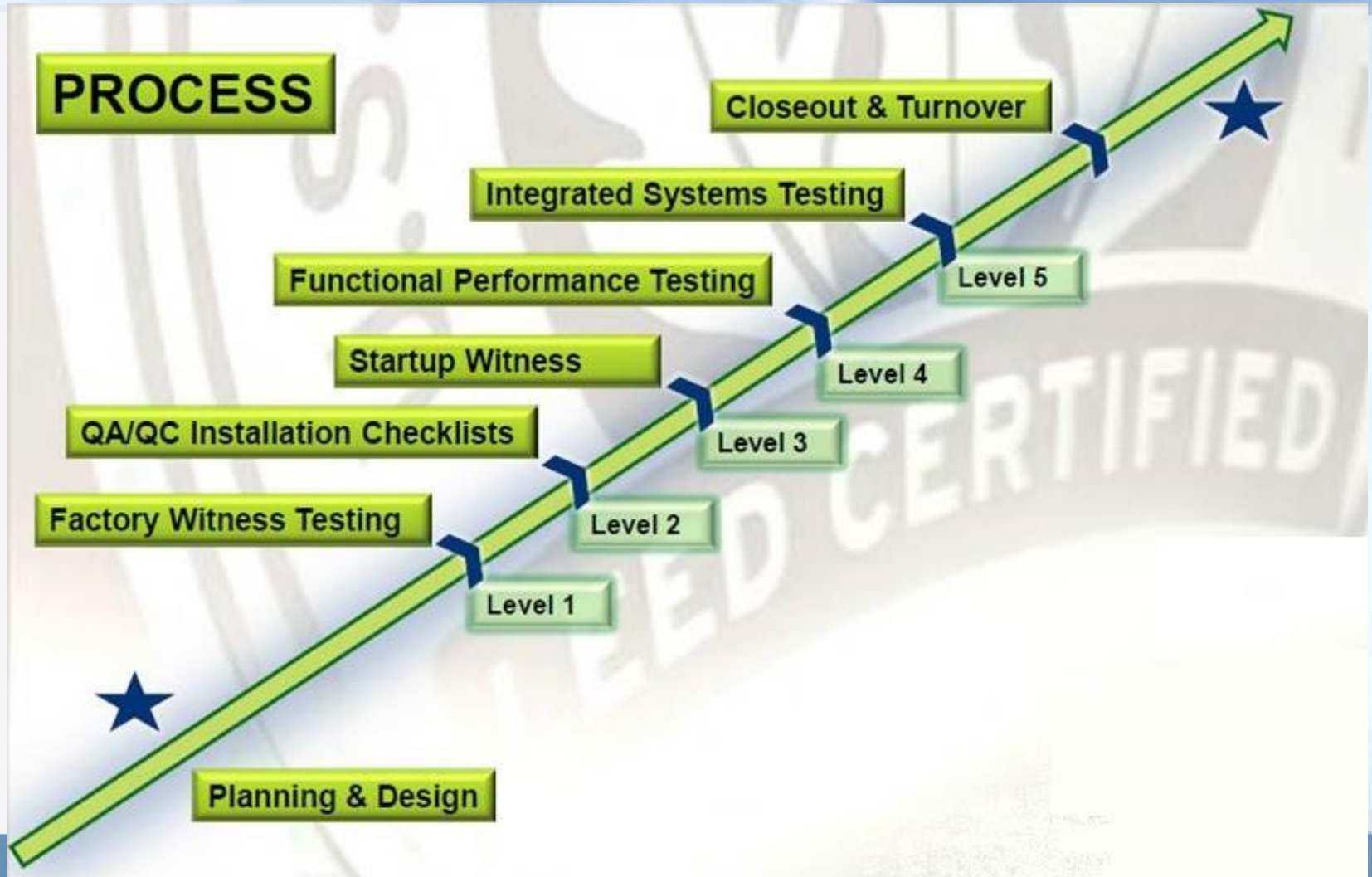


Bathtub curve



Commissioning must surpass the infant mortality period

Commissioning Phases



Commissioning – a multi level procedure

- Design phase
- Construction phase:
 - FWT
 - Installation
 - Startups
 - Functional performance
 - IST
- Operations phase
 - Documentation and training
 - Seasonal test
 - Project closure



Commissioning Stakeholder

- Owner
- Cx Agent
- Design team (architects, electrical, HVAC, BMS, Security)
- GC
- Sub contractors
- Equipment manufacturers & suppliers
- Maintenance team / contractor
- Operations
- Uptime Institute

The involvement of contractors, Equipment manufacturers & suppliers must be specified as part of their contracts



Design Phase

- Design of commissioning
- Compliance between BOD (Spec.) and design
- Testability
- Commissioning plan:
 - Phases and activities
 - Responsibilities
- Attachments for tender documentation
- Review of design documentation and drawings
- In parallel to UTI Tier Certification of Design Documents



Level 1 – Factory witness testing

- Review of FWT plans.
- Attending FWT (partial).
- Verification of compliance to manufacturers Spec.
- Verification of compliance to design demands.
- Verification of factory test reports.



Level 2 – QA/QC Installation Checklists

- Few site visits
- Review of submittals, RFIs and Change requests
- Mapping of installed Equipment
- Preparation for higher commissioning levels:
 - L3 forms – by contractors
 - L4 forms – by Cx agents
 - Schedule coordination



Level 3 – Startup Witness

- L3 forms – prerequisite for startup
- Startups by manufacturer or local representative / supplier
- Startup is generally a condition for warranty
- Baseline measurements
- Coordination between tests
 - Electrical connection before operation of HVAC.
 - Pump before chiller.
 - Cooling before UPS.



Level 4 – Functional performance Testing

- Verification of planned testing of each system – separately
- Operation of each system in every operation mode
- Simulation of various conditions, load levels and extreme situations
- Testing is performed by contractor, witnessed by Cx agent
- Attendance of operation and maintenance teams is highly recommended – a unique opportunity to “play” with the facility and try operation modes
- L4 is combined with regulatory tests (SII, 102, certified electrician Etc.)

Level 5 – Integrated System Test

- Integrative and simultaneous test of the whole facility, fully loaded as a system.
- In case of TIER certification – demonstrating the UTI test list
- Operation of each system in every operation mode
- Simulation of various conditions, load levels and extreme situations
- Simulation of failures
- Simulation of operation while performing maintenance.
- Testing is performed by contractor, witnessed by Cx agent
- Attendance of operation and maintenance teams is highly recommended – demonstrations can be performed by operation and maintenance team.
- Verification of training & documentation
- Verification of signs and operation instructions



Tested Systems

- Data center environment
- Critical systems environment (UPS rooms...)
- Electrical system
- Cooling system
- BMS system
- Security system (firefighters control panel, EPO)



TIER Certification

- Performed ONLY by the Uptime Institute
- A long and complex procedure
- Strict compliance to the UTI standard
- No partial tier certification – for a site, for all systems
- No combined tier certification – no Tier III+ or almost TIER IV
- Phase 1 - Progress Review
- Phase 2 - Tier Certification of Design Documents
- Receiving Tier Certification Demonstration List – baseline for IST
- Phase 3 - Tier Certification of Constructed Facility
- Optional - Preliminary Operational Sustainability Review & Tier Certification of Operational Sustainability



Commissioning – practical view

- GC – SPOC - responsible for building and all systems.
- Baseline for operations and ,maintenance.
- Unique opportunity for “playing” with the systems
- Time consuming procedures – 2 months at the end of the project
- Different from normal acceptance tests
- Costly – quality procedures 5% of project
- Data centers – due to over spec - the only time the site will run fully loaded. Might cause operational difficulties later.
- Lack of local Cx knowledge in Israel, partial Cx procedures.
- A certified discipline learned in universities include certification as Qualified Commissioning Process Provider (QCxP / QCP)
- Language gaps: design in Hebrew Vs. Cx in English

TIER Certification – practical view

- Most of the demonstrations – supply from generators
- All the demonstrations – fully loaded facility
- Heat loads – can be simple and manually transferred between A and B supplies
- BMS – in addition for functionality ease of logging and measurements
- Unique names, signs and marking
- Safety systems – firefighters control panel



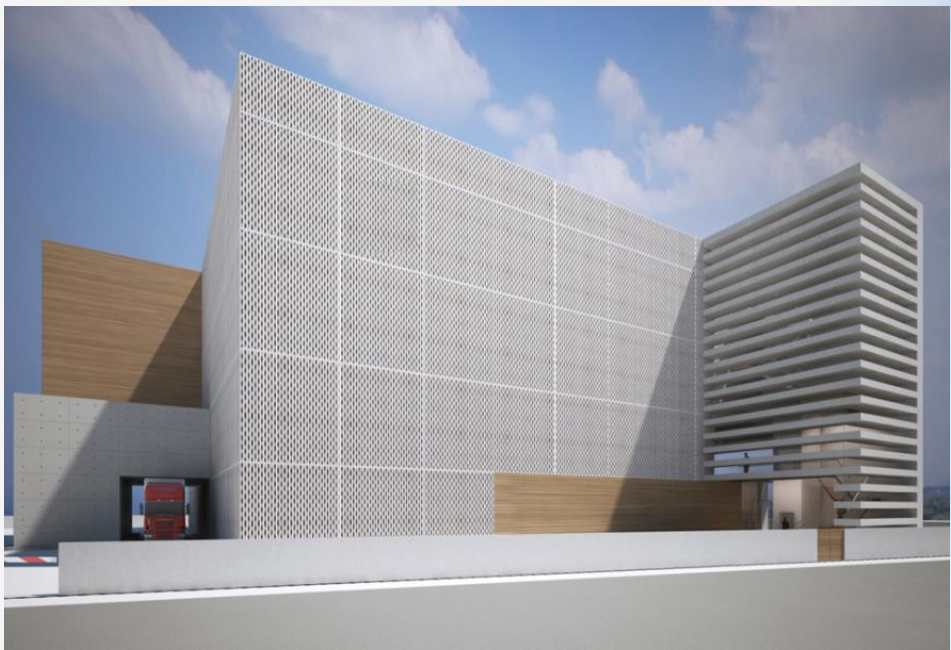
EG2		With the facility supported by all engine generators, isolate engine generator E20C0103-01B for maintenance. Then re-enable the engine generator.	Engine generators E20C0100-01A and E20B0100-01A should continue to serve the data center load.
EG3		With the facility supported by all engine generators, isolate SUPPLY TO UPS board E36C0100-01A for maintenance.	Engine generators E20B0100-01A and E20C0103-01B continue to support the data center load.



Project Stakeholders and Characteristics

- Owner – Mei-Oz Limited
 - Project manager – Shimon Katz
 - Project management – Poran-Shrem
 - Design leader – Osnat Naveh
 - Architecture – Skorka
 - Electrical – YANAI
 - HVAC – Harari Noam
 - BMS – EMG
 - Communication – Radian
 - Cx – LEE Technologies – Schneider Electric
 - Spec. and Cx review – DIT
 - GC, MEP & Communication - Electra
- Total Area – 10,000 Sq.M.
 - DC Area – 2000 Sq.M.
 - 420 IT racks
 - Day 1 power – 1 MW
 - Future growth – 2.5 MW
 - Cooling – CRACs, chimney racks
 - Preparation for closed-coupled water cooling







תודה!