

ECMWF/RFP/2025/397

FOR

PROVISION AND INSTALLATION OF AN ADDITIONAL CHILLER UNIT

AT

ECMWF DATA CENTRE, BOLOGNA, ITALY

ANNEX 1 SPECIFICATION OF REQUIREMENTS:

Annex 1A- Technical report

Technical Report

Table of Contents

1. INTRODUCTION	3
1.1 FRAMEWORK.....	3
1.2 EXISTING CONDITIONS	3
2. APPLICABLE REGULATIONS	5
3. INSTALLATION OF THE CHILLER UNIT	7
3.1 TECHNICAL SPECIFICATIONS	7
3.2 POSITIONING	8
3.3 HYDRAULIC CONNECTIONS AND INSTALLATION OF AUXILIARY COMPONENTS	10
3.4 MODIFICATIONS TO THE EXISTING CIRCUIT AND OPERATING LOGIC	11
3.5 ELECTRICAL CONNECTIONS AND INTEGRATION INTO SUPERVISION SYSTEMS.....	12

1. INTRODUCTION

1.1 FRAMEWORK

This technical report outlines the characteristics and installation procedures of the new refrigeration unit identified as CH2n, the tenth air-cooled chiller planned for the roof of Building L2.

The chiller was previously foreseen in the initial design of the technology plant and is now to be installed to enhance the cooling capacity and system redundancy of the Data Centre cooling infrastructure serving the ECMWF Bologna Data Centre.

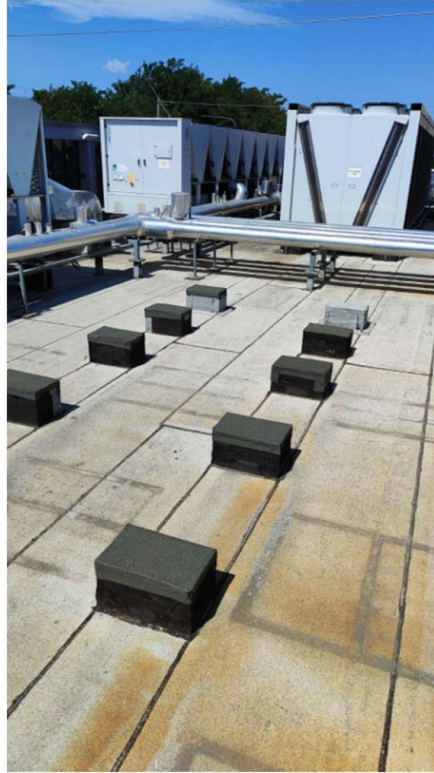
1.2 EXISTING CONDITIONS

Building L2 currently houses the mechanical technology plant of the ECMWF Data Centre, which is divided into two identical substations—Central A and Central B—each powered by a primary loop with redundant pumping units.

On the roof, nine air-cooled chillers, each with a capacity of 921 kW, are installed and equipped with screw compressors and integrated primary pumps. Chillers CH1A to CH4A supply Central A, while CH1B to CH4B supply Central B. The ninth chiller, CH1n, configured as a backup unit, can be switched between the two substations by means of motorized two-way solenoid valves placed at the connection points between Central A and Central B loops.

Sequence and emergency operation logics are managed by the Mitsubishi ClimaPRO system, which sends open/close signals to the solenoid valves and enables the backup chiller in the event of production unit failure or complete substation outage.

Roof space has been designated for the installation of the new machine, and branch connections with shut-off valves have been included to facilitate the connection of new piping to the CH2n chiller.



2. APPLICABLE REGULATIONS

The design and execution of the systems must comply with applicable laws, technical standards, and regulations. Below is a list of the main reference standards; note that this list is not exhaustive:

- Specific regulations on fire prevention and accident protection, particularly regarding installed systems and adopted materials
- UNI standards; applicable technical specifications
- CEI standards; applicable technical specifications
- ASTM standards; applicable technical specifications
- EU Regulation No. 3093 of 15 December 1994 and Legislative Decree No. 193 of 12 April 1996
- Provisions relating to Article 46, paragraph 3, of Legislative Decree No. 277/91 on noise levels emitted by equipment and systems
- Local Fire Department requirements and recommendations
- Applicable municipal regulations
- Ministerial Decree No. 37/2008: Safety standards for systems, and related implementation regulations
- Legislative Decree No. 626 of 19/09/1994: Implementation of EU directives concerning worker safety and health
- Legislative Decree No. 93 of 25/02/2000: Implementation of Directive 97/23/EC on pressure equipment
- ANSI/TIA-942-2005
- ASHRAE 20/2017 and 90.1/2010
- Legislative Decree No. 192 of 19/08/2005: Implementation of Directive 2002/91/EC concerning energy performance in buildings
- Legislative Decree No. 311 of 29/12/2006: Amendments and additions to Legislative Decree No. 192 of 19 August 2005

- Legislative Decree No. 28 of 03/03/2011: Implementation of Directive 2009/28/EC on promoting the use of energy from renewable sources
- Presidential Decree No. 59 of 2/04/2009: Implementing Legislative Decree 192/05
- UNI 7939-1: Terminology for automatic control of comfort systems – Heating systems for spaces
- UNI 8011: Refrigeration systems – Safety requirements
- UNI EN 378-1 to 378-4 (2012): Safety and environmental requirements for refrigeration systems and heat pumps (Parts 1–4)
- UNI EN 14511-1 to 14511-4 (2022): Air conditioners, chillers, and heat pumps with electric compressors for space heating/cooling and process cycles – Definitions, testing methods, and requirements
- UNI 8199: Acoustics – Acoustic testing of HVAC systems – Contractual guidelines and measurement procedures
- UNI 9432: Acoustics – Determination of personal noise exposure levels in the workplace
- DPCM 01/03/1991: Maximum noise exposure limits in residential and outdoor environments
- Framework Law on Acoustic Pollution (Law of 26/10/1995)
- DPCM 14/11/1997: Determination of sound source limit values
- DPCM 05/12/1997: Determination of passive acoustic requirements of buildings
- DM 16/03/1998: Techniques for detecting and measuring noise pollution
- ASHRAE 90.1-2010: Energy Standard for Buildings Except Low-Rise Residential Buildings as mandated by the Texas Administrative Code

3. INSTALLATION OF THE NEW CHILLER UNIT

3.1 TECHNICAL SPECIFICATIONS

The new chiller unit must have the same technical and dimensional characteristics as the nine existing units. The key specifications are as follows:

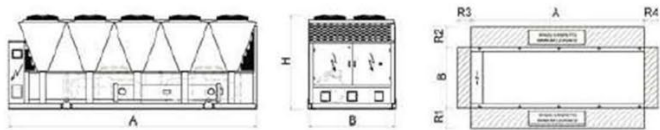
UNIT TECHNICAL DATA

- Cooling capacity: 921 kW
- Water temperature: 15–21°C
- Outdoor air temperature: 39.5°C
- EER: 3.72 (excluding integrated pump performance)
- Total electrical input (at 39.5°C): 249 kWe

The indicated cooling capacity corresponds to 90% of the unit's maximum capacity under design temperature conditions (39.5°C).

WEIGHT & DIMENSIONS

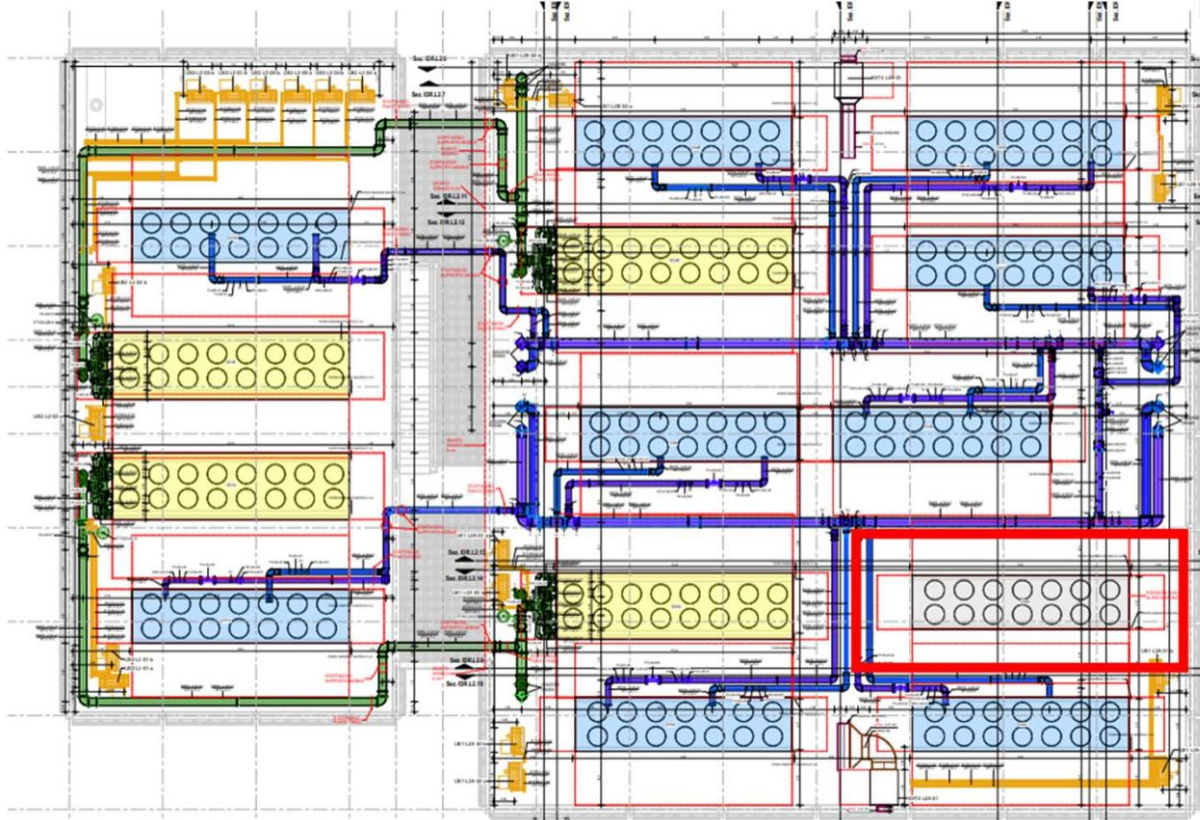
A	mm	9000
B	mm	2260
H	mm	2500
Operating weight	kg	8500
R1	mm	1500
R2	mm	2300
R3	mm	1500
R4	mm	1500



For further technical details, refer to the Special Technical Specifications.

3.2 POSITIONING

A designated area for the installation of the new chiller unit has already been allocated on the roof of Building L2, highlighted in red in the roof layout drawing shown below.



Lifting of the unit will be carried out using a mobile crane positioned on the adjacent road next to the railway, as illustrated.



To allow for correct placement, it will be necessary to temporarily dismantle the section of the lightning protection system currently interfering with the work area on the roof of Building L2.



3.3 HYDRAULIC CONNECTIONS AND INSTALLATION OF AUXILIARY COMPONENTS

The connection piping for the new chiller shall be linked to the existing circuit at the pre-defined branching point, equipped with manual shut-off valves.

No crossover or bypass systems will be required on the building's roof, as the shut-off valves will be relocated to ensure accessibility.



The following components shall be installed on the inlet line to the chiller:

- A 12-liter expansion vessel
- A safety valve preset at 4 bar
- An electronic flow switch
- A flow meter interfaced with the ClimaPRO and Schneider supervision systems

The following shall be installed on both the inlet and outlet lines of the chiller:

- Thermometers and pressure gauges
- Temperature probes connected to the ClimaPRO and Schneider supervision systems

All newly installed pipes and equipment shall be provided with anti-seismic supports.

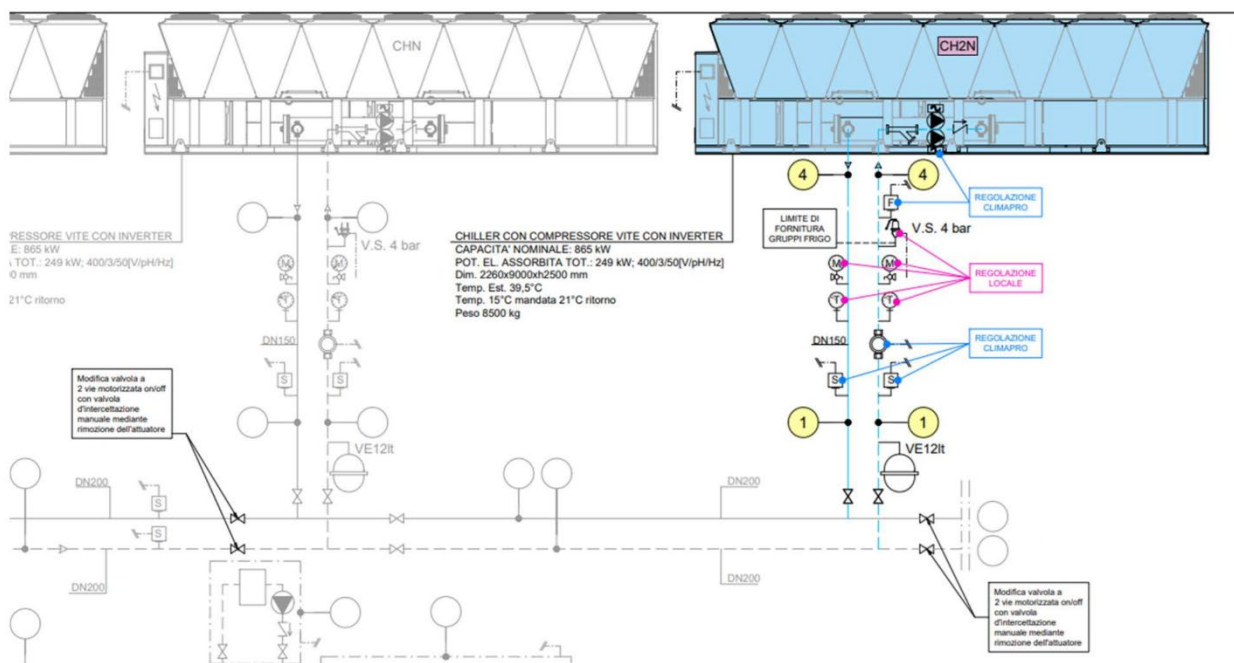
3.4 MODIFICATIONS TO THE EXISTING CIRCUIT AND OPERATING LOGIC

With the installation of the new CH2n unit, each substation will be assigned a dedicated backup chiller: Substation A will be backed up by CH1n, while Substation B will use CH2n.

The motorised two-way valves currently controlling the CH1n unit shall be opened and deactivated by removing their actuators. The ClimaPRO system's sequence and backup logic shall be revised to exclude control of these four motorised valves.

Emergency backup from Substation A to Substation B or vice versa will rely on existing manual shut-off valves.

The new configuration ensures dedicated redundancy and greater operational clarity by simplifying the emergency switching logic and reducing the number of active components subject to failure.



3.5 ELECTRICAL CONNECTIONS AND INTEGRATION INTO SUPERVISION SYSTEMS

The new rooftop chiller unit will be electrically powered through existing provisions within the electrical panels identified as **MECHANICAL SWITCHBOARD 2** and **MECHANICAL SWITCHBOARD 4**, located inside Building L2.

- These panels, constructed with protection levels suitable for the installation environment and compliant with **CEI EN 61439-2**, are already sized to accommodate additional mechanical loads, in particular: power lines shall be constructed using cables of appropriate cross-section and **CPR-compliant characteristics**, installed within designated conduits previously laid and identified according to **CEI 64-8** standards

The new chiller unit shall be integrated into the existing **ClimaPRO supervision system** through bus, digital and analog signals from the onboard control and regulation equipment. Adequate space is available within the **ClimaPRO Master and Slave regulation panels** to accommodate new signal wiring, ensuring full continuity in automatic monitoring and regulation of the system.

Additionally, the chiller shall be integrated into the **general Schneider Electric supervision system** via the electrical panel **SUB-SW-B1**. Specifically, the following updates are foreseen:

- **IP List update**
- Development of the **AS-P supervision software** for control unit **CTF-A**, with dual interface (**Modbus Serial** and **BACnet IP**) to manage 14 selected variables, including commands, statuses, and alarm signals
- For control unit **CTF-B**, the **IP-IO-UIO5DOFA4 module** shall be updated with new hardwired points (3 **DI** and 1 **DO**), with corresponding software development, addressing, testing, and commissioning

Finally, the graphical representation of the new chiller shall be created for both **CTF-A** and **CTF-B** within the **Enterprise Server**, ensuring full functional mapping within the supervision system.

APPENDICES:

Please see separate documents for drawings:

- Appendix 1 - Cooling system general schematic
- Appendix 2 - L2 layout - ground floor
- Appendix 3 - L2 layout - First floor
- Appendix 4 - Single line diagram ME-SW-2
- Appendix 5 - Single line diagram ME-SW-4
- Appendix 6 - Water piping - 3D and sections