XYZ DATA CENTER

Testing & Commissioning and IST

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Process Requirements

Commissioning is a quality process which provides documented confirmation of proper installation and function of a facility's systems and components as designed and specified. Commissioning ensures the facility meets the Owner's project requirements, the Basis of Design and operational needs of the owner's intended usage. Commissioning process shall include the following:

To ensure building systems perform interactively according to The Client's Data Center Development's project requirements, Project Charter, Basis of Design and the Commissioning Plan of Record. The specific objectives include but not limited to the following:

Verify that no mechanical and electrical coordination and design issues are present, as well as identify any Single Points of Failures (SPoFs), through a careful review of the construction drawings, specifications, and submittals.

Ensure that applicable equipment and systems are installed properly and receive adequate quality checkout through careful site observation and verification of contractor's quality control documentation.

The purpose of commissioning is to provide a high level of assurance that the building systems are installed and operating in the appropriate manner, and is in compliance with the design intent, contract documents and Commissioning Plan of Record.

This process is not to diminish the responsibility of the system designers or installing contractors, nor is it intended to be a redundant testing or inspection function. Commissioning is performed to document and validate the efforts of the designers and contractors, ensuring that the quality of the systems meets the owner's project requirements as documented by the basis of design.

A major component of the commissioning process is the **Integrated Systems Test**. This phase of commissioning is intended to verify that the emergency and redundant systems, which are interrelated in complex manners, will perform appropriately when called upon.

The IST will be conducted after all factory and field component/system quality control, start-up, and test procedures have been completed. The goal of this testing is to verify the operation, proper interdependencies, redundancies, and fail-safe operation of all critical systems.

Verify and document the mechanical and electrical systems function and interact as intended. This will be accomplished through witnessing and documenting an Integrated Systems Test. The test will be developed and administered by the Commissioning Authority (Commissioning Agent) and performed by the subcontractors and/or vendors.

Deliver a comprehensive systems manual to the owner. This electronic manual will provide the owner with a searchable reference of all as-built drawings, specifications, O&M manuals, final commissioning reports, and other important documentation.

Commissioning Meetings - The Commissioning Agent shall setup a kickoff meeting and hold regular meeting throughout the project. Meeting will be conducted locally in Japanese and via live meetings; times shall be coordinated with the required parties.

The commissioning team shall use an approved Automated Commissioning Management System during the commissioning process. This shall include but not limited to the execution of commissioning scripts, QA/QC inspections, testing progress, reporting, Issue tracking and Daily reports. All such reports etc. are to be uploaded in a timely manner to the designated servers of the Client. Delays in uploading meeting minutes, test results etc. must be avoided at all times.

In accordance with the Health & Safety regulations in Japan, all parties/persons who are a part of the T&C and IST have a liability for safety on site, especially in any matters where they can influence the outcome. It is required for the Commissioning Agent to provide OWNER with a copy of their company's Safety Policy.

The Commissioning Agent must also provide us with a method statement on how they will undertake the T&C in a safe manner.

Basic Requirements

XYS critical engineering infrastructure and power and cooling distribution is to be comprehensively tested and commissioned prior to Client occupation of the Data Centre space.

Only such equipment that is required to support two Data center halls of 3F will become operational at this time, with some minimal HVAC and power in the two Data Halls on 4F..

The Commissioning Agent must also quote for subsequent floors 4 and 5. *(See Schedule*).

- Critical engineering infrastructure and systems must be successfully tested
- Complete T & C of all critical Electrical equipment and switch gear.
- Complete T & C of all critical Mechanical equipment and switch gear.
- Complete T & C of Thermal storage, related pumps and Mechanical UPS systems.
- Level 4 FPT Test Scripts will test all sequence of operation, maintenance, and failure modes of the equipment, monitoring and control points and validate the performance and efficiency.
- Engine-Generators will be load tested at 100% load at 0.8PF for 12 hours. o UPS and Mechanical systems will be load tested at 25%, 50%, 100% load for 4 hours. Static Transfer Switches (STS) and ATS will be load tested for a minimum of 4 hours (2 hours on each source) at 100% load.
- Level 5 IST will be performed at various load levels 25% and 100% load levels to ensure that the systems will operate correctly from initial deployment, ramp up and at full load.
- The Level 5 IST will incorporate normal operating modes, maintenance modes and failure modes of the equipment and that ensures the performance matches Tenant's & Landlord's data center requirements and Basis of Design (BOD). The functionality of the alarm and monitoring systems will be verified during Level 5 testing.
- Appropriate and duly calibrated test equipment shall be used to record and verify the results of the tests at all stages.
- T & C for all relevant wiring, piping, controls, BEMS, Fire system, HSSD etc.
- Complete on-site load testing using dummy loads
- Integration validation of the BEMS for Alarms, Alerts, Warning and Logs/Reports

Key Equipment Installation completion schedules to be discussed and confirmed with the General Contractor on site. Commissioning Agent to fill in approximate dates.

Equipment	Install begins	Install ends
Super High Voltage Transformers		
PQM UNITS ON THE SECONDARY OF SHV		
C-GIS		
DEDICATED UPS FOR IT load		
PQM UNITS ON THE SECONDARY OF UPS		
PDU AFTER UPS FOR IT LOAD FEEDER BUS		
BUS BARs (Over racks and feeder supply)		
VCB / ACB		
STS / ATS WHERE INSTALLED		
GENERATORS		
FUEL TANKS & PUMPS		
AIR CHILLERS		
CRAH		
DEDICATED UPS FOR MECHANICAL LOAD		
THERMAL ENERGY STORAGE TANKS & PUMPS		
HUMIDITY CONTROL SYSTEMS		
ELEVATORS		
HSSD (VESDA) and OTHER FIRE ALARM SYSTEMS		
CLEAN AGENT FIRE SUPPRESSION SYSTEMS		
SECURITY SYSTEMS / CCTV		
BEMS SYSTEM		
DEDICATED UPS FOR BMS, SECURITY & CCTV		

Electrical Systems

The critical electrical engineering systems covered by Integrated Systems Testing shall include, but not be limited to, the following:

- High Voltage Transformers and all associated switchgear
- UPS Systems and multiple String Batteries
- STS and ATS if installed
- HVAC UPS System and multiple String Batteries
- Generator Systems including paralleling and associated switchgear
- Fuel Oil and transfer Systems (including fuel level monitoring)
- Verification of Generator Sub transient reactance (X"d below 15%)
- Verification of fault current at the power supply to the racks. (Below 10kA)
- Coordination and Protection device study and Arch flash hazard analysis.
- MV Cable HyPot, LV Cable megging and torque verification,
- Transformer testing, PT, CPT and CT testing,
- Protection relay and circuit breaker testing, earth resistivity measurement, electrical equipment inspection and infrared thermal scanning.
- Bus Bar Risers for UPS by pass
- Cable for UPS systems
- Bus Bars above the Racks
- Short Circuit protection and trip setting studies
- Earthing system and loop impedance. (TN-S earthing will be deployed).
- Fault current at Bus Bar over the racks must be below 10kA.
- Various PQM and Multi Meters
- Integrated Security and CCTV monitoring system
- Emergency Public Address system
- Emergency lights & Battery time and evacuation/egress route signage.
- Both Elevators checked for normal, earthquake and fire alarm operations
- BEMS systems
- Current Testing and Calibration certificates for all test instruments must be sighted prior to use.

Note: Although not specified, in all cases where the BEMS is integrated or monitors any of the above, the BEMS shall also be included as part of that test.

Mechanical Systems

The critical mechanical engineering systems covered by Integrated Systems Testing shall include, but not be limited to, the following:

- Rooftop Air Chiller units and Header piping.
- All associated piping, valves and pumps.
- CRAH / CRAC for Machine Rooms.
- CRAC for MMR x 2.
- CRAC for SER x 2 and BMS Server Room x 1.
- CRAH for Data Centre Halls.
- CRAH / CRAC for UPS Rooms.
- THDi, which must be below 5%.
- Cooling Systems (Supply & Return Temp. & Humidity / Air Pressure in Halls)
- HSSD Systems (VESDA).
- Water Leak detection systems fire hydrants and hoses.
- Water Leak detection system (Shafts, Piping etc.)
- Water Leak detection system for CRAHs and CRACs.
- Pipe works; conduct pipe pressure tests and perform water and air balancing.
- Drainage and Sump pits.
- DC Hall cooling Control System with BMS.
- Gas Fire Suppression System and Vent fans.
- Fire alarm and horn sound checks.
- Additional Fire warning strobes inside Data Halls Hot/Colt Aisles.
- Fresh air ductwork in all areas.
- Emergency duct closure devices.
- Fresh Air Fans.
- Fresh Air Filter system.
- Emergency Exhaust Fans.
- Battery Room Ventilation System and H2 detection.
- H2 sensors if installed in UPS battery areas.
- O2 sensors if installed in N2 gas cylinder room.
- Humidification systems.
- Seismographs test data visual check only.

SCOPE OF SERVICES

- The Commissioning Agent's basic scope of services shall be to provide professional SAT site acceptance testing and IST Integrated Systems Testing management and consulting services.
- The test plan the Commissioning Agent produce should be based around their own commissioning document and be adapted to suit the XYS DC
- The Commissioning Agent shall manage the process and provide weekly reporting of the progress of the SATS and IST.
- The Commissioning Agent shall be responsible to work with the OWNER in-house M & E Engineers as well as Taisei, the General contractor, to ensure IST is done in a professional and orderly manner.
- The Commissioning Agent must ensure that the IST procedures are comprehensive enough to validate performance of the systems, including all intended contingency and redundancy measures.
- The Commissioning Agent must validate the proper operation of the critical engineering systems by witnessing the testing, managing the process and program and submitting a comprehensive report with their findings.
- Contractors are responsible to execute the tests per se and provide the required cables, materials and attendant technical staff.
  (NOTE Technical staff will only be able to converse in Japanese).
- Liaise with the Designers, contractors and equipment suppliers.
- Review of all available drawings, specifications and procedures proposed for general testing & commissioning.
- A detailed review report on the above shall be written by the Commissioning Agent and submitted to Landlord and Engineering team for review.
- Review of completed off-site factory test reports and any on-site tests already completed. Most off-site tests would have been witnessed by the responsible project team members.
- An Electrical Testing Plan will be developed based on NETA ATS standards and submitted to Landlord and Tenant for review and approval.
- Meet with Designers and the contractors to discuss their expectations and plans for T&C.

- Visit building site and familiarize yourselves with the detailed installation conditions as well as the actual site conditions, which will impact the T&C procedures and detailed methodology.
- Ensure that all installation works for the respective areas are fully complete and ready prior to testing
- Prepare master commissioning and testing programs which identifies the logical commissioning sequence of each activity and the interdependency of each set of activities.
- Check and confirm that all test & measuring equipment is calibrated and certified with valid dates.
- Upload in a timely manner all T&C and IST data to MSFT data bases as specified.
- Prepare master commissioning and testing programs which identifies the logical commissioning sequence of each activity and the interdependency of each set of activities.
- Comment on and agree the commissioning method statements prepared by trade contractors.
- Chair and minute regular commissioning meetings.
- Establish and put in place detailed inspection and reporting procedures during construction and installation.
- Develop detailed methods statements describing procedures, resources and timing for all IST procedures.
- All methods statements shall be in English and Japanese and shall be reviewed and agreed with Mechanical & Electrical designers and the relevant contractors.

On-Site Integrated Systems Testing Management

STAGE 2 –This stage involves the management of on-site activities.

Note; For scheduling reasons testing will often take place during unsocial hours; I.E. overnight or over weekends. Please allow for this in your pricing.

Factory Witness Tests (FWT) & Factory Acceptance test (FAT)

- The Commissioning Agent should quote separately for travel and time costs for the required FWT for the first batch of any mission critical equipment. Subsequent batches may only require a FAT.

On-Site Testing Management & Reporting

- Attend on site, witness and oversee adherence to the detailed plans produced in previous processes
- Provide appropriate reporting on progress and results of T&C.

Heat Load Tests

- Ensure correct set-up and execution for heat load testing, including proper placement and connections. Check for Data logger positioning and count.

Recording and monitoring

- Throughout the tests, ensure that a thermograph or similar device is available to monitor and record the temperature variations

Integrated Systems Test (IST)

- Upon successful completion as in the previous pages, an IST will be required, including load banks, to simulate full design loads in each hall. (*Due to the high power density, testing more than one hall at a time may not be feasible.)*
- The T&C and IST for Phase 1 shall be done per Half (500m2) Hall only due to the limitations on power capacity provided by TEPCO at that point in time. Any plans for conducting tests in a full Hall of 1000m2 will not be practicable.
- During this IST, all system interconnections and control links shall be checked and verified, including all contingency and redundancy measures.
- Any failures will require a re-run of the same test.
- If there are consistent failures, the Commissioning Agent shall deem such test as Failed and require the manufacturer / installer to arrange for the necessary rectification.
- The manufacturer / installer will be instructed to do their own test prior to requesting the Commissioning Agent to attend further tests.
- The Commissioning Agent should allow for an anticipated number of re-tests in their costs, while detailing these as separate line items.

STAGE 3 – Final Reports

- Report on completion of various stages of IST, such reports shall be in English.
- Update Methods Statements, if required, to reflect actual methods used.
- Include as attachments to reports detailed reporting forms used by the contractors while executing the IST procedures.
- Ensure all such forms are properly signed by all relevant parties.
- Provide independent technical summary and assessment for the test results, including recommendations, if any, for re-testing or improvements.
- Prepare Final Report, including confirmation and validation of system performance.
- Tracking of Detailed Critical Systems O&M Manual Compilation
- Track completion by others of detailed critical systems O&M manuals, which may be in Japanese for locally made equipment.
- Certain imported equipment may have O&M in English or both languages.
- Track all as-built drawings and relevant IST certification sheets and reports.
- Once all commissioning reports have been approved the Commissioning Agent shall, within 30 days of RFS, incorporate same in a composite document record system electronically and in hardcopy.
- All and any commissioning reports could / may be read by non-technical persons. All such reports must be written to allow all persons to understand the relevant content.
- Provide attendance at all Practical Completion inspections and key area handovers.
- Key area handovers: 3F DC (x2) Halls, UPS rooms, CRAH corridors, Generators and Pump Room shall be fully tested and documented prior to handover. Program and implementation of IST testing including full coordination and sign off.
- Ensure all critical Mechanical systems are operating as designed before final handover to client and clients' maintenance providers.
- Deliver an IST integrated system testing completion certificate in English.

Project key details summary	
Site location	Chuo Ward, Tokyo
Site area	8,689.38m2
Building foot print	4,790.0m2
Total building floor area	19,005.0m2
Net DC White space	6,000m2
Net dedicated office space	340m2 (515m2 total)
Dedicated storage space	600m2 (700m2 total)
Floor loading Data Halls	17kN/m2
Data Hall floor type	Hard deck, epoxy finished
Data Hall floor to ceiling height	3,800mm
Total height of building	36.5m
Seismically isolated	Yes, full seismic isolation
Power to building	66KV / 30MW, 6,600kV
Super HV transformers Oil cooled	2N, 30MVA per unit
Total Data Hall power provisioning (Day ultimate)	18MW
Power to each DC Hall	3,150kW
UPS configuration and redundancy	3+1 Block redundant
UPS Battery monitoring	Yes, Cell watch
UPS critical data monitoring	Yes, PQM ION9000
Power distribution to racks	Bus Bar overhead
Heat rejection to each DC Hall with an overhead of 7.5%	3,505kW
Cooling method	Chilled water loop pipe
CRAH redundancy in each DC Hall (Both sides supply)	N+1 per side
Chilled water thermal storage	275 tons (Exceeds 10 min)
Dedicated UPS for MMR, SER, BMS & Security and Mechanical UPS for HVAC	Yes
Secure IT rooms for BMS, Security and DVR servers	Yes, 2 – Security, 1 - BMS
Fuel on site for emergency Generators	1,300,000 litres (75 hours)
Fire suppression	NN100 Clean Agent gas.
Fire hydrants / hose	Yes per Fire Code

Qualifications to bid

- The company bidding to conduct the Commissioning must be domiciled in Japan or be able to work in Japan as a legal entity or work with a Japanese domiciled partner and have more than five (5) years experience in T&C /IST.
- Responsibility to comply with all relevant Japanese laws is that of the bidder.
- The company must provide Profiles or CVs of their key engineers who will participate in the T&C and IST.
- The company must provide reference of at least 2 other Data Centers where they have worked in a similar role and where they have done the T&C and IST for a facility in Japan, preferably a hyper scale DC of over 15MW IT power.

Submission of your response

- Any travel or other incidental expenses incurred in the IST / T&C are to be included in a separate estimate, including overseas factory acceptance test costs, which may include Hotel, Meals, Visas, Air travel, local travel etc.
- Indicate clearly if you will provide PQM (30 units) and Data Loggers (100 units) for the duration of the T&C and IST. We can lease these ourselves if required.
- By responding to this RFP, you agree that any and all expenses incurred in the preparation of your response will be your responsibility and that OWNER will not be called upon to reimburse any such expenses.
- Your response must be sent by email in a zipped folder that is password protected. Please provide your quotation in editable MS Excel format with a supporting PDF sheet.

Your response must be received by us on or before COB on March 15th 20xx

OWNER retains the right to select any bidder of its choice without giving reason for such a decision to other bidders. We will notify all bidders of the outcome.

If you have questions or need clarification, please contact the undersigned by email only. Thank you.

Submit your responses by Email to:

Imtiaz Issadeen
Director Design and Build – OWNER KK
Imtiaz.issadeen@Ownerdevelopment.com

