

# Data Center Commissioning Checklist

This checklist can be used to monitor the progress and process of the commissioning activities and tasks that will be required to be completed by the various parties relating to the commissioning process.

The list could be used for reporting and to monitor commissioning requirements for handover of each stage.

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# Introduction

The below checklists will be based upon the commissioning tasks and activities that are required to be completed under the projects Commissioning Process Stages and the Data Centre Commissioning Levels.

For the Levels of commissioning that will be delivered specifically related to this project the following has been developed and incorporates the general commissioning process, as noted:

- Level 0 – Design & Planning
- Level 1 – Factory Testing
- Level 2 – Component, System Delivery and Pre-Installation
- Level 3 – Pre-Commissioning / Pre-Functional and Start-up
- Level 4 – Component / System Functional Performance Testing
- Level 5 – Systems Integrated Testing
- Level 6 – Closeout and Turnover / Handover

The general commissioning process has been determined from ASHRAE by using elements of the following stages:

- Stage 1 – Pre-Design Stage
- Stage 2 – Design Stage
- Stage 3a – Pre-Construction Stage
- Stage 3b – Construction Stage
- Stage 3c – Commissioning Stage
- Stage 4 – Occupancy and Operations Stage
- Stage 5 – Continuous Commissioning Stage

## Level 0- Design & Planning

Level 0 starts the data center commissioning process and will focus on the design, planning, tendering, and onboarding of the client's commissioning agent where, once on board, they will use the below steps to create and integrate the commissioning process into the project, ensuring that the contractors are fully aware and understand the requirements prior to submitting their proposal.

Level	Task/Activity	Status
L0-01	Write and Issue Owners Project Requirements [OPR] Document.	To Be Completed
L0-02	Oversee Owners Project Requirements [OPR] are being met throughout the contractor design stage, and issue updates to the project team.	To Be Completed
L0-03	Write and Issue Basis of Design [BOD] Document.	To Be Completed
L0-04	Ensure that the Basis of Design [BOD] is updated and reviewed by Main Contractor during the 100% design stage, and issue to the project team.	To Be Completed
L0-05	Develop design [30%, 60%, 90%, 100%] and issue documentation for review and approval.	To Be Completed
L0-06	Create, Develop, and Issue Computational Fluid Dynamics Study [CFD] Document.	To Be Completed
L0-07	Complete Commissioning Review of Design [60% to 100% and Issue Report.	To Be Completed
L0-08	Conduct Short Circuit / Single Point of Failure Coordination Study	To Be Completed
L0-09	Issue Commissioning Document List covering all stages until handover.	To Be Completed
L0-10	Write and Issue Data Centre Commissioning Guideline Document. [This document]	To Be Completed

<b>Level</b>	<b>Task/Activity</b>	<b>Status</b>
L0-11	Agree on Sequencing and Duration of Level 4 & 5 Requirements.	To Be Completed
L0-12	Issue Initial Integrated and Sequenced Commissioning Programme.	To Be Completed
L0-13	Issue Commissioning Process Flow Diagram covering all stages until handover.	To Be Completed
L0-14	Agree Commissioning Process and Responsibility Matrix. [This document]	To Be Completed
L0-15	Issue Commissioning Team Organigram covering this stage. [This is 'Initial']	To Be Completed
L0-16	Agree equipment to be Factory Tested.	To Be Completed
L0-17	Create, Develop, and Issue Load Bank & Metering Plan for Level 4 & 5 works.	To Be Completed
L0-18	Write and Issue Initial Commissioning Plan.	To Be Completed
L0-19	Write and Issue Construction Commissioning Specification.	To Be Completed
L0-20	Upon contract award, 'Form Commissioning Team' and issue organigram.	To Be Completed
L0-21	Set up Cx Electronic Platform [Levels 1-6] for later input of commissioning checklists, test procedures and observations/issues.	To Be Completed
L0-22	Set up and discuss use Document Management System and Numbering Structures for the testing and commissioning works.	To Be Completed
L0-23	Conduct Commissioning Kick Off meeting.	To Be Completed

<b>Level</b>	<b>Task/Activity</b>	<b>Status</b>
L0-24	Create, Develop, and Issue Commissioning Communication Protocol.	To Be Completed
L0-25	Create, Develop, and Issue Material Submission Document List.	To Be Completed
L0-26	Issue Integrated and Sequenced Commissioning Programme.	To Be Completed
L0-27	Issue Integrated and Sequenced Commissioning Work Logics.	To Be Completed
L0-28	Agree on method for Capturing Site Issues and Observations.	To Be Completed
L0-29	Agree on Tagging Process and design of tags to be used.	To Be Completed
L0-30	Agree on format and content of Factory Testing Scripts.	To Be Completed
L0-31	Agree on format and content of Factory Testing Reports.	To Be Completed
L0-32	Plan / programme Factory Testing.	To Be Completed
L0-33	Agree on format and content of Confirmation to Ship Certificates.	To Be Completed
L0-34	Agree Training Requirements and Write Training Manual.	To Be Completed
L0-35	Develop Training Programme.	To Be Completed
L0-36	Agree on format and content of Pre-Start Up Checklists.	To Be Completed
L0-37	Agree on format and content of Functional Testing Procedures.	To Be Completed

<b>Level</b>	<b>Task/Activity</b>	<b>Status</b>
L0-38	Agree on format, content, and process for Inviting Owner Team for Witnessing and Verification.	To Be Completed
L0-39	Agree Final Testing Pack information to be included in O&M.	To Be Completed
L0-40	Agree on format and content of Daily, Weekly, Monthly Commissioning Reports.	To Be Completed
L0-41	Agree on format and content of 2 Week Look Ahead Schedule.	To Be Completed
L0-42	Agree on format and content of Final Commissioning Report.	To Be Completed
L0-43	Agree on format and content of Systems Manual.	To Be Completed
L0-44	Agree O&M Requirements.	To Be Completed
L0-45	Write and Issue Final Commissioning Plan.	To Be Completed
L0-46	Conduct Commissioning Focused Meetings and Workshops, issuing Minutes.	To Be Completed
L0-47	Provide to CxP, Commissioning Focused Reports [monthly/weekly].	To Be Completed
L0-48	Provide to Client, Commissioning Focused Reports [monthly/weekly].	To Be Completed
L0-49	Review Information for Gap Analysis between Owner Specified Equipment and Main Contractor works.	To Be Completed
L0-50	Create, Develop, and Issue Electrical Discrimination Study.	To Be Completed
L0-51	Create, Develop, and Issue Arc Flash Study.	To Be Completed

<b>Level</b>	<b>Task/Activity</b>	<b>Status</b>
L0-52	Agree on Arc Flash Sticker Template to be used.	To Be Completed
L0-53	Agree Thermal Graphic Inspection locations.	To Be Completed
L0-54	Create, Develop, and Issue Thermal Graphic Procedure and Plan.	To Be Completed
L0-55	Create, Develop, and Issue Electrical Lock Out, Tag Out Process and Procedure.	To Be Completed
L0-56	Create, Develop, and Issue Plant Settings Report.	To Be Completed
L0-57	Create, Develop, and Issue Schedule of required Work Permits for commissioning activities.	To Be Completed
L0-58	Create, Develop, and Issue Commissioning Strategies.	To Be Completed
L0-59	Agree Sequence of Operation [SOO] List.	To Be Completed
L0-60	Create, Develop, and Issue Sequence of Operations [SOO].	To Be Completed
L0-61	Create, Develop, and Issue BMS Graphic Document.	To Be Completed
L0-62	Create, Develop, and Issue BMS Points List Document.	To Be Completed
L0-63	Create, Develop, and Issue Fire Cause & Effect Matrix.	To Be Completed
L0-64	Provide to Owner, Level Close Out Reports.	To Be Completed
L0-65	Sign off Level.	To Be Completed

# Level 1 – Factory Testing

Factory testing will be completed on major equipment that is critical to the operation of the data centre, checking the equipment and its components against approved tests/design prior to leaving the manufacturers facilities.

Once accepted that the equipment/components are operating as per the project requirements, it will be provided a 'RED TAG' and can be shipped to site where Level 2 will conduct inspections prior to accepting delivery and storing.

Level	Task/Activity	Status
L1-01	Fix and confirm dates of <b>Factory Testing</b> .	To Be Completed
L1-02	Create, Develop, and Issue <b>Factory Testing Scripts</b> .	To Be Completed
L1-03	Conduct Commissioning Focused <b>Meetings and Workshops</b> , where required.	To Be Completed
L1-04	Organize Transportation and Accommodation for Factory Testing.	To Be Completed
L1-05	Conduct <b>Factory Acceptance Testing</b> with owner team at factory or remotely.	To Be Completed
L1-06	Add any issues to <b>Observation Register</b> and managing to close.	To Be Completed
L1-07	Create, Develop, and Issue <b>Factory Testing Reports</b> for all equipment.	To Be Completed
L1-08	Obtain and Issue <b>Factory QA/QC</b> documents for record and filing.	To Be Completed
L1-09	<b>File and manage</b> Factory Testing information and records within the Project electronic filing system.	To Be Completed
L1-10	Install all <b>Red Tags</b> where applicable.	To Be Completed
L1-11	Issue Confirmation to Ship Certificate.	To Be Completed



Level	Task/Activity	Status
L1-12	<b>Ship</b> equipment to site.	To Be Completed
L1-13	Provide to Owner, Level Close Out Reports.	To Be Completed
L1-14	Sign off Level.	To Be Completed

## Level 2 – Component Delivery/Pre-Installation

To ensure that the quality assurance of the project is upheld, prior to accepting any equipment and components from the manufacturer/supplier delivery company, checks will be conducted and documented.

Level	Task/Activity	Status
L2-01	Write and <b>Issue Level 2 Checklists and Scripts</b> that will be used to facilitate the works.	To Be Completed
L2-02	Plan and <b>Manage Deliveries</b> of plant, equipment, and materials. [If not, Factory Tested]	To Be Completed
L2-03	Complete <b>Delivery and Storage Checklists</b> when plant, equipment and materials arrive on site.	To Be Completed
L2-04	Complete Installation Checklist Inspections.	To Be Completed
L2-05	Complete Pre-Start-up / Energization Inspections.	To Be Completed
L2-06	Conduct any <b>First of Kind [FOK] Inspections</b> if noted in the project process with the owner's CxP.	To Be Completed
L2-07	For Electrical Panels ensure <b>Arc Flash Stickers</b> are attached and <b>Breakers Set</b> in line with the Arc Flash Report and Discrimination Study.	To Be Completed
L2-08	Complete <b>Foreign Object Detection [FOD] Inspection</b> for all electrical panels and equipment.	To Be Completed
L2-09	Update <b>Commissioning Tracking</b> to reflect actual status and progress. [Manually or as per Commissioning Electronic Platform]	To Be Completed
L2-10	Manage the <b>Overall Programme</b> for the Commissioning Tasks and Activities.	To Be Completed

Level	Task/Activity	Status
L2-11	Add any issues to <b>Observation Register</b> and managing to close.	To Be Completed
L2-12	<b>File and manage</b> documentation and records within the Project electronic filing system.	To Be Completed
L2-13	Issue regular <b>2 Week Look Ahead Schedules</b> for Commissioning Team Resource Planning.	To Be Completed
L2-14	Conduct Daily Morning Coordination Workshop.	To Be Completed
L2-15	Provide Daily Commissioning Updates.	To Be Completed
L2-16	Conduct Commissioning Focused <b>Weekly Meetings and Workshops.</b>	To Be Completed
L2-17	Provide Commissioning Focused Reports. [Monthly / Weekly]	To Be Completed
L2-18	Install all <b>Yellow Tags</b> where applicable.	To Be Completed
L2-19	Provide to Owner, Level Close Out Reports.	To Be Completed
L2-20	Sign off Level.	To Be Completed

## Level 3 – Pre-Functional/Start Up

The Pre-Functional/Start up work will involve the inspection of the equipment, systems and installations for adherence to the construction drawings and design, to ensure they are installed in line with the project requirements and manufacturer's needs.

Once complete the equipment and systems can then be energized and go through their Level 3 pre-functional/ start up checks and activities, prior to the Level 4 Functional Testing.

Level	Task/Activity	Status
L3-01	Write and <b>Issue Scripts/Start-up Plans</b> that will be used to facilitate the start-up and testing works.	To Be Completed
L3-02	Write and <b>Issue Work Permits</b> as noted in Level 0 that will be used to facilitate the start-up and functional testing works.	To Be Completed
L3-03	Install <b>Temporary Equipment and Instruments</b> to facilitate the testing and Level 4 Works in line with the Load Bank & Equipment Plan.	To Be Completed
L3-04	Ensure <b>BMS and Control Logics</b> are ready and available. [Point to Graphic]	To Be Completed
L3-05	Ensure <b>Control Room</b> and equipment is ready and available, for testing to commence.	To Be Completed
L3-06	Plan and <b>Manage Energization, Site Testing and Acceptance</b> of plant, equipment, and materials in line with approved procedures, scripts, and programme.	To Be Completed
L3-07	Conduct any <b>First of Kind [FOK] Testing</b> if noted in the project process with the Owner's Commissioning Consultant.	To Be Completed
L3-08	Update <b>Commissioning Tracking</b> to reflect actual status and progress. [Manually or as per Commissioning Electronic Platform]	To Be Completed

<b>Level</b>	<b>Task/Activity</b>	<b>Status</b>
L3-09	Manage the <b>Overall Programme</b> for the Commissioning Tasks and Activities.	To Be Completed
L3-10	Add any issues to <b>Observation Register</b> and managing to close.	To Be Completed
L3-11	<b>File and manage</b> documentation and records within the Project electronic filing system.	To Be Completed
L3-12	Issue regular <b>2 Week Look Ahead Schedules</b> for Commissioning Team Resource Planning.	To Be Completed
L3-13	Conduct Daily Morning Coordination Workshop.	To Be Completed
L3-14	Provide Daily Commissioning Updates.	To Be Completed
L3-15	Conduct Commissioning Focused <b>Weekly Meetings and Workshops.</b>	To Be Completed
L3-16	Provide Commissioning Focused Reports [Monthly / Weekly]	To Be Completed
L3-17	Issue Operation and Maintenance Manuals.	To Be Completed
L3-18	<b>Complete Clean</b> of Data Halls and critical areas.	To Be Completed
L3-19	Install all <b>Green Tags</b> where applicable.	To Be Completed
L3-20	Provide to Owner, Level Close Out Reports.	To Be Completed
L3-21	Sign off Level.	To Be Completed

## Level 4 – Functional Testing

Level 4 will monitor the overall equipment and system site functional testing, prior to full integration testing at Level 5.

All systems and equipment [bms, electrical, elv, mechanical, plumbing, drainage, fire etc], at this stage will be integrated and put through extensive testing to ensure the systems operate and react as per the original design intent.

Level	Task/Activity	Status
L4-01	Write and <b>Issue Scripts</b> that will be used to facilitate the testing works.	To Be Completed
L4-02	Write and <b>Issue Work Permits</b> as noted in Level 0 that will be used to facilitate the works.	To Be Completed
L4-03	Ensure that <b>Temporary Equipment and Instruments</b> are installed in line with the approved Load Bank & Equipment Plan as noted in Level 0 works.	To Be Completed
L4-04	Operate Temporary Equipment and Instruments to facilitate the testing works.	To Be Completed
L4-05	<b>Plan and Manage Testing and Acceptance</b> of plant, equipment, and systems in line with approved procedures, scripts, and programme.	To Be Completed
L4-06	Complete <b>Thermographic Studies</b> and create report as noted in Level 0 works.	To Be Completed
L4-07	<b>Download Data</b> and Information for review after testing.	To Be Completed
L4-08	Update <b>Commissioning Tracking</b> to reflect actual status and progress. [Manually or as per Commissioning Electronic Platform]	To Be Completed
L4-09	Add any issues to <b>Observation Register</b> and managing to close.	To Be Completed
L4-10	<b>File and manage</b> documentation and records within the Project electronic filing system	To Be Completed

Level	Task/Activity	Status
L4-11	Issue regular <b>2 Week Look Ahead Schedules</b> for Commissioning Team Resource Planning.	To Be Completed
L4-12	Conduct Daily Morning Coordination Workshop.	To Be Completed
L4-13	Provide Daily Commissioning Updates.	To Be Completed
L4-14	Conduct Commissioning Focused <b>Weekly Meetings and Workshops.</b>	To Be Completed
L4-15	Provide Commissioning Focused Reports [Level 4 / Monthly / Weekly]	To Be Completed
L4-16	Issue Final Operation and Maintenance Manuals.	To Be Completed
L4-17	Start <b>Facility Operatives Training</b> in line with the documents noted in Level 0 works.	To Be Completed
L4-18	Install all <b>Blue Tags</b> where applicable.	To Be Completed
L4-19	Provide to Owner, Level Close Out Reports.	To Be Completed
L4-20	Sign off Level.	To Be Completed

## Level 5 – Integrated Testing

The integrated testing will test the data hall for performance to validate that the electrical and mechanical systems operate and respond in line with the design, ensuring that the critical spaces can be maintain the environmental conditions to meet the client's Service Level Agreement [SLA].

Level	Task/Activity	Status
L5-01	Write and <b>Issue Scripts</b> that will be used to facilitate the testing works.	To Be Completed
L5-02	Write and <b>Issue Work Permits</b> as noted in Level 0 that will be used to facilitate the works.	To Be Completed
L5-03	Ensure that <b>Temporary Equipment and Instruments</b> are installed in line with the approved Load Bank & Equipment Plan as noted in Level 0 works.	To Be Completed
L5-04	Operate Temporary Equipment and Instruments to facilitate the testing works.	To Be Completed
L5-05	<b>Plan and Manage Testing and Acceptance</b> of plant, equipment, and systems in line with approved procedures, scripts, and programme.	To Be Completed
L5-06	<b>Download Data</b> and Information for review after testing.	To Be Completed
L5-07	Remove <b>Temporary Equipment</b> after testing has been agreed complete.	To Be Completed
L5-08	Update <b>Commissioning Tracking</b> to reflect actual status and progress. [Manually or as per Commissioning Electronic Platform]	To Be Completed
L5-09	Add any issues to <b>Observation Register</b> and managing to close.	To Be Completed
L5-10	<b>File and manage</b> documentation and records within the Project electronic filing system.	To Be Completed



Level	Task/Activity	Status
L5-11	Issue regular <b>2 Week Look Ahead Schedules</b> for Commissioning Team Resource Planning.	To Be Completed
L5-12	Conduct Daily Morning Coordination Workshop.	To Be Completed
L5-13	Provide Daily Commissioning Updates.	To Be Completed
L5-14	Conduct Commissioning Focused <b>Weekly Meetings and Workshops.</b>	To Be Completed
L5-15	Provide Commissioning Focused Reports. [Level 5 / Monthly / Weekly]	To Be Completed
L5-16	Complete <b>Facility Operatives Training</b> in line with the documents noted in Level 0 works.	To Be Completed
L5-17	Install all <b>White Tags</b> where applicable.	To Be Completed
L5-18	Provide to Owner, Level Close Out Reports.	To Be Completed
L5-19	Sign off Level.	To Be Completed

## Level 6 – Closeout/Handover

Level 6 will ensure that the above processes are fully closed out and handover is completed.

Level	Task/Activity	Status
L6-01	Write and Issue Closeout Script.	To Be Completed
L6-02	Complete Clean of Data Halls and critical areas. [If not completed under Level 3 tasks and activities]	To Be Completed
L6-03	Conduct Final Site Inspection.	To Be Completed
L6-04	Inspect and Document all Plant Settings.	To Be Completed
L6-05	Conduct Lessons Learned Workshop and document.	To Be Completed
L6-06	Ensure all <b>Issues and Observations</b> have been closed out for the project.	To Be Completed
L6-07	Ensure all <b>Commissioning Documentation</b> is complete and uploaded to the relevant electronic platforms.	To Be Completed
L6-08	Conduct Closeout Meeting.	To Be Completed
L6-09	Issue Final Commissioning Report.	To Be Completed
L6-10	Write and Issue <b>Systems Manual</b> .	To Be Completed
L6-11	Provide to Owner, Level Close Out Reports.	To Be Completed
L6-12	Sign off Level.	To Be Completed

-END-