

CONFIDENTIAL CLIENT



DUBLIN, IRELAND

1 YEAR + 6 MONTHS | €1.1MM EURO

DATA CENTER COMMISSIONING IN A LIVE ENVIRONMENT

-  Commissioning & Qualification
-  Building Commissioning
-  Asset Management & Reliability
-  Quality, Compliance, & Regulatory
-  Human Performance
-  Process & Manufacturing Technology
-  Program & Project Management
-  Automation & Information Technology
-  The Chemistry of Full-Scale Operations™
-  Data Centers

WHEN YOU NEED TO MEET A HIGHER STANDARD™

PROJECT OVERVIEW

This project involved the retrofit of an Evaporative Cooling System to three separate live, fully operational hyper-scale data centers on a highly secured campus in Ireland. Equipment included N+1 Evaporative Cooling 25000L Water Tanks, N+1 Booster Pumps, and Evaporative Coolers into rooftop AHUs. The rooftop AHUs (N+1) were responsible for cooling the entire critical infrastructure, including server rooms and electrical equipment distribution rooms. The openings into the critical rooms were just inside the AHUs, so the installation of a retrofit evaporative water system was extremely high risk with no room for mistakes or gaps in coordination/processes. This was all done simultaneously with a full-scale Building Automation System upgrade which included Controller updates (AHU Controllers, Central Controllers, and brand new Evaporative Cooling System Automation Controllers), hardware sensor installs to all AHUs, and graphics updates. A team was assembled consisting of CAI as Commissioning Agent (CxA), equipment manufacturers and their technicians, the General Contractor (who was also the Mechanical Contractor), Owner's Representatives, and Design Engineers.

OBJECTIVE

The objective was to commission the retrofitted Evaporative Cooling systems simultaneously with a full-scale BAS software upgrade. CAI also had to ensure that the fully loaded enterprise Data Centers within the assigned project schedule experienced minimal disruption and that there was no impact to live data center load during commissioning. CAI provided third party commissioning services for the Client/Facility Owner.

EQUIPMENT

Data Center 1

- 36 COLO AHU's (12 AHU per COLO), 9 Electrical Room AHU's (3 AHU per Electrical Room), 2 Electrical Room Reserve AHU's (2 AHU per Reserve Electrical Room)
- This included testing and verifying all 'auto', 'hand' and 'off' mode control sequences, various failure scenarios, temperature, humidity, fan control, communications loss between AHU and Central Controller, and rack and OSA-Room differential pressure control.

Data Center 2

- 48 COLO AHU's (12 AHU per COLO), 12 Electrical Room AHU's (3 AHU per Electrical Room), 2 Electrical Room Reserve AHU's.
- This included testing and verifying all 'auto', 'hand' and 'off' mode control sequences, various failure scenarios, temperature, humidity, fan control, communications loss between AHU and Central Controller, and rack and OSA-Room differential pressure control.

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EQUIPMENT (CONTINUED)

Data Center 3

- 48 COLO AHU's (12 AHU per COLO), 12 Electrical Room AHU's (3 AHU per Electrical Room), 2 Electrical Room Reserve AHU's.
- This included testing and verifying all 'auto', 'hand' and 'off' mode control sequences, various failure scenarios, temperature, humidity, fan control, communications loss between AHU and Central Controller, and rack and OSA-Room differential pressure control.

SERVICES PROVIDED

- Design Reviews of the Client's and Consultant's Drawings, Sequences of Operation and Descriptions of Operations
- Startup meetings with Client, Operations, Main Contractor, and Vendors
- Morning Cx Meetings with Client, Operations, Main Contractor, and Vendors
- Safety Method Statements development, review, and submission to Operations for testing on live systems
- Risk Assessments development, review, and submission to Operations for testing on live systems
- Spot check sampling strategy development and implementation
- Combined Site Acceptance L3 Tests (SAT)/Functional Performance L4 Tests (FPT) for all AHUs –Evaporative Cooling AHU controls equipment within the Data center. This included development of equipment-specific test scripts, testing execution, test process management, and test data analysis
- Evaporative Cooling Tank and Pump set L3 SAT witnessing/FPT execution. This included development of equipment-specific test scripts, testing execution, test process management, and test data analysis
- Development of equipment-specific test scripts, testing execution, test process management, and test data analysis for BAS Central Controller (FPT)
- Generation, tracking, and closeout of all L4 issues
- Final report to close out project execution stage
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VALUE DELIVERED

Of greatest importance was that any commissioning effort should be accomplished safely, with no harm to personnel or equipment. Cx activities were coordinated with the installing contractors to minimize duplication of efforts. Many FPTs were able to be combined with the Vendor's SATs to improve efficiency, reducing overall testing time while still ensuring thorough system testing and expediting the final delivery of the cooling system to the owner. All testing issues were documented and tracked to satisfactory resolution. Below are some of the major issues identified and corrected due to the commissioning process:

- During spot-check testing conducted by CAI it was identified that certain sequence of operation software updates were not applied to all units.
- Operations approval delays impacted maintenance schedules daily. This required extra coordination efforts and flexibility from CAI and Construction teams.
- Evaporative Media Pipework of AHUs was causing leaks into the AHUs, these were of huge concern due to proximity of opening into below server rooms.
- Manual return valve on the Evaporative Cooling Break Tank caused issues with flooding of roof and AHUs as water had no return path when pumps were running.
- Evaporative Cooling Water System Control Issues was causing a failed system to open AHU valves with water being supplied to AHUs that did not require cooling. This had to be fixed with a software change and fully retested to prove the issue was resolved.

During the project, there were many challenges addressed during design, construction, and commissioning. Major operational issues relating to the Evaporative Cooling Water System were experienced when the return valve was closed or when the tank was in a failed scenario. These issues were resolved through a software change to all AHU's by the controls contractor. These systems were then retested and validated by the CAI team. Without commissioning, these issues would not have been identified and the facility would have experienced major operational problems resulting in an increased risk of an outage or worse. The financial impact of any outage can be in the millions.