

Name of Project:	Residential Building	Submitter:	CTU CE Prague
------------------	----------------------	------------	---------------

RESIDENTIAL BUILDING

TAINAN – ANPING

AIR VENTILATION AND COOLING SYSTEM

DOCUMENTATION FOR CONSTRUCTION

C1.3 TECHNICAL REPORT

Profession:	Air ventilation and Cooling System	Author:	Bc. David Šnajdr
Content:	Technical Report	Date:	05/2019

Name of Project:	Residential Building	Submitter:	CTU CE Prague
------------------	----------------------	------------	---------------

Content of Technical Report

1. Introduction	3
2. Initial Data.....	3
3. Requirements for Air Ventilation and Cooling System	3
4. Technical Description of Devices for Air Ventilation	4
5. Cooling System.....	4
6. Requirement for Following Professions.....	4
7. Device Operation Test.....	5

Profession:	Air ventilation and Cooling System	Author:	Bc. David Šnajdr
Content:	Technical Report	Date:	05/2019

Name of Project:	Residential Building	Submitter:	CTU CE Prague
------------------	----------------------	------------	---------------

1. Introduction

The subject of the project is a new residential complex. The building has 15 above-ground floors and 1 underground floor. In the underground floors there is a cellar, garbage depot and technical facilities. There are 70 housing units on the above-ground floors.

The project documentation solves the Air Ventilation and Cooling system in the Residential House. The system ensures the parameters of the internal microclimate of the individual rooms in terms of thermal comfort according to the investor's requirements and the relevant standards.

2. Initial Data

The design of individual ventilation devices is based on the following calculation data:

Latitude	22°99`N
Altitude	5.1 m elevation above sea level
Air Pressure	101,3 kPa
Dry bulb temperature in winter	+12°C
Wet bulb temperature in winter	+8°C
Air enthalpy in winter	25.6 kJ.kg ⁻¹
Relative air humidity in winter	94%
Dry bulb temperature in summer	35°C
Wet bulb temperature in summer	24°C
Enthalpy of air in summer	65 kJ.kg ⁻¹
Relative humidity in summer	83%
Absolute humidity in summer	22,5 g.kg ⁻¹

3. Requirements for Air Ventilation and Cooling System

NOISE PROTECTION MEASURES

Air handling and cooling equipment is selected and positioned so that the maximum permissible noise levels in the indoor and outdoor environment are not exceeded. Alternatively, they are provided with silencers. Silencers are considered with low pressure loss and high insertion loss.

To prevent vibration transmission, all rotating parts will be flexibly connected to the ducts and resiliently seated.

FIRE PROTECTION MEASURES

Air ducts will be made of non-combustible materials. Fire dampers will be installed on the air-handling ducts with a clear cross-section greater than 0.04m or the ducts passing through another fire section will be provided with a fire-resistant cladding with the required fire resistance. The type of insulation and the method of its attachment to the duct must have a valid certificate.

If EPS is installed in the building, the signal from this device will shut down all operating air conditioning.

Fire solutions and escape routes are not addressed in this section.

Profession:	Air ventilation and Cooling System	Author:	Bc. David Šnajdr
Content:	Technical Report	Date:	05/2019

Name of Project:	Residential Building	Submitter:	CTU CE Prague
------------------	----------------------	------------	---------------

4. Technical Description of Devices for Air Ventilation

The occupied rooms will be ventilated naturally through the windows. WCs and bathrooms will be ventilated by individual fans. Extracted air will be connected to a common riser duct, extending above the roof of the building. Kitchen ventilation will be solved by hoods over cookers.

Ventilation of cellar cubicles, common areas, furnishings and technical spaces is designed as natural.

Sizing the device

Individual ventilation devices are sized as follows:

- WC: min. 40 m³.h⁻¹
- Bathroom: 80 m³.h⁻¹
- Kitchen exhaust: 150 m³.h⁻¹

5. Cooling System

Individual cooling is proposed in all apartments. The thermal loads were calculated in the individual rooms, which were determined for an internal temperature of 25 ± 2 ° C at an outdoor temperature of 35 ° C. The thermal-technical properties of the proposed structures were used for the calculation, the windows are considered as a single-pane, protected by external blinds. Internal load common to 2-4 people per room.

Multisplit systems with direct refrigerant injection will be designed for cooling, based on local standards. The refrigeration system for each apartment will consist of an outdoor condenser unit with an inverter-controlled compressor and internal wall units according to the number of refrigerated rooms. The outdoor units will be installed on the balconies of the respective apartments. Location of indoor units according to disposition.

The device will work with environmentally friendly refrigerant R410A. The refrigerant will be conducted through the copper pipe, this will be conducted freely in the duct channels. The condensate drain will be solved by gravity plastic piping. Control of indoor units is assumed to be individual for each room remote by the remote control.

6. Requirement for Following Professions

Construction

- making all ducts for ventilation ducts, grilles, blinds, etc., and filling holes after assembly and cleaning them
- execution of fire seals of all pipes and fire grids in the passage through fire separating structures
- installation of doors without thresholds, or a gap of 10-15 mm below them
- equipping the chamber doors with grids for natural ventilation of these areas to adjacent rooms
- providing adequate transport routes for the installation of the equipment and later for servicing and repairs
- ensuring proper lighting for the installation, maintenance and servicing of equipment

Wiring, measurement and control

- ensuring power supply for individual fans, including their protection and control
- grounding of ventilation and cooling equipment
- shutting down the EPS from the EPS in case of fire

Profession:	Air ventilation and Cooling System	Author:	Bc. David Šnajdr
Content:	Technical Report	Date:	05/2019

Name of Project:	Residential Building	Submitter:	CTU CE Prague
------------------	----------------------	------------	---------------

Sanitary Installations

- condensate drainage of cooling units in apartments on the last 4 floors of the building

7. Device Operation Test

The air supply and exhaust air elements will be adjusted so that the requirements of the decree are met, particularly in terms of flow velocity and air temperatures.

After installation, the device will be set to the design parameters, the flow rates will be set in the individual branches and the flow rates on the end elements will be set.

Furthermore, the function of chiller control will be tested and current consumption of el. fan motors or compressors.

A test run of the device is required before handing over the equipment to the user. The functionality and reliability of the equipment will be monitored during the trial run.

The contractor shall provide operator training and draw up the operating rules of the equipment.

Profession:	Air ventilation and Cooling System	Author:	Bc. David Šnajdr
Content:	Technical Report	Date:	05/2019

C1.4 Table of Cooling Loads -> 4F+13F (Tainan)

4F											
Flat Number	Floor:Zone	Design Capacity [kW]	Design Flow Rate [m ³ /s]	Total Cooling Load [kW]	Air Temperature [°C]	Humidity [%]	Max Op Temp in Day [°C]	Floor Area [m ²]	Volume [m ³]	Flow/ Floor Area [l/s-m ²]	Design Cooling Load Per Floor Area [W/m ²]
1441	04FL:Zone4	16,55	0,498	14,39	25	73,4	26,5	96,6	285,4	5,2	171,4
1442	04FL:Zone3	14,64	0,445	12,73	25	72,8	26,6	82,3	243,2	5,4	177,9
1443	04FL:Zone5	9,79	0,295	8,51	25	73,4	26,5	57,0	168,4	5,2	171,8
1444	04FL:Zone6	12,68	0,391	11,03	25	72,1	26,7	68,7	203,1	5,7	184,6
1445	04FL:Zone1	10,50	0,318	9,13	25	73,1	26,4	60,3	178,2	5,3	174,1

13F											
Flat Number	Floor:Zone	Design Capacity [kW]	Design Flow Rate [m ³ /s]	Total Cooling Load [kW]	Air Temperature [°C]	Humidity [%]	Max Op Temp in Day [°C]	Floor Area [m ²]	Volume [m ³]	Flow/ Floor Area [l/s-m ²]	Design Cooling Load Per Floor Area [W/m ²]
14132	13FL:Zone4	18,85	0,564	16,39	25	73,7	26,5	111,6	329,9	5,05	168,8
14131	13FL:Zone3	11,86	0,364	10,31	25	72,5	26,6	65,9	194,6	5,52	180,0
14133	13FL:Zone5	16,86	0,508	14,66	25	73,4	26,6	98,2	290,0	5,17	171,8
14134	13FL:Zone1	16,06	0,486	13,96	25	73,0	26,6	91,1	269,1	5,34	176,4