**SYSTEM NARRATIVE**

**DESCRIPTION AND CONTROL OF THE HOT WATER FOR HEATING PRODUCTION PLANT**

For the generation of hot water for heating, there is an Aldingás natural gas condensing boiler, model R505, with a nominal power of 168 kW and a useful power of 165 kW, a performance at maximum power of 104.1% and of 102.6% at 30% power (approved according to European Directive 92/42/EC on energy performance). The operating temperature ranges from 104 to 113 ºF.

The natural gas condensing boiler is an inverted combustion boiler with variable-speed fan motor. The control system is as follows:

1. Boiler modulating between 20% and 100%.
2. It incorporates automatic control with over-temperature disconnection, freeze protection and flow control safety mechanisms.
3. As well as these safety mechanisms, it incorporates various other features including different operating modes [standby, automatic, summer, service], controls the flame via the ionisation current, modulates the burner, and controls both the pump and the external gas electro-valve.

It has a circulating pump in the primary circuit. The hot water generated is used to fuel the underfloor heating system and hygienic air renewal system. It has a feed collector and return collector.

---

**DESCRIPTION AND CONTROL OF THE COLD WATER PRODUCTION PLANT**

For the generation of cold water, there is a CARRIER air-cooled liquid chiller, model 30RA (120) Aquasnap, with a useful cooling power of 118 kW. Its exit temperature stands at 44ºF and the return temperature is 54ºF.

It incorporates Pro-Dialog control. It takes care of all compressor, fan and water pump procedures, optimises power consumption and controls all security parameters and mechanisms. It has remote start/stop control managed by a pre-programmed timetable at the central control unit.

The cold water generated is destined to fuel the underfloor heating system and hygienic air renewal system. It has a feed collector and return collector.

---

**DESCRIPTION OF THE HOT SANITARY WATER PRODUCTION PLANT**

For the production of hot sanitary water, there is a solar installation made up of two panels measuring 2.5m², a double-chamber tank with a capacity of 300 litres and a support system consisting of a Viessmann wall-mounted, gas-condensing boiler, model Vitopend 100 WHE, with a useful power modulating between 10.5 and 24 kW. The hot water accumulated at a temperature of 140ºF is distributed at a temperature of 131ºF to the washbasins in the bathrooms on the various floors of the building, and to the shower in the ground floor changing rooms.
DESCRIPTION OF CENTRAL HEATING AND COOLING SYSTEM

Heating and cooling is carried out via underfloor heating, which consists of water being circulated at medium temperatures using Wirsbo-evalPEX cross-linked, polyethylene pipes. These pipes are placed on an insulating surface and buried in concrete screed, which is then heated (heating) or cooled (cooling). The screed serves to transmit the stored energy to the floor, in such a way that this latter can release the heat into the room through processes of radiation and convection.

The underfloor heating is fuelled by the hot water production plant and the cold water production plant, respectively.

Room temperature is regulated by controlling the flow of water pumped into each circuit in response to the signal sent by each thermostat.

The temperature of feed and return collector waters is regulated by mixing boiler water with underfloor heating return water using a 3-path mixing valve.

It has a feed and return collector for each floor. The feed collector sits on top and incorporates lock-shield valves for each circuit (whose position is set manually). The return collector lies underneath and incorporates manual open and close taps for each circuit, on the thread of which thermo-electric heads are installed for automatic control of flow to each circuit.

Each of the collectors has a shunt unit made up of: a 1 ¼” 3-path valve controlled by the capillary tube, by-pass and Grundfos pump, model UPS 25-80 180.

DESCRIPTION OF THE HYGIENIC AIR RENEWAL SYSTEM

For the treatment of hygienic air being supplied to the various rooms, there is a central air conditioning unit for the whole of the building. This air treatment unit has an EU3 filter, hot/cold battery, and an air supply and extraction fan. It is fuelled by the hot water production plant and the cold water production plant, respectively.

Furthermore, the ventilated air expelled outside by mechanical means is passed through a plate exchanger type energy recovery device in order to transfer part of the heat to the new air being supplied.

Meanwhile, due to the variations in the number of people working in the building, the supply air flow is adjusted with the help of an environmental quality sensor located at the return or extraction of the air conditioning unit, in such a way as to achieve minimum levels of energy consumption while at all times sustaining ideal indoor air quality. In any case, the gates regulating the flow being supplied and extracted are adjusted manually in order to guarantee minimum flow of outside air.

There is a greenhouse which allows hot air to be supplied to the air conditioning unit in the winter. The objective is to save energy in the process of heating the air in relation to the temperature inside the greenhouse and the outside temperature.

In the summer, the existing vent system facilitates the circulation of air and subsequent cooling of the greenhouse.
CONTROL OF THE AIR CONDITIONING, HEATING AND HYGIENIC AIR RENEWAL INSTALLATION

The air conditioning and heating installation is centralised via computer control. This control enables the following factors to be managed and controlled:

- Underfloor heating circuits: 15.
- Room temperatures in a total of 15 areas.
- Floor temperatures in 15 areas.
- Average humidity and temperature of the building.
- Dew point on each floor.
- Operational settings and Start/Stop of boilers, cooler and air conditioner for supplying hygienic air.
- Solar shading on the west-facing facade.

All of these controls allow an operational regime to be established for the various factors and occupied areas, and for various comfort or temperature levels to be set as required, in order to adjust thermal energy consumption in response to the variations in thermal load existing at any given moment.

Of all the controls mentioned, we should highlight the solar shading of the west-facing facade, whose windows are protected by sliding shutters.

These shutters move horizontally in response to the position of the sun, in order to avoid solar energy gains through the windows, thus saving considerably on energy consumption, especially during the summer.

The system also controls a greenhouse located on the south-facing facade. This greenhouse enables the supply of warm air to the air conditioner over the winter, with a view to saving on the energy required for heating the air in relation to the temperature inside the greenhouse and the outside ambient temperature.

Over the summer, the control system automatically activates the existing openings in order to facilitate the circulation of air and the cooling of the greenhouse.

The operational timetable of the hygienic air renewal system is as follows: 9:30am to 2pm, and 2:45pm to 6:30pm.

See the document which provides a detailed outline of the automated control system (attached to the proof of compliance with LEED-EB Credit 3.1).

DESCRIPTION AND CONTROL OF THE INDEPENDENT COOLING UNIT FOR THE DATA CENTRE

On the ground floor of the building there is a room where the UPS and racks are located. Given the heat released by these elements, there is a Mitsubishi Electric wall-mounted split-type air conditioner unit, heat pump type, with a nominal power of 15,000 Btu/h cooling and 17,100 Btu/h heating (model PKH-RP1.6 GAL).

The temperature is set in unit at 66ºF.

DESCRIPTION AND CONTROL OF LIGHTING

The building’s lighting is primarily made up of fluorescent lamps. In the office spaces and reception area, there is fluorescent lighting featuring T5 technology with integrated electrical ballast, and compact fluorescent lighting with integrated electronic ballast. Areas used for storage or parking, which have a lower frequency of use, are installed with fluorescent lighting featuring T8 technology with conventional electromagnetic ballasts.

The bathrooms are fitted with dichroic halogen lamps. Exterior facade lighting consists of metal halide lamps.

Lighting is controlled as follows:

- General: manual switches.
- Bathrooms: motion sensors.
- Storerooms on each floor: time delay switches.
- Exterior [facade] and inner patio lighting: centralised control thanks to the Building Automation
Exterior (façade) and inner patio lighting is controlled as follows:

1. Authorised use: via centralised control, thanks to the Building Automation System (BAS), with the following timetables:
   - Inner patio: from 5pm to 8pm.
   - Exterior (façade): from 5pm to 10pm.

2. Final control of lighting: if within hours of authorised use, lighting will be turned on and off in response to the data captured by the brightness sensor.

See the document outlining the automated lighting control system in detail [attached to the proof of compliance with Credit 3.1 of Energy and Atmosphere]. See also the inventory of lamps [attached to the proof of compliance with Credit 4 of Material and Resources].